Sociologists and anthropologists have long been concerned with how individuals are linked to one another and how these bonds of affiliation serve as both a lubricant for getting things done and a glue that provides order and meaning to social life. This attention to networks of association, which began in earnest in the 1970s, provided welcome texture and dynamism to portraits of social life. Indeed, this work stood in stark contrast to the reigning approaches in the social sciences. In contrast to deterministic cultural (oversocialized) accounts, networks afforded room for human agency, and in contrast to individualist, atomized (undersocialized) approaches, networks emphasized structure and constraint. Indeed, networks offered a middle ground, a third way, even if no one was quite sure whether networks were a metaphor, a method, or a theory (Barnes 1972). But sociologists and anthropologists did not pay sustained attention to how networks shaped economic life, even though industrial sociologists (Roy 1954; Dalton 1959) had long stressed the role of informal networks as an antidote to formal organization practices and structures.

Over the past decade, however, there has been an enormous upsurge of interest in the role of networks in the economy. This sea change occurred in the worlds of both practice and theory. Business practice has changed profoundly in recent years. As Bennett Harrison (1994) puts it, “Networking among companies is now in fashion, all over the world.” In the academy, a much quieter change has been occurring as scholars develop sophisticated methods to study the structure of social networks. Mark Granovetter, in his influential 1985 paper, added much-needed substance to these methodological developments, arguing that “networks of social relations penetrate irregularly and in different degrees” (p. 491) throughout the economy. Granovetter reinvigorated an older tradition of economic sociology (Parsons and Smelser 1956), and made networks a critical component of this enterprise.

The concept of network is in vogue, but popularity is accompanied by a general vagueness about exactly what the idea entails. In this chapter, we survey various strands of research that under the network rubric. We organize this work topically and highlight key conceptual issues that motivate different research programs, stress the strengths and liabilities of the varied analyses of networks. Following our review, we search for common conceptual foundations: are there generalizable arguments about the processes that lead to the formation of networks? What contribute to the vitality and durability of networks? Why are the causes of failure in networks? We close with a brief discussion of the kinds of research and theorizing that are needed to capitalize on the promise networks hold for economic sociology.

Two Approaches to the Study of Networks

In their present state of development, the strands of social science research that invoke the network concept lack coherence with respect to terminology, definition, and operationalization. One way to give order to the sprawling enterprise is to note two pervasive, but not always identified, perspectives. The first, anchored in sociology and organization theory, employs networks as an analytical device for illuminating social relations, whether inside a firm, in the interorganizational ties that link firms, or in the environments of organizations. The second more multidisciplinary and prescriptive approach views networks as a kind of organizing logic, a way of governing relations among economic actors. We briefly sketch these two approaches and their common assumptions.

Networks as an Analytical Tool

In the interdisciplinary field of organization theory, a concern with networks has long been paramount. Over time the level of analysis has
Networks and Economic Life

shifted; in tandem, the concept of network has evolved from a metaphor to describe patterns of informal ties within organizations, to a portrait of how the environments of organizations are constructed, to a formal research tool for analyzing power and autonomy.

The interplay between formal and informal structures—the chain of authority represented in the organization chart versus the soft underbelly of friendship cliques and tacit workplace norms—is a recurring theme in organization studies. Some analysts see informal relationships as a hindrance to productivity (Roethlisberger and Dickson 1939), while others view them as a means to subvert management dictates (Roy 1954; Gouldner 1954). But informal networks can also bridge departmental boundaries and overcome stifling organizational routines, thus enhancing organizational performance (Barnard 1938; Kanter 1983). Running through this work are the shared insights that informal relationships are at the center of political life in organizations; that formal organizations are essentially patterns of recurring linkages among persons and that organizations are built on a complex mixture of authority, friendship, and loyalty.

Recent work in macro organization theory has focused on how the environments of organizations are structured. Both population ecology (Hannan and Freeman 1989; Hannan and Carroll 1992) and the new institutionalism (Powell and DiMaggio 1991; Meyer and Scott 1992) examine the collective organization of the environment, arguing that the environments of organizations consist of other organizations and that demographic and structural properties of the environment shape the behavior of organizations. Ecologists and primarily to key demographic processes (organization formations, transformations, and deaths), while institutionalists pay more attention to cultural and normative features of the environment (sources of legitimacy, professional claims, rationalized belief systems). Much progress in explaining the behavior of organizations has been made by recognizing that most of the relevant action in organization fields or communities takes place within dense webs of network ties that link organizations and their members. Networks of relations among individuals in different organizations and among organizations in a field are critical in explaining how organizations adopt similar structures and pursue common strategies.

Formal network analysis, developed out of a influence of insights from social anthropology, sociometry, and the work of Harrison White and his collaborators, has burgeoned in recent years. This line of research conceives of social structure as a pattern of identifiable relations linking social units (be they individuals, collectives, or corporate actors) that can account for the behaviors of those involved. One’s position in a network both empowers and constrains action. Structural analyses show that knowledge of the resources present in an actor’s network tells us a good deal about that actor’s capacity for power and influence. Ron Burt (1992), in a work of impressive generality, has moved beyond the who question—that is, which position in a network structure has privileged access to resources—to the deeper question of how certain structural arrangements generate benefits and opportunities. Networks pose a swirl of conflicting demands, but those players who prosper, Burt contends, are those whose immediate networks are dense and overlapping, and who are linked to more distant networks rich in nonredundant contacts. Those so positioned are structurally autonomous; that is, capable of capitalizing on the information and control benefits afforded by the presence of structural holes (i.e., opportunities) to broker gaps in the social structure.

Networks as a Form of Governance

Alongside the abstract analytical work is a rich and lively vein of research with a much more pragmatic and real-world flavor. This work views networks as a form of governance, as social glue that binds individuals together into a coherent system (Powell 1990; Sabel 1989, 1991, 1993). Network governance structures characterize the webs of interdependence found in industrial districts and typify such practices as relational contracting, collaborative manufacturing, or multistranded interfirm alliances. Some scholars even elevate network to an ideal type that captures key features of an entire economy, arguing that certain national economies are constituted by a preponderance of long-term intercorporate relationships (Dore 1987; Lincoln 1990; Gerlach 1992a). Indeed, the tendency to see network patterns as a distinctive organizing motif of economic life runs through many of the chapters in this Handbook, including the role of networks in labor markets, ethnic enterprise, and the organization of business groups, to name but a few.

Much of the impetus for this line of work can be traced to Piore and Sabel (1984), who argue
that a new logic of production—flexible specialization—emerged as a challenge to mass production. Mass production (based on vertical integration, dedicated machinery, rigid, hierarchical work rules, and a detailed division of labor), they argue, has reached a crisis point. Markets for standardized goods are saturated, while higher quality and more specialized goods attract consumers. Into this volatile environment stepped flexible producers who could respond quickly to changing market conditions. To meet the demands of this changing marketplace, firms adopt new modes of organization that spread production across diversified interfirm linkages of suppliers, subcontractors, and end users. In the regions of north central Italy and southwestern Germany, a complex division of labor among small and medium-sized companies has developed, buttressed by a supportive tissue of local institutions, which allows firms to produce a wide range of products.

In tandem with developments among small firms in industrial districts came a transformation in corporate organization—the blurring of organizational boundaries, typified by greater reliance on subcontractors and the launching of collaborative ventures with former competitors to develop new technologies. Arguments have been offered either as accounts of why a new logic of production emerged or as normative statements about the need for such changes. Students of multinational firms argue that a new era for the transnational firm has dawned, in which companies are now enmeshed in alliances and linkages that eschew centralized control while enhancing flexibility and adaptability to local markets (Porter and Fuller 1986; Contractor and Lorange 1988; Bartlett and Ghoshal 1989). Others contend that new information technologies allow entirely new, more disaggregated, and flexible production arrangements (Morton 1991; Rockart and Short 1991). Even economists, albeit mostly European ones, argue that information-based networks led the transition from the age of machines to the era of information (see Freeman 1991; Antonelli 1992).

Research on the development of successful start-up companies stresses networks as a means for quick access to resources and know-how that cannot be produced internally (Larson 1992; Nohria 1992). Students of Japanese business have long noted that work is organized differently in that country, depending more on extensive subcontracting relations, joint learning, a diffuse responsibility for technological innovation, and interfirm cooperation (Dore 1983, 1987; Friedman 1988; Smitska 1991; Gerlach 1992a; Fruin 1992; Nishiguchi 1993). Research in Sweden, done largely by marketing scholars, points to stable long-term linkages among industrial manufacturers who share research and development resources and personnel (Håg and Johanson 1983; Håkansson 1987; Håkansson and Johanson 1992). Swedish firms appear to invest in connections with other companies and pool resources and information thus blurring their independent identities (Johanson and Mattsson 1987; Biemans 1992; Axelsson and Easton 1992).

Taken together, these diverse lines of work reveal consistent insights, causing scholars and policymakers to rethink long-held arguments about the nature of the firm and economic development. Put boldly, the findings demonstrate that:

There are essential linkages between economic and organizational practices and the institutional structure of a region or a society. Industrial development need not involve vertical integration or standardized mass production but may rely instead on horizontal networks of production. Trust, mutual forbearance, and reputation may supplement and/or replace the price mechanism or administrative fiat.

Points of Convergence: Common Themes, Parallel Weaknesses?

These two literatures developed independently, with little cross-fertilization. We believe this is unfortunate and merits remedy. First, the conceptual underpinnings—embeddedness, connectivity, reciprocity—of both lines of work evince strong similarities. Second, networks are both opportunity structures and sources of constraint in each literature. Third, both employ an analytical agenda that links networks to broader social contexts. This is most obvious in the governance literature, where supportive tissues of infrastructure and local customs restrain cut-throat competition and foster cooperation. But the most compelling recent work in organizational sociology reflects a similar theme: social and cultural forces shape the contours of collective action, organizations, and labor markets, and networks erect and sustain socioeconomic boundaries between individuals and organizations. Finally, we think the two literatures may compensate for and resolve some of their respective points of weakness and ambiguity.
Consider the language and the models of action in the two lines of work. Burt (1992, p. 13) tells us that the key informational benefits of networks are access, timing, and referrals. The choice of network contacts is guided by “a matter of trust, of confidence in the information passed and the care with which contacts look out for your interests.” Granovetter (1985) suggests we trust those informants we have dealt with in the past and have found to be reliable. Examine the verbs Burt uses to describe network ties: players are “connected to, trusting of, obligated to, and dependent on” certain others. Compare this statement with the descriptive accounts found in case studies of network forms of organization: exchanges occur through neither contractual agreements nor hierarchical dictates, but through networks of individuals engaged in reciprocal actions. This research points to dense, overlapping contacts, to the entangling strings of reputation and friendship. The open-ended, relational features of networks, with their relative absence of explicit quid pro quo behavior, greatly enhance the transmission and acquisition of new knowledge (Powell 1990).

Both literatures view identity as constructed through multiple role settings. In the formal literatures on networks, a social role exists only in relation to one or more complementary roles with which it regularly interacts. A role, then, is not merely a label for a set of activities that an individual routinely performs; it also indicates the points of contact with other people and the kinds of infections appropriate between people occupying different positions. Thus knowledge of a person’s work ties facilitates prediction of similarities in their attitudes and behaviors (Emerson 1972; Uden and Friedkin 1993). But the person at the center of a network of contradictory demands is at the mercy of others’ whims. Instead, in modern variants, Burt (1992) finds that individual autonomy can be formed out of a web of interdependencies; while White (1992) stresses networks as sources of meanings, of stories cobbled together to constitute identities.

Compare these formal definitions with ethnographic accounts. In describing the overlapping work, professional, and social life in the activity of editors in publishing houses, Powell (1985) observes that there is no boundary between work and personal life and that most of the time editors behave as if they are optimizing not their organization’s welfare but that of the social networks to which they belong. Identities are thus forged out of porous, multistranded relations in which business, reputation, and friendship are entangled.

We do not wish to make too strong a case for commonalities. In fact we highlight these conceptual linkages in part because we feel that both literatures have limitations. But we contend that cross-fertilization offers potential solutions to some of their respective drawbacks. For example, the case study-oriented research, whether on industrial districts, flexible firms, or global networks, has focused on “success” stories (Storper and Harrison 1991). In essence, this work has sampled on the dependent variable, ignoring the possibility that: (1) other kinds of organizational arrangements may be just as productive, innovative, or adaptive; or (2) similarly organized network structures exist in a wide range of settings but may produce radically different economic outcomes. Attention to network sampling procedures would provide a method for ascertaining the generalizability of these findings.

But the powerful analytical tools of network analysis have often been honed without parallel attention to substance. White (1992, pp. 65f) laments the sterility of network analysis, with its “misleading overtones of nodes being monads and of ties as lines in physical space with Cartesian dimensionality.” A curious irony of network research is that despite its focus on the causal importance of structures of relations among actors rather than properties of actors, the research treats network positions as properties themselves (see Davis and Powell 1992). Thus, studies often regard network centrality as an essential feature of an organization, such as size. Centrality, however, has significance only in specific network contexts. The remedy for the apparent primacy of method over substance in network research is to bring the content of ties, rather than merely the structure formed by these ties, back in. Social ties among organizations can be consequential, but not all of them need be. As Stinchcombe (1990, p. 381) suggests, “[O]ne has to build the dynamic and causal theory of a structure into the analysis of the links. . . . We need to know what flows across the links, who decides on those flows in the light of what interests, and what collective or corporate action flows from the organization of links, in order to make sense of intercorporate
relations." The more process-oriented, field-based research on network forms of governance can generate insight into how ties are created, why they are maintained, what resources flow across these linkages, with what consequences.

**Networks in Action**

In this section we critically review four main areas of network research. We begin with the more informal side of networks—the role that social ties play in searching for jobs, in mobilizing collective action, and in transmitting information. We turn next to the more developed and formal literature on networks and power. We then examine the de-evolution of the large, centralized, vertically-integrated firm, and its disassembly into a complex network of treaties. Finally, we review research on networks of production that points to the increasingly important role of spatially decentralized collaborative production in the development of new manufacturing processes and the commercialization of new products. We focus on research that illustrates the critical role of networks in economic life and suggest ways in which these disparate lines of research might profitably inform one another.

**Networks of Access and Opportunity**

A wide-ranging literature shares the common assumption that the structure of social relations shapes the flow of information and opportunities in the workplace. Table 1 summarizes this body of literature. Access to information, we argue, is channeled through networks and these networks have important consequences for employment prospects, the mobilization of resources, and the diffusion of ideas and policies.

**Employment.** We begin with a brief survey of job searching. More extended discussions are provided in other chapters of this *Handbook*; the Tillys (chap. 12) deal with networks and labor markets; Light and Karageorgis (chap. 26) discuss networks and the ethnic economy; and Alejandro Portes (chap. 17) looks at networks in the informal economy. Job searches are a mating process, matching job seekers with employers searching for employees. But few employers looking for workers or workers seeking work look expansively. In fact, to sift through every candidate on every classified ad would be an inefficient allocation of time. Job seeker and employer do not typically encounter one another as strangers. A considerable amount of recruitment occurs through a process that Granovetter (1973, 1974) captured nicely in his "strength of weak ties" argument. He argued that people are much more likely to find out about a job opening through a weak tie (someone with whom you are acquainted but who travels in different circles, such as a classmate from college) than from a strong tie (a close friend who associates with many of the same people as you do). Close friends have access to the same contacts and information, and thus provide redundant information, whereas acquaintances are bridges to new contacts. Nor do networks matter only for professional and managerial employees; research suggests that networks facilitate job searches in blue-collar communities (Wilmot 1988) and immigrant communities (Light et al. 1993) as well. But the functions served by networks vary across different labor markets. Under

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<td><strong>Examples of Research</strong></td>
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| Mobilization | Boissevain (1974) | Access to capital | Brokerage, know-
|           | Rogers and Larsen (1984) | and information | how trading |
|           | von Hippel (1988) | | |
|           | Schrader (1991) | | |
| Diffusion | DiMaggio and Powell (1983) | Spread of organizational | Legitimacy |
|           | Baron et al. (1986) | practices across members of a field | institutionalization |
standing how these variations in network structure are linked to labor market outcomes is a cutting-edge research topic in both sociology and economics (Montgomery 1991, 1992; Granovetter 1986).

Networks do the valuable work of matching supply and demand; they transmit through personal communication information that is not circulating through public channels. Moreover, there is evidence that the jobs secured through networks are of higher quality in that they pay more and are more likely to be newly created jobs without incumbents (Granovetter 1974, pp. 14–16). Current debate centers on whether network contacts relay job information more frequently, or whether the “weak-tie” job offers are drawn from a superior distribution (Lin 1982). Montgomery (1992) finds that network composition is an important determinant of labor market success, but the use of a weak tie does not necessarily generate higher wages. These results need to be placed in a larger context. Campbell et al. (1986) argue that networks are resources, and like many resources, networks are not distributed evenly in society. Research on friendship and discussion networks reveals strong, consistent results: the more educated a person is, the larger his or her network and the more likely he or she is to include in a discussion network people who are weak ties (Fischer 1982; Marsden 1987; Burt 1990). Less educated individuals are more likely to include relatives and strong ties in their discussion networks (Burt 1990). Individuals of high socioeconomic status have more opportunities, both on the job and in social settings, to form weak ties with others in positions of influence. People from lower socioeconomic status, with more tightly knit social networks, have fewer opportunities and thus less access.

Differences in network composition do not mean that networks matter more for some individuals and less for others. Considerable evidence shows that “street smarts” are widely distributed—as many as half of all jobs are found through personal referrals (see the survey of previous research in Montgomery 1991; and Granovetter 1986). The key insight of network studies is that the resources available through contacts vary, and the advantages and numbers of contacts early increase with education. Networks facilitate access in a wide range of settings, whether it is a blue-collar job found through a close friend or an executive position secured through a business school acquaintance. But the individual with more extensive weak ties clearly has a larger pool from which to draw.

The type of network access also varies by company size (Granovetter 1974, 1986). In smaller firms, the likelihood is high that a new employee has had previous contact with members of the firm and may know the employer personally. Larger companies are more likely to tap into established recruiting channels such as college alumni networks or university placement officers. Recruiting through direct personal ties is less common in large firms, but new personnel are filtered on a variety of dimensions to ensure that they are similar to past hires (DiMaggio and Powell 1983). By drawing employees from the same schools or training institutes and selecting for similar attributes, existing organizational policies and practices are reinforced. Consequently, both weak-tie and strong-tie networks can produce a similar effect: New hires with network ties gain access to informal relations in the workplace. The process of learning the ropes is thus greatly facilitated. Having better access to friends and/or people with common backgrounds does not just make work go more smoothly, it contributes to long-term survival and success. Granovetter (1986) argues that there is less turnover in jobs secured through network ties. Dalton (1959) made a more explicitly political point, suggesting that much recruitment and subsequent promotion should be seen as an effort on the part of superiors to surround themselves with individuals who are likely to be their strong supporters. Rosenbaum (1984) has shown that the first few years in a job are critical to one’s long-term chances. Obtaining a job through network ties can put people on the fast track more readily. He shows that early successes give people much greater visibility, which in turn leads to more opportunities and greater challenges.

Networks play a critical role in the employment process in many kinds of jobs. Moreover, once in place, networks reproduce themselves in two ways: people recruited through networks may experience faster mobility inside an organization and people tend to recruit additional employees who are similar to themselves. These processes are obviously selective and particularistic. Some people are precluded entirely from consideration, while others, recruited through more formal means, may experience subtle forms of disadvantage. Ibarra (1992), in her study of networks in an advertising firm, found that women lacked access to the key informal networks in the company.
Women with the same skills and positions as men were excluded from informal linkages that allowed men to form alliances and obtain higher-level support. But even the disadvantaged can turn to networks to provide access to opportunities that are not available on the open market. The burgeoning literature on immigration provides a vivid illustration of how networks generate resources, even among people lacking physical capital.

The kinds of jobs that new immigrants obtain are very different than those secured by both professional and managerial employees and blue-collar workers. Yet we find that networks also play a crucial role in immigration and immigrant entrepreneurship (Massey 1988; Light et al. 1993). In addition, migration networks are both substantively interesting and theoretically important as well. Conceptually, networks link two determinants of immigration: individual choices of immigrants (micro), and economic and political influences at the regional level (macro). Network migration processes span continents and decades; they are the "interpersonal ties that link migrants, former migrants, and nonmigrants through the bonds of kinship, friendship, and shared community origin" (Massey 1988, p. 396). The decision to migrate, where to migrate, and how to cope in a new location are influenced greatly by the ethnic, kinship, and friendship networks in which people are involved (Morawska 1990). Once in place, networks create self-sustaining migratory flows, movements that are increasingly independent of the conditions that generated immigration in the first place.

Networks influence immigration processes and employment in at least four ways. When network density reaches a certain stage, the resulting support structure becomes a powerful inducement to further immigration. Thus not only do networks play a key role in the decision to immigrate, once communities of new and not so new immigrants are firmly established, they are a strong pull factor encouraging more mobility (Boyd 1989). A second point concerns the role of migration networks in diversifying risk. Massey (1988) argues that diversifying a household's location is a means of insuring against risk, especially for Third World families facing economically precarious circumstances. The presence of migration networks makes it possible for families to benefit from good times abroad and survive bad times at home.

When immigration is extensive, the migrant network modifies the local community by creating and expanding the employment opportunities for newly arrived, as well as prospective, migrants. A third way in which networks shape employment is through processes of chain migration (see the more detailed discussions in chapters 12 and 26 in this Handbook). To the casual observer, it seems odd that ethnic groups, with very small numbers in the overall population, concentrate with such frequency in certain jobs (e.g., Koreans and grocery stores, Pakistanis and gas stations, Greeks and restaurants, or Asian Indians and hotels). This selectivity is an outcome of successful chain migration networks. Finally, much of the entrepreneurship in new immigrant communities is supported through network ties, in the form of mutual aid, revolving credit associations, and assistance in dealing with formal bureaucracies such as the courts (Light et al. 1993).

Clearly networks are important in both migration processes and in white-collar job searches but a better understanding is needed of the relationship between different kinds of network structures and labor market outcomes. Moreover, the demand side process must be matched with supply considerations. Employers have a compelling motivation not to hire complete strangers; they prefer dependable employees who have been vouched for by others. One way of insuring reliability is to hire new employees from networks that have delivered reliability in the past. We also see in the literature on immigration how networks are multipurpose resources. In ethnic communities, employment is but one benefit. Contacts provide access to capital, news about promising business locations or the latest purchasing information, for example (Portes et al. 1989). We turn now to this more general process of resource mobilization.

Mobilization. Landing a job is the first step in a career. Maintaining that job and advancing on a career ladder also depend heavily on the ability to mobilize support for one's ideas. Access to resources, either informational or financial, is obviously important. But not everyone has the same interest in and talent for cultivating relationships with key people and using these ties for advantage. Two points are central to an individual's ability to mobilize resources to get things done. One, other things being equal, someone with a small set of overlapping, hence redundant, ties is at a disadvantage when competing with someone with a large set of diverse ties. Diverse ties provide ready access to information on opportunities and threats. The ability to tap into rich stores of information makes it easier to generate support for
one's agenda, as well as block those whom one opposes.

The extensiveness of linkages is only one part of the equation; equally important is access to persons in strategic locations who serve as brokers (Boissevain 1974). Weak ties expose individuals to new information that they would not likely receive within their immediate network. But brokers bring together different social worlds, bridging networks and making possible new combinations of resources. In the young field of biotechnology, for example, venture capitalists have played the essential role of bringing together academic and financial resources. In high technology industries, venture capital and law firms have been critical in matching research skills and money, as well as providing management and legal advice (Rogers and Larsen 1984; Powell 1993; Saxenian 1994). Brokers bring together, for a fee, networks that would, on their own, have limited opportunity for contact.

An intriguing line of research has developed on information trading among employees in competing firms. Of course, from a narrow economic viewpoint, these kinds of transfers involve leakage of crucial information and are a reason that firms have difficulty appropriating the gains from innovation (Mansfield 1985). But evidence has accumulated that such know-how trading is very widespread (Katz and Tushman 1981; Rogers 1982; Allen 1984; von Hippel 1988; Carter 1989; Schrader 1991). Consequently, economists have developed inventive accounts of why participation in informal information-transfer networks benefits the economic performance of the firm. In studies of the specialty steel industry, von Hippel (1988) and Schrader (1991) found that valuable information flowed freely through professional networks. Schrader (1991, pp. 154–55) reports that 61 percent of 294 respondents considered linkages in other firms to be an important or very important source of information. Nineteen percent of his sample of mid-level managers and engineers had been asked for information by competitors ten or more times in the past year.

Hippel (1988) suggests that information has positive-sum effects (e.g., suggestions for pollution controls, labor-saving techniques, equipment maintenance) should be openly shared, while information with monopoly power (e.g., key advances in product quality) should be tightly guarded.

Both Schrader and von Hippel, however, focus the importance of the firm and downplay the impact of an engineer's networks or professional reputation. They emphasize that the decision to trade information should be strongly influenced by economic considerations of the value of the information to the firm and that these calculations outweigh the bonds of friendship. But what their data show is that professionals practice reciprocity, and do so with both taste and discretion. They are concerned about the quality of their trading partners, their individual expertise, and the status of their firm. Moreover, reciprocity remains a bilateral relationship; strong norms exist that information should not be given to a third party, who is instead referred back to the original source (Schrader 1991, p. 156). The trading of knowledge in the mini-mill industry is similar to that observed by Powell (1985) in his study of editors in scholarly book publishing. Professional ties stretch well beyond a person's current employer, and those contacts are not only a valuable source of information; when mobilized effectively, external ties can be critical to a person's success and advancement inside his or her firm. Put more strongly, a professional's internal career prospects are strongly shaped by the density and quality of his or her external ties.

The ability to mobilize financial support, gain access to the latest information, and solve pressing problems are all reasons individuals rely on affiliations outside their place of employment. But these are highly utilitarian considerations: interfirm linkages also are paramount in the diffusion of knowledge about appropriate ways to organize, and the subsequent legitimation and institutionalization of these practices. We turn now to these more normative considerations.

Diffusion. Communication networks play a critical role in the spread of models of business practice and structure. But the transfer of knowledge, as well as fads and fashions, is a complex process involving multiple, overlapping, yet analytically separable channels of communication. We focus on three avenues that operate to transmit ideas and policies from one organization to another. As with information-sharing among professionals, a good deal of knowledge flows through professional networks. These linkages have grown and become more formalized in recent years as professional and trade associations promulgate standards about appropriate professional behavior. Universities, training institutes, professional journals, and the business press all serve to elaborate on information about current best practices. One key network of communica-
tion, then, is the professional or trade network. A second channel of communication is the pattern of interorganizational relations in which an organization is involved, including suppliers, key customers, members of relevant regulatory agencies, and the like (Meyer and Scott 1992; DiMaggio and Powell 1983). The interorganizational network is a critical source of news about administrative and technological innovations. Much of the behavior of organizations is also shaped by the activities of other organizations that are considered to be exemplars. Firms are not only embedded in an intricate network of relations with other organizations, yet also attend to the actions of highly visible or prestigious organizations within their field. Early adopters of new practices are likely to be situated at the intersection of multiple networks, with links to diverse informational sources that expose them more quickly to new ideas and to critical evaluations of their merits. Taken together, the information available through professional, resource, and status networks shapes the definition of what kinds of behavior are appropriate and sets standards that organizations seek to match.

The influence of external sources of information and legitimacy is most critical in organizations that produce outputs that are difficult to measure, but nevertheless require confidence in the propriety of the organization’s methods and structures. Hospitals, banks, schools, and law firms all deliver services that are not readily evaluated by an average consumer, but she or he can use the organization’s policies as a proxy for quality. Network ties foster the diffusion of policies and practices across the members of a field. As DiMaggio and Powell (1983) suggest, much learning occurs through imitation; mimicry is an effective way to save on search costs. The movement of key personnel across organizations and the presence of professional associations further contributes to the diffusion of standard solutions to organizational problems. Research has shown that human resource management policies (Baron et al. 1986), promotion and review procedures in law firms (Tolbert 1988), and financial reporting methods in law firms (Mezias 1990) all diffuse through densely connected interorganizational networks.

Two aspects of this diffusion process deserve special attention. On the efficiency side, obvious gains are to be had from widely accepted standards. Arthur (1990) illustrates this process in his discussion of how new technologies spread. The more other users there are, the greater the payoff and the higher the incentive for adoption. But common procedures can also produce what is called lock in. Altering well-established rules, or an industrywide technology standard, involves steep switching costs. In this regard, networks can speed the spread of new ideas, but once those new ideas are adopted and developed, and accommodations are made to them, subsequent change may well be retarded because of interdependencies among members of the network.

**Networks of Power and Influence**

Much recent work using the formal analytical tools of network analysis attempts to explain the power of economic actors (Mintz and Schwartz 1985; Burt 1992; Mizruchi 1992). Indeed the persistent concern with power marks one of the key points of divergence between sociologists and economists who study organizations. For example, Williamson (1985, p. 238) avers that “the main problem with power is that the concept is invoked to explain virtually anything.” He further contends that “power enthusiasts have not demonstrated that significant organizational innovations—those in which large transaction costs savings are in prospect—are regularly defeated by established interests” (Williamson 1985, p. 124–25). Williamson suggests there is “abundant evidence to the contrary,” although a regular reader of the business press might find such optimism perplexing.

The problem is that power is a slippery concept, as March (1966) complained long ago. But one of the advantages of network analysis is that it recognizes that because power is “inherently situational, it is dynamic and potentially unstable” (Knoue 1990, p. 2). Power has been defined as formal authority, informal influence, and overt domination. Authoritative power involves issuing orders or instructions with the expectation of uncontested compliance (Wrong 1979, p. 35). The source of the orders rather than their specific content induces compliance. Influence involves transmitting information from one person to another that alters the actions the latter would have pursued in the absence of the information (Gamson 1968, p. 60). And domination entails the control of the behavior of one individual by another who can offer or restrict benefit or inflict punishment. Network analyses of power can encompass all three types of power. Whether the resource is legitimacy, information, or force, a network
Table 2. Three Network Approaches to the Study of Organizational Power

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<th>Examples of Research</th>
<th>Subject of Research</th>
<th>Key Concepts</th>
</tr>
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<tbody>
<tr>
<td>Social exchange</td>
<td>Individuals' behavior in laboratory experiments applied to organizational dynamics</td>
<td>Power is in network position, in relative exchange opportunities</td>
</tr>
<tr>
<td>Emerson (1972), Cook et al. (1983)</td>
<td>Interorganizational relations, interlocking directorates</td>
<td>Resources equal power, lack of resources equals dependence</td>
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</table>

The argument contends that power lies in structural position. Table 2 provides a summary of these arguments.

Network approaches to the analysis of power build on the insight that even though individuals come and go, the distribution of power among positions frequently remains stable. In this view, the basic units in a system of power are not individuals per se, but the statuses occupied by them and the relations and connections among their positions (Nadel 1957, Blau 1964, Emerson 1972, Knoke 1990). Network analyses use concepts of location, or nodes, and the relations among these positions—termed ties, connections, or links—to argue that the pattern of relationships shapes the behavior of the occupant of a post as well as influences others (Marsden and Friedkin 1993). In short, as Knoke (1990, p. 9) tells us, “A position’s power—its ability to produce intended effects on the attitudes and behaviors of other actors—emerges from its prominence in networks where valued information and scarce resources are transferred from one actor to another.”

One advantage of a network approach to power is its insights into relationships at multiple levels of analysis, from individuals to organizations to nations. Networks have been used to study power in economic relationships through such means as laboratory experiments, analyses of interorganizational relations, and, most commonly, mapping interlocking directorate ties. Experiments employing individual subjects have been used extensively by social exchange theorists to study network dynamics (e.g., Cook et al. 1983; Molm 1990). Cook and Emerson (1984) have applied the basic principles of networks derived from work with individual subjects in the laboratory to the analysis of complex organizations—on the assumption that the units of analysis are interchangeable and the power dynamics between relative positions is the issue.

Network approaches to organizational power are premised on the assumption that structures of interorganizational relations are consequential for understanding the actions of organizations. Abundant research has documented how an organization’s location within an interorganizational network can account for a firm’s strategy and structure. Moreover, it is not simply direct relations between organizations that are significant; both direct and indirect linkages can have an impact on individual and corporate action. Interorganizational networks take on many forms: they can be centralized and hierarchical like a bureaucracy, with a dominant organization at the peak (see Mintz and Schwartz 1985); balkanized into multiple, more-or-less hierarchical clusters (see Roy and Bonacich 1988); or disorganized and even fractious, as in a highly competitive industry. Such different structures are significant both for the life chances of individual organizations and for explaining patterns of organizational behavior.

By definition, a network is composed of a set of relations, or ties, among actors (either individuals or organizations). A tie between actors has both content (the type of relation) and form (the strength of the relation). The content of ties can include information or resource flows, advice or friendship, shared personnel or members of a board of directors; indeed any type of social relation can be mapped as a tie. Thus, organizations typically are embedded in multiple, often overlapping networks—resource exchange networks, information networks, board of director interlock networks, and so on. To the extent that they take a focal organization perspective, network researchers map either the set of relations an organi-
zation has with those to which it is tied (its "ego network") or its position in the larger network system, often described in terms of its degree of centrality or prominence. Centrality describes the extent to which an actor is tied to many others in the system and (in some versions) the extent to which these others are in turn tied to many others themselves (see Bonacich 1987). Another way to characterize network position is in terms of autonomy and constraint (Cook et al. 1993). Structural autonomy is the ability to pursue actions without constraint from others; firms have high structural autonomy to the extent that they operate in concentrated industries (with limited intra-industry competition) while their buyers and suppliers are competitive among themselves, thus ensuring only limited constraint from external actors (Burt 1982; 1992).

Most research on interorganizational networks has proceeded from two perspectives that use similar methods to pursue somewhat different agendas. In the resource dependence perspective, organizations are the primary actors and individuals act as agents of these organizations, whereas in the social class perspective individuals are the primary actors and organizations are their tools (see Palmer 1983 and Pfeffer 1987 for discussions of these approaches). The basic tenet of the resource dependence arguments is that organizations operate in unpredictable and turbulent environments; consequently, because most organizations need resources beyond those they can generate internally, reducing uncertainty is critical. Pfeffer and Salancik (1978), in a key initial formulation of this argument, maintained that organizations sought to establish a stable flow of resources from other organizations, thus avoiding dependency and limiting uncertainty.

The social class perspective builds on the arguments of Mills (1956) that social, political, and economic linkages among elite groups create a cohesive power elite. Closely-tied networks of corporate leaders, key policy-making bodies, and elite social groups (ranging from country clubs to private universities) promote the continued dominance of upper-class interests. Moreover, interorganizational networks formed out of overlapping elite memberships are a vehicle for enhancing upper-class cohesion and the control of key social institutions (Useem 1984).

For a variety of reasons, including easy data access and public policy concerns, one type of network has received the great bulk of attention from resource dependence and social class scholars—the "interlocking directorate network" that is formed by having the same people sit on multiple corporate boards of directors. Although the two approaches are motivated by somewhat different theoretical concerns, there is a good deal of commonality and overlap in their methods and findings. We do not attempt to summarize either the methodological debates or the empirical studies here; Davis and Powell (1992) and Mizruchi and Galaskiewicz (1993) do a thorough job of this. Instead, we briefly survey the principal ways in which interorganizational networks have been found to shape corporate behavior.

Network centrality and power. Building on the insights of early small-group research (Bavelas 1948; Leavitt 1951), network studies have repeatedly demonstrated a correlation between centrality and power within interorganizational networks. In interlock studies, New York City-based banks tend to be the most well-connected business organizations, as the direction of the economy as a whole is shaped by their investment decisions (Mintz and Schwartz 1985). Large industrial firms such as AT&T, General Electric, and IBM also cast their interlock nets broadly, and therefore are better able to gather information about their environments (Davis 1991). In studies of community politics, researchers have found, not surprisingly, that the centrality of organizations was strongly correlated with their reputations for influence in community and external affairs (Galaskiewicz 1979; Ratcliff et al. 1979; Useem 1984). More interestingly, Galaskiewicz (1979, p. 151) argued that it was not the size of the assets that an organization could individually muster but rather the "resources that actors mobilize through their existing set of social relationships" that determined their influence. And in research on national-level policy making, Laumann et al. (1987) and Knoke (1990) found that prominence in interorganizational communication networks predicted how much influence an organization could wield in the health and energy policy domains.

Network position and organizational structure and strategy. Palmer and his colleagues (Palmer et al. 1987; Palmer et al. 1993) have documented how network position is tied to major changes in organizational structure. Palmer et al. (1987) found that firms owned or controlled by either family coalitions or banks were less likely to have a multidivisional structure than were management-controlled firms. In later research (Palmer et al. 1993), they noted that companies were
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more likely to adopt the multidivisional form when they had ties to other firms that had already adopted it. Davis (1991) found that firms were more likely to employ poison pills as a takeover defense when they shared directors with firms that were prior adopters. Similar network diffusion processes shape such corporate practices as greenmail (Kosnik 1987, 1990) and golden parachutes (Wade et al. 1990).

Network position and noneconomic activities.

A good deal of research has focused on corporate philanthropic activity as well as broader issues of corporate political involvement. Galaskiewicz and his collaborators (Galaskiewicz 1985a; 1985b, Galaskiewicz and Wasserman 1989; Galaskiewicz and Burt 1991) have shown that the position of a company within a local urban network has significant effects on both its general attitude toward nonprofit organizations and the amount of its contributions to charitable groups. An extensive literature chronicles the effects of network position on the political activities of corporations, typically measured by political contributions to candidates. Mizruchi (1992), summarizing this research, argues that network relations and economic interdependence create unity in corporate political activity that supersedes narrower common business interests.

The network perspective has allowed researchers to identify power dependence relations among corporate actors and to predict how organizational behavior is linked to structural position. Both resource dependence and social class arguments have been sharpened considerably through the use of network methods. Network analysis has provided a methodology for systematically assessing competing arguments about the centrality and prominence of different organizations. Social class theory has been improved by testing arguments, (e.g., the disproportionally powerful role of banks in the economy, the effects of family stockholdings, and the influence of class-based corporate interests on society) that had previously been asserted rather than substantiated.

These are considerable accomplishments, but it also hard not to view this literature as a rather sectarian one in which the most spirited debates arise over different measures of centrality, or whether cohesion or structural equivalence is a more powerful explanation for diffusion effects in networks. Relatively little is yet known about the effects of network position on organizational performance. The extensive literature on interlocking directorates ultimately shows that directorates have minimal impact on corporate profits (Richardson 1987, Mizruchi and Galaskiewicz 1993). Moreover, few studies have examined concrete organizational outcomes; that is, how the political process has been shaped or altered by corporate political activity or what kinds of performance effects follow from different network structures. On the critical issue of consequences, Burt (1983, 1992) speaks the loudest: an industry’s profitability is strongly related to the degree of exchange-based constraint it faces but has very little relation to the interlock ties it maintains with other industries.

When we examine the goodness of fit between the sophisticated methods of network analysis and the theories and questions that are parsed, something of a mismatch is found. Methodological sophistication has continually outpaced substantive findings. This is a common criticism, and one network analysts have been responsive to; hence, future research can be expected to focus more on questions of network formation and substantive outcomes. A second concern reflects a different double-edged feature of network research. What is emerging from two decades of research by exchange, resource dependence, and class theorists is a generalizable, abstract model of power. The virtue of this model is its broad applicability, from college sophomores participating in lab experiments to Fortune 500 corporations. The vexing question is whether this abstract model of network contingencies and constraints glosses over fundamental differences in the capacity of different actors to exert influence in society. If nonprofit advocacy groups were similarly organized as large corporations, would they have comparable leverage in shaping public policy? Nevertheless, the rigorous methodology of networks of power research, refined from repeated studies of topics such as interlocking directorates, has provided a strong analytical foundation for further study of the dynamics of power in other kinds of economic relationships.

The Firm as a Network of Treaties

Much of the writing in the economics and sociology of organization concerns the formal structure of authority, the incentive systems that ostensibly motivate employees, and the job ladders that employees climb throughout their careers. That there is considerable activity outside the formal channels of authority is obvious to anyone who has spent any time in organizations, but curi-
ously there is little theory to guide us in understanding informal organization. Dalton (1959, p. 219) suggests that the formal or official is "that which is planned and agreed upon," while the informal or unofficial represents "the spontaneous and flexible ties among members, guided by feelings and personal interests indispensable for the operation of the formal, but too fluid to be entirely contained by it."

Informal organization. Scholars disagree about the relationship between the formal and the informal channels of organization. In the much-discussed Hawthorne study, Roethlisberger and Dickson (1939, p. 457) argued that "employees had their own rules and their own logic which, more frequently than not, were opposed to those which were imposed on them." In contrast, Burawoy (1979), in his ethnography of a piece-work machine shop, argued that the myriad games and rule-bending taking place on the shop floor were neither independent of nor in opposition to the interests of management. Stinchcombe (1990b) observes that much of the informal conversation among workers reported in ethnographic studies of the workplace (such as Burawoy 1979 or Halle 1984) concerns the formal system of work. Research on communication networks done in the early 1950s (Bavelas 1950; Leavitt 1951; Guetzkow and Simon 1954) suggests that hierarchical patterns inevitably emerge out of informal channels of communication. Hall (1991, p. 116) makes the more general argument that cliques, coalitions, or other forms of informal organization "obviously begin from the established organizational order and then become variations from that order."

Management scholars, however, are much more attuned to the world of practice; consequently, they recognize that managers prefer the personal, verbal channels of the informal system to the documents and orders of the formal. Indeed managers spend as much time working outside the chain of command as they do working through it (Dalton 1959; Strauss 1962; Aguilar 1967; Mintzberg 1973; Eccles and Crane 1988). This rich vein of ethnographic research has, however, rarely employed network concepts other than as metaphors. Not surprisingly, the two exceptions to this generalization, Dalton (1959) and Mintzberg (esp. 1979), offer the most compelling accounts of the relationship between the formal and the informal. Dalton's work, based on observational studies of four Midwestern firms in the 1950s, sees organizations as rife with cliques and coalitions: between staff and line, between those defending their turf and those trying to usurp it, and among those who mobilize cliques to accomplish new purposes. Even today few scholars have so graphically and analytically captured the process by which informal networks supplement and at times supplant the routine channels of organization.

Mintzberg (1979) conceives of organizations as sets of work constellations, or quasi-independent cliques of individuals who work on decisions appropriate to their own level within the organizational hierarchy. In his view, the formal and informal are interdependent: "The formal shapes the informal, while the informal greatly influences what works in the formal, and sometimes even reflects its shape to come" (p. 53). He recognizes that all organizations are, in important respects, made up of social networks. In even the most routine-driven bureaucracy, precisely because tasks are so specialized, work activities are highly interdependent and thus rely considerably on patterns of informal relations to lubricate the cogs in the machine. Bureaucracies depend far more on informal collaboration and friendship, alliances of strange bedfellows, cross-departmental cooperation, and the overlooking of role-bending and rule-breaking behavior than either our theories or the pronouncements of those at the heads of the bureaucracies suggest.

Moreover, many kinds of work tend to be project-based, rather than involve the continuous production of a good or service. Such project-based activities involve products that are relatively unique, hence the work process depends to a considerable degree on intuition and skill (Stinchcombe 1959; Perrow 1967). Organizations in craft-based industries have long eschewed rigid, organizational arrangements, opting instead for more flexible and loosely coupled activities. Industries as diverse as construction (Stinchcombe 1959; Eccles 1981), book publishing (Coser, Kadushin, and Powell 1982), architecture (Blau 1984), the diamond trade (Ben-Porath 1980), and the film industry (Maulkin and Anderson 1987) rely, to a considerable extent, on stable and enduring personal networks based on loyalties and friendships cemented over time. In sum, formal and informal organization are inextricably linked. Hierarchical organizations are deeply connected to wider networks, while informal networks straddle and interpenetrate the boundaries of hierarchical structures.

The flattening of corporate hierarchies. There
But there is scant doubt that in all countries and regions there is a general tendency of private firms to form, or to be incorporated into, networks of decentralized production. What accounts for these developments? Do they signal the end of an era of vertical integration or merely a transitional stage in economic evolution? In short, why do networks seem more important now?

One line of argument suggests that networks redefine agency and control. The large, vertically integrated firm is designed to do specific tasks repeatedly. The strength of a hierarchical structure is its reliability—its capacity to consistently produce large numbers of goods or services of a given quality. Such an organizational form, with its capability of reducing costs through increasing the scale of production, is ideally suited for mass production and distribution (Chandler 1977). But because of the scale of investment in particular assets, accompanied by the development of specialized skills and routines in the workforce, companies become increasingly resistant to change (Hannan and Freeman 1984). Indeed, the very factors that made vertically integrated businesses successful—the investment in scale and scope economies and organizational routines to ensure reliable, high-volume production—may lock these organizations into practices that are exceedingly difficult to alter.

In contrast, network-like arrangements are lighter on their feet. They are more readily decomposable or redefinable than the fixed assets of hierarchies (Powell 1990; DeBresson and Amesse 1991; Saxenian 1994). Indeed, the strength of networks—the flexibility with which they permit recombining various components to exploit new opportunities—may, under certain kinds of conditions, outpace the capabilities of hierarchies. The vertically integrated firm flourished in an environment of market stability and slow-changing technologies. But as Piore and Sabel (1984) and the French regulation school (Boyer 1988) have argued, a different logic of production is needed to respond rapidly to the shortened product life cycles and accelerating technological changes that now typify international competition. A new form of horizontal coordination through interorganizational networks is, arguably, more responsive to these changed conditions.

Other scholars concur that horizontal networks greatly rationalize the control of production by reconciling coordination, cost containment, and flexibility (Harrison 1994). But they caution against a simple binary opposition of mass pro-
Table 3. The Firm as a Network of Treaties

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<th>Examples of Research</th>
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<th>Key Concepts</th>
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<tr>
<td>Informal organization</td>
<td>Roethlisberger and Dickson (1959), Dalton (1959), Burawoy (1979)</td>
<td>Rule-bending, turf wars, cliques, and coalitions</td>
</tr>
<tr>
<td>Network logics</td>
<td>Powell (1990), Sabel (1993)</td>
<td>Transfer of tacit knowledge, dynamics of cooperation</td>
</tr>
<tr>
<td>Rival alliances</td>
<td>Powell and Brantley (1992), Badaracco (1991)</td>
<td>Inter-firm collaboration and competition</td>
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Production and flexible production and suggest that reality is much more equivocal (Amin and Robins 1990). There is little doubt that networking as a form of organization is supplanting vertical integration, but several crucial caveats are in order: (1) contemporary organizational change is also a process of “layering new global corporate networks upon old, international production hierarchies” (Amin 1993, p. 291); (2) networks offer a way for large firms to hedge their bets in the face of uncertainty and market barriers—risk-sharing is attractive to large firms in industries where product life cycles are short and the costs of product development steep (Mowery 1988); and (3) the decentralization of production does not entail a corresponding decentralization of power—while large firms are reorganizing the very nature of their production activities, control of these decisions remains concentrated (Harrison 1994).

Many forces clearly are at work in the decentralization of the large firm. Researchers have pointed to diverse causal mechanisms; thus we should be wary of collapsing divergent processes into one convenient category. While there is a general consensus regarding the flattening of hierarchies and the growing importance of networks as a key principle of industrial organization, all horizontal forms of production do not stem from similar rationales. Table 3 summarizes the varied strands of research that portray the firm as a network of treaties.

multiple logics of networks. We have suggested that networks represent a softer, more multilateral form of governance than either markets or hierarchies. But one cannot assume that all network forms of production either derive from the same purpose or evince the same approach to organizing. Just as the large hierarchical firm contains a shadow structure of informal organization, networks also involve a complicated intermingling of cooperation, competition, and power. Nor are networks created overnight; new relations must be grafted on to old ones, or exist side by side. Undoubtedly, there are many reasons for the reconstruction (or deconstruction) of the firm into a complex network of treaties.

Powell and Brantley (1992) suggest that the need for fast learning encourages the spread of interorganizational collaborations. In fields where knowledge is dispersed, innovation depends on cooperative interaction among different types of organizations. Networks, according to many scholars (Kaneko and Imai 1987; Powell 1990; DeBresson and Amesse 1991; Sabel 1993), promote experimentation by providing broader experiences and encouraging learning from other collaborators. Because networks involve complex channels of communication, the information that is passed is both freer and richer—new meanings and new connections are generated and debated. Contrast this experimentation with the more restricted flow of information in markets or hierarchies (see Kaneko and Imai 1987; Powell 1990; Lundvall 1993). Passing information up or down a corporate hierarchy or purchasing information in the marketplace involves merely processing it; the flow of information is largely controlled. Thus no new meaning or knowledge is generated. In contrast, networks provide a context for learning by doing.

The need to learn quickly is paramount in high-tech fields; hence it is not surprising that
inter-firm collaboration expanded rapidly in the 1980s in the biotechnology, materials technology, and informational technology industries. At the University of Limburg in Holland, the MERIT research center has been tracking inter-firm collaborations. They find that more than a quarter of all the interfirm cooperative agreements involve R&D cooperation (Hagedoorn and Schakenraad 1990b; Freeman 1991). The motives for collaboration in high tech are not only strong but reinforcing. Access to relevant centers of knowledge is critical when knowledge is developing at an unprecedented pace. Moreover, much sophisticated technical knowledge is tacit in character—an indissoluble mixture of design, process, and expertise; thus it is not effectively transferred by licensing or purchase. Under conditions of uncertainty, firms seek out partners with technological complementarities. Collaboration can shorten the time it takes to bring new ideas to market, while access to a broad network of cooperative R&D provides companies with a rich portfolio of diverse information sources.

Companies involved in collaborative ventures are struggling to construct a framework in which they can learn from partners without becoming unduly dependent upon them. But the very process of collaboration can be infectious. Internally, authority and responsibility are constantly debated and reconstructed. Externally, the evolution of collaboration can snowball. Kogut et al. (1993) find that more information sharing leads to better relationships, and thus to more subsequent collaboration. Belonging to a cohesive network of partners reduces search costs, while increasing the willingness and the pressure to continue to collaborate. Boorman (1975), in his formal combinatorial optimization model, demonstrated that network ties have positive externalities: the larger the network, the greater its value to its members.

Learning is not the only motive for collaboration; indeed some scholars prefer not to even use such soft terms as cooperation or collaboration, opting instead for hard terms like risk-sharing or limiting irreversible sunk investments (Porter and Fuller 1986). Clearly financial considerations can matter—in forming a coalition with another firm, both parties enjoy options that would not be open to them otherwise. Risk-sharing reduces entry costs and pools ideas, considerable incentives in fields where new generations of products are expensive to build, and product life cycles are short.

Harrison (1994) pushes these strategic calculations even further. He does not dispute that networks of production are widespread; indeed he contends they have become a dominant form of organization. But he suggests that reconstructing the large firm as a network of multiple relations allows the largest companies in the world to remain on center stage. Dubbing the process "concentration without centralization," he argues that network production has four key components: (1) core-ring structures, typified by the auto industry's lean manufacturing process, in which there is a center of high paid, high skill employees and the rest of production is relegated to a lower paid periphery; (2) new uses of computerized manufacturing and information management to coordinate far-flung activities according to principles of just-in-time production; (3) extensive use of sub-contracting and strategic alliances, especially across national borders; and (4) attempts by management to elicit more active collaboration on the part of employees who are most expensive to replace. Harrison is concerned that these principles of global network production exacerbate labor market inequality and free firms from oversight and regulation by national governments. The global economy, he avers, remains dominated by powerful businesses, who are "dressed in new costumes and armed with new techniques."

Still other scholars dispute this overall trend—whether it is regarded as either cooperative competition or a form of "decentralized Fordism." They contend that precisely because collaboration is strategic, it will prove to be transitional (Teece 1986). From this perspective, networking is useful as a means of developing new technologies. In the early stages of industry evolution, small firms and collaborative networks play a key role, but as the technologies mature, large companies come to the forefront and move the emerging technologies under their direct control. This process of renewed concentration typified the electrical industry in the 1890s and the automobile industry after World War I (Utterback and Abernathy 1975; Freeman 1991). In this view, network production will be handicapped by its inability to finance the investments necessary to achieve economies of scale and scope in production (Teece et al. 1992).
make collaboration vastly easier; electronic mail is one small but powerful illustration. And the closeness between basic science research and commercial R&D has never before been so intimate (Powell 1993). Moreover, organizations are developing competencies in and reputations for cooperation. As networks evolve, it becomes more strategically sensible to exercise voice rather than exit. Expectations are not frozen in a contract, but change as circumstances dictate. As Macneil (1978, 1985) suggests in his influential writings on relational contracting, a mutual orientation develops—parties develop knowledge regarding one another and they draw on that knowledge to communicate and resolve problems.

We argue that firms today are coming to resemble a network of treaties because these multistranded relationships encourage learning from a broad array of partners and promote experimentation while reducing the cost of expensive technical commitments. But such a view by no means implies that competition is not critical. The competitive strength of companies lies in the nature and depth of their relations with other firms and institutions. 

Rivalry among hierarchies and networks: Perhaps companies never really had clear boundaries or neat lines of authority. Even if in theory the vertically integrated firm was supposed to resemble a medieval castle, walled off from outside influences, the reality was messier. But in recent years the walls have come tumbling down; today organizations exist in a world with fluid boundaries, and no hard line separates the interior and the exterior. The forces behind this transformation are varied, but we have stressed that cooperation, competition, and power all contribute in different ways to the expansion of networks of production. In what ways, then, does the search for new partners, new technologies, and new markets reshape the very basis of cooperation and competition?

We begin with two simple points: (1) much formal collaboration evolves out of preexisting informal relationships; and (2) collaborative production has become much more than the sum of a series of bilateral relationships. That informal relationships are the seedbed for formal ties seems elementary, but the consequences of this process are not fully appreciated. For example, in biotechnology, formal research collaborations build on preexisting affiliations in the scientists’ “invisible colleges.” Indeed, Powell (1993) argues that one reason the commercial side of biotechnology is so ripe with cooperative agreements is that these formal ties are simply outcroppings of the professional lives of scientists. Behind the formal linkages are informal relationships, which give them life, sustain them, and shape their direction.

Collaboration typically occurs between only two parties, but the collaborators are also involved in multiple forms of cooperation. The consequences of these multiplex ties are profound, and they point us in directions that our theories have not yet addressed. In a network of collaboration, firms and business units are engaged in shifting interorganizational and interindustry patterns of cooperation and competition. Firms deepen their own capabilities through involvement in close, but not exclusive, relations with other companies. Competition no longer occurs on the basis of firm-to-firm combat, but among rival shifting alliances competing against one another on a project-by-project basis. Such rivalries among alliances by no means imply that competition has been dampened; it does mean that the nature of competition has been altered, increasing the likelihood that others will be forced to adopt similar strategies. Still, are we not talking about networks of collaboration among hierarchical organizations? These are not small, solidaristic communities but rival, powerful networks battling one another. On the surface, these cross-cutting multiplex relationships appear to just be a new form of competition. But we want to suggest this new form also creates novel content. First, recognize how profoundly a competitive relationship is altered when two parties compete on one project, but collaborate on another. The goal of competition cannot be to vanquish your opponent lest you destroy your collaborator on a different project. Second, consider how the identity of the organization has changed. It is no longer a coherent totality, but a bundle of complex projects. Judging the likelihood of success requires knowledge of the capabilities of all the firm’s partners. Considerable economic and intellectual capital is spent on managing and profiting from cooperation. Finally, the financial markets are increasingly learning how to evaluate the value of networks. In fields such as biotechnology, the industry business press, as well as reports from the financial community, routinely comment on the quality of a firm’s networks. A reputation for successful cooperation has become a valued asset.
Networks of Production

Why has there been such considerable scholarly interest in collaborative production among business firms? Cooperation among business enterprises is not that rare. Macaulay (1963) alerted us to the wide range of business practices that fall outside contractual agreements, and reinvigorated discussions found in classical social theory (Durkheim [1893] 1964) of the noncontractual elements of contract (see Stinchcombe 1985). It is the larger theoretical questions raised by collaboration among ostensibly proprietary and self-seeking business units that animate much of the research on networks of production. These questions cut to the core of some of the most vexing issues in the social sciences (Axelrod 1984; Hirschman 1984; Stinchcombe 1986; Gambetta 1988; Coleman 1990; Putnam 1993; Scharpf 1993): Can cooperation come about independently of trust? Can trust be a result rather than a precondition of cooperation?

Trust and other forms of social capital are particularly interesting because they are moral resources (Hirschman 1984) that operate in a fundamentally different manner than physical capital. The supply of trust increases rather than decreases with use; indeed, trust can become depleted if not used (see Putnam 1993, esp. chap. 6). This implies that once trust is operable, it may prove durable. But how can trust be introduced into antagonistic situations? If social norms are part of the reason for the presence of trust, how can it be manufactured (Elster 1983)? Game theory provides us with important leads. A key lesson from game theory is that cooperation is exceedingly hard to establish even when it would benefit most parties involved (Axelrod 1984). But under certain conditions even enemies—such as soldiers in rival armies facing one another across trenches (Axelrod 1984, pp. 73–87)—may learn to cooperate. When there is a high probability of future association, people are not only more likely to cooperate with others, they are also increasingly willing to punish defectors. When parties recognize that they have objectively common interests, cooperative relations more readily ensue.

Trust does not imply blind loyalty, however. Indeed, thoughtful commentators stress that trust must be deliberate or even calculated (Axelrod 1984; Sabel 1993, Scharpf 1993). Cooperation entails moving to a vulnerable position; such a risky move requires creating governance structures that allow for constant monitoring and consultation. Monitoring is both easier and more natural, and vastly more effective, when done by peers rather than superiors (Powell 1990). As Sabel (1993) observes, monitoring not only reduces the possibility of duplicity, it serves the more important function of routinizing contact between parties. Such consultation minimizes errors and misreadings and allows for improvements to be made. Taken together, these arguments suggest that research on networks of collaboration is appealing because it offers insight into building trust, in which consensus emerges as a by-product of success rather than as a precondition for it (Sabel 1993).

Seen in this light, interorganizational collaboration that exemplifies trust-based governance has an enormous advantage. Generalized expectations of cooperation radically reduce the cognitive complexity and uncertainty associated with most business dealings. But not all forms of trust-based governance operate in the same fashion. We argue that the sources of good faith vary significantly with respect to the kinds of collaboration being pursued and we review four types of network-based collaboration, which are summarized in table 4. In industrial districts the bonds of community are forged out of ties of place and kinship. Here trust builds on norms of reciprocity and civic engagement (Putnam 1993), hence it is “thick” (Williams 1988). Research and development collaborations build on common membership in a professional community; this serves as an initial commitment to a relationship. The multiplex ties of extended business groups rely on shared historical experiences and the obligations and advantages of group membership. In these settings, group membership is enforced through benevolent authority (Dore 1987). Strategic alliances and collaborative manufacturing emerge out of mutual dependencies; if they are to last, calculated trust must be created.

Industrial districts: Networks of place. The exemplars of new forms of flexible production are found in the industrial districts of north-central Italy and in Baden Württemberg in southwest Germany. These districts are composed of socially integrated, small-scale, decentralized production units. In key respects, they resemble the late nineteenth century industrial districts described by the British economist Alfred Marshall, where the matrix of production was the region, not the individual firm (Marshall 1919; Becattini 1978). The
success of industrial districts demonstrates that business practices guided by trust-based governance structures are not novel; indeed, given different historical background characteristics, such alternatives to mass production may well have developed (Sabel and Zeitlin 1985). Networks of loosely linked, but spatially clustered, firms create a distinctive "industrial atmosphere" where the "secrets of industry are in the air," to use the language of Giacomo Becattini (1978) who borrowed from the writings of Marshall and gave substance to the notion that something unusual was afoot on the plains of Tuscany.

The modus operandi of the industrial districts rests on a very different logic than that found in the vertically integrated, mass-production firm. In the Third Italy, the small firms are commonly grouped in specific zones according to their product: knitwear in Modena; bicycles, motorcycles, and shoes in Bologna; food processing machinery in Parma; and woodworking machine tools in Capri (see Brusco 1982). Within the region, firms specializing in a product congregate in a specific area, serving to link industry and region closely. Work is carried out through extensive, collaborative, subcontracting agreements. Only a portion of the firms market final products; the others execute operations commissioned by a group of firms that initiate production. The owners of small firms typically prefer subcontracting to expansion or integration (Lazerson 1988). The use of satellite firms allows them to remain flexible and preserve their legal and organizational structure as small companies. Though closely related and highly cooperative, the firms remain strictly independent. The time horizons for collaboration are long. Subcontractors and suppliers have diverse interfirm linkages, thus developing a wide range of products within a given line of activity.

A strong feature of the research on industrial districts is its keen attention to institutional detail and to the social and political systems that buttress this mode of production. Herrigel (1990) points to the support services—excellent technical colleges and vocational training institutes, small banks willing to loan funds to local small businesses, specialized industry research programs—that strengthen the social structure in Baden Württemberg and encourage cooperative relations that attenuate the cut-throat aspects of competition. In the Third Italy, decentralized production also depends upon a combination of familial, legislative, political, and historical factors. The bonds of extended kinship create economic relations based on cooperation and aid the search for new employees through family and friendship networks (Lazerson 1988). The use of family labor is widespread—making up about 39 percent of all employees in the knitwear sector (Lazerson 1990, p. 123). The CNA, or Confederazione Nazionale dell' Artigianato, is one of several trade associations that provide small artisanal firms with such services as accounting, loan guarantees, property development, information marketing, and assistance in forming cooperatives (Best 1990; Pyke 1992).

Saxenian (1994) contends that Silicon Valley, that narrow strip running from Palo Alto to San Jose, California, evinces many of the same characteristics as the European industrial districts. She
suggests that it represents a kind of industrial order that promotes collective learning among specialist producers of a complex of related technologies. In this decentralized system, dense social networks and open labor markets encourage entrepreneurship and the ongoing mobilization of resources. Companies compete intensely, but they simultaneously learn about changing markets and technologies through informal communications, collaborative projects, and common ties to research associations and universities. High rates of job mobility spread technology, promote the recombination of skills and capital, and aid the region’s development. Silicon Valley companies, just as those in Germany or Italy, trade with the whole world, but the core of knowledge and production remains local.16

The logic of the industrial districts is self-reinforcing. The more distinctive each firm is, the more it depends on the success of other firms’ products to complement its own. Repetitive contracting, embedded in local social relationships cemented by kinship, religion, and politics, encourages reciprocity. Monitoring is facilitated by these social ties and constant contact. Indeed, trust-based governance seems easy to sustain when it is spatially clustered.17 Proximity, as is found in north-central Italy or Silicon Valley, seems to be both too strong and too weak an explanation for trust. Too strong in that the apparent advantages of the industrial districts seem insurmountable: How could models of production that are not as spatially concentrated generate comparable levels of trust? But too weak in that other regions that combine similar skills and advantages cannot reproduce comparable norms of reciprocity and civic engagement. The simple fact of proximity among companies reveals little about their mode of organizing. The vibrancy of the districts is not due to their geography alone, but to their social practices. What other kinds of social arrangements, then, are likely to generate trust?

R&D networks. Common membership in a technological community generates a type of precommitment (Powell 1993). Bonds of professional membership greatly expedite the formation of collaborative R&D networks. The sense of common association with a technological, intellectual, or scientific community is a glue that thickens cooperation. This membership in scientific or industrial associations is ongoing, occurring outside of commercial relationships; thus members monitor individuals’ behavior and reputation. In collaborative R&D, a person’s standing in a technological community also shapes his or her reputation for business practice.

Angel (1991) highlights a different aspect of Silicon Valley, asserting that employees, and their experiential knowledge, pass freely through open labor markets there. This interfirm movement is made possible because the intellectual community focuses on the advancement of semiconductor technology in general rather than allegiance to a single firm. This trading of information and people is a key to the “innovative milieux” of Silicon Valley because technological know-how is often tacit, and best transmitted through personal relationships (Clark and Staunton 1989; Angel 1991).

Innovation often lies at the interstices of firms’ knowledge (Håkansson 1990; Gadde and Håkansson 1992). When an R&D network brings firms together, the sharing of different competences can generate new ideas (Fujita 1991; Semblinger 1991; Imai and Baba 1989; DeBresson and Amesse 1991). In rapidly developing fields, organizations are compelled to join networks to access relevant expertise. For example, innovative science-based firms need linkages to research institutes and universities to foster their own R&D (Clark and Staunton 1989). Moreover, without such ties, firms find it exceedingly difficult to recruit new scientists. Cooperation in interfirm networks also permits blending of new technologies. Imai and Baba (1989) illustrate this merging of technologies in Japan, where mechanical engineering and electronics combined to produce Nintendo’s Family Computers, which allow users to trade stocks, bank, book travel, and play video games at home on the television screen.

Movement toward stronger involvement in external relationships also reflects the fact that institutional sources of innovation have become more diverse and firms can no longer obtain all their knowledge internally (Nelson 1990; Powell and Brantley 1992). Indeed, in many high tech fields, companies must become expert in both in-house research and cooperative research with external parties (e.g., universities, research institutes, R&D-driven start-up firms, and even competitors). Mowery and Rosenberg (1989, p. 13) capture this process in their depiction of basic research “as a ticket of admission to an information network.” Research done in-house and research done externally can no longer be viewed as substitutes but as complements. Internal R&D is necessary to be able to monitor and evaluate research done elsewhere. Collaborative research is critical.
to exploit new knowledge that is being developed outside the firm. External linkages are thus a competitive form of learning; they are both a means of gaining access to new knowledge and a test of the quality of internal expertise.

The flow of information through R&D networks produces certainty for members in the face of technological uncertainty. Because no single firm has all the relevant information, or can readily access it, the company is faced with doubt about its ability to keep pace with the competition. Building on the preexisting ties of its scientists, a company can gain by cooperation. Von Hippel (1988) argues that industries with free-flowing information trading, such as he observed among engineers in the mini-mill segment of the steel industry, have lower search costs and find that innovation comes easier. Innovation is more than new ideas; for a new technology to catch on there must be broader normative support, which R&D networks of production provide as well. Networks help garner backing for the introduction of new ideas (Håkansson 1990; DeBresson and Amesse 1991). But much of R&D collaboration is not calculative; rather it is emergent. In a survey of Swedish companies, Håkansson (1990) found that about half of development resources went into collaborative efforts, but he characterizes the collaborations as “organic”—informal, initiated out of existing ties, and non-premeditated. When R&D networks are based on common membership in a technological community, collaborations occur more readily and seem more natural.

The dynamics of cooperation are endogenous to high technology fields where intellectual advances fuel new capabilities, which in turn require novel forms of collaboration. Freeman (1991) illustrates this dialogic process in his discussion of information technology, where new applications are found in a wide range of products and processes. The technology simultaneously reshapes every function within a firm as well, consequently the technology is diffused through collaboration while its further development necessitates new forms of network relations. Freeman (1991, p. 508) points out that new technology paradigms change “the common sense rules of behavior for engineers, managers, and designers.” Networks of cooperative R&D become breeding grounds for both further formal cooperative ventures as well as the expansion of all manner of informal networks of collaboration.

Business groups. Another type of production network that seems naturally based on affiliation or common membership (rather than on physical proximity) is the diversified business group, in many respects, the diversified industrial group has been the core institution of successful late developing nations (Amsden 1989). Simply put, a business group is a network of firms that regularly collaborate over a long time period. The groups combine relatively egalitarian, horizontal interorganizational ties as well as more hierarchical vertical linkages (Gerlach 1992a). The boundaries of business groups are clearer than with other networks of production. Even though the members of a group may remain autonomous, the business grouping is viewed as a community.

The best known example of business groups is the Japanese keiretsu (literally meaning “societies of business”). Seen through a U.S. lens, where interfirm cooperation has been viewed suspiciously from both legal and business viewpoints (Jorde and Teece 1992), diversified business groups seem puzzling and forbidding. And there is little doubt that the cohesiveness of Japanese business groups is, in large part, responsible for the difficulties that foreign firms have had in cracking the Japanese market. Japanese production networks are private in nature; they predate the era of activist involvement in business by Japanese government. The extensive reach of the keiretsu in Japan, as well as the chaebol in Korea, suggest that business enterprises can be organized along a different set of principles, what Gerlach (1992a) terms “alliance capitalism.” Indeed, the Japanese economy literally runs on network principles in three key respects: (1) large Japanese companies are much more decentralized than their Western counterparts (Aoki 1990); (2) a great deal of production is contracted out to complex networks of specialist suppliers (Friedman 1988; Frun 1992; Nishiguchi 1993); and (3) the identity of a firm is closely tied to the identity of the larger business grouping with which it is affiliated (Dore 1987; Gerlach 1992a).

Painted in broad strokes, the Japanese economic landscape is dominated by two main network structures. The large family-run pre-World War II zaibatsu ostensibly were disassembled after the war by the American occupying forces. But six kinship-centered holding companies, such as Mitsubishi and Sumitomo, re-emerged. By some estimates, the big six account for nearly one-fifth of Japanese economic activity.
Operating according to the principle of one finger in every pie (or wan setto shingi), each keiretsu operates one company in nearly every major Japanese industry. Each keiretsu also has a lead bank, and the financial institutions play a critical role in linking the corporate network altogether, although they remain relatively silent in the decisions of individual firms (Glasmeier and Sugiuira 1991; Gerlach 1992b). Alongside the six keiretsu are a number of large industrial groupings, often termed supply keiretsu, that operate in industries such as automobiles, heavy machinery, and electronics, where the parent (e.g., Toyota, Hitachi, or Sony) is the final assembler of complex parts and subassemblies supplied by affiliates and subcontractors. In both cases, the large networks of producers look like complex extended families, organized in either a cobweb-like fashion or as a vast holding company with financial institutions at the apex. In some respects, the family analogy can be stretched further because even though the keiretsu are a complex mix of vertical and horizontal affiliations, authority is exercised with benevolence.

Principles of obligation (Dore 1983) and reciprocity (Gouldner 1960) are infused in Japanese business practices. What is striking, however, is how those principles have been translated into business strategies that have proven to be immensely productive and innovative. Consider the case of subcontracting relationships. In the 1950s and early 1960s, when Japanese firms competed on the basis of lowest cost, relationships with subcontractors were hierarchical and asymmetric. But as firms increasingly competed on the basis of quality and innovation, complex multitiered supply relationships underwent significant change. These relationships remain hierarchical in two key respects: the larger firm has a significant financial stake in the supplier or affiliate, and it initiates the production process. But today the asymmetry has been considerably reduced. Suppliers, in an effort to remain competitive, make significant investments in new equipment, constantly upgrade workers’ skills, and take on more critical aspects of the assembly process (Sako 1992). The subassembler’s stake in the production process can be considerable: Van Kooij (1990) estimates that 75 percent of the value of Japanese color television production is contracted out. In turn, the large firms offer long-term contracts, share employees and provide technical assistance, and make financial investments to fund equipment upgrades.

This is not, however, a cozy, harmonious arrangement. It is an intensely pressurized world in which the smaller partners, or associates as they are termed, constantly strive to improve performance and remain attractive to the large companies. But by spreading their large corporate wings benevolently, the parents allow the smaller firms to operate under a blanket of protection that enhances their reputations, improves their ability to attract high-quality labor, and generates more business for them. Indeed, a few suppliers, such as auto parts producer Nippondenso, have become powerful multinational companies in their own right, providing subassemblies for multiple, competing parents.

On the production side, the network structure looks like one in which the principal and the agent, or the parent and the sibling, have increasingly reversed roles. But this reversal of control can be illusory; authority remains solidified by hierarchical financial control. In other words, capital flows down from the top of the network and sophisticated industrial products flow back up (Gerlach 1992b; Lincoln et al. 1992). Moreover, because of extensive cross-shareholdings, the majority of the stock in the giant keiretsu are not publicly traded, affording the large companies the long-term horizons that permit their investments in small firm upgrading to produce results.

Given the dramatic success of Japanese industry, attempts are being made almost universally to imitate some features of Japanese network practice; hybridized versions are also spread by direct Japanese investment, such as in the Japanese transplant auto factories in Britain, Canada, and the U.S. The Japanese system, obviously, has some built-in liabilities (see chap. 6 in this Handbook for a thoughtful discussion of these potential weaknesses), but the network principles employed by Japanese business groups have proven to be remarkably capable of competing on the basis of quality and speed. As long as global competition requires success at coordinating complex production processes in a timely manner, organizing production through networks should prove advantageous.

**Strategic alliances and collaborative manufacturing.** Members of a diversified business group possess a shared normative foundation; partners feel that they are following a common set of rules. But can cooperative networks of production be established without either proximity or a sense of common membership? Alliances are yet another
form of cooperation, even though they may be calculatively formed, with details of the relationship spelled out by contract. Since strategic alliances lack the natural basis of trust that other networks possess, they rely on contractual agreements to curb potential opportunism. Monitoring tends to be more formally structured as well, with prearranged progress reports and milestone dates. As a rule, strategic alliances are short-term agreements designed for specific purposes—to produce a subassembly, to establish a joint venture, or to enter a new market. Under such settings trust is not easily manufactured; fear and uncertainty must be overcome before information can be shared. But once a strategic alliance is successfully pursued, further cooperation with the same partner becomes easier; moreover participants may develop reputations as reliable partners. The process is iterative—the level of cooperation increases with each agreement between the same partners and individual partners become more skilled at learning through alliances.

Strategic networks have been described as relationships between autonomous firms that allow them to be more competitive in comparison to nonaffiliated outsiders (Jarillo 1988; Sydow 1991). Although strategic alliances are often formed to share information and produce innovation, they differ from R&D networks in their level of intensity. In strategic alliances such as joint ventures and licensing agreements, the depth of information transferred is seldom as great or as proprietary as with R&D collaborations (Hagedoorn and Schakenraad 1990b). The decision regarding whom to cooperate with is based on calculation of resource needs. When partners have complementary resources—from information and technology to materials and labor—they are sometimes willing to forego fears of vulnerability and collaborate.

Sydow (1991) argues that managerial functions change when organizations become involved in alliance networks. As firms pursue external collaborations they attend more to inter-organizational politics, and assign greater importance to boundary spanning personnel. Kanter and Myers (1991) also suggest that partnerships with others transform the internal organization of firms (see also Håkansson and Snuske 1989) and that when strategic alliances are formed, boundary spanners become more salient to the firm. The increasing importance of boundary spanners reflects the new manner in which firms compete through strategic alliances (Badaracco 1991). Alliances are investments—key weapons in corporate strategy. Partnerships and joint ventures shape the structure of competition, opening windows of opportunity for some and closing them to others.

Is it possible to be simultaneously strategic and cooperative? A good way to examine these calculations is through subcontracting relationships, which are being redefined throughout Europe and the United States. No doubt part of the impetus for change comes from awareness of the key role that subcontractors play in the Japanese just-in-time system. Yet introducing voice into a system that has long been dominated by exit is exceedingly difficult (Helper 1993). The broad contours of the changing relationships between suppliers and assemblers are clear. In addition to their age-old demands to keep prices down, large firms now expect that subcontractors will operate under shorter time frames, provide greater variety in product design, and deliver higher quality. In return, the large firms rely more on single-source suppliers and offer longer-term contracts (Semlinger 1993; Helper 1993). To cope with these more intense demands, subcontractors must spend more on R&D, and both parties must remain in constant communication, even to the extent of direct access through data-sharing electronic information networks. Yet both partners remain autonomous; indeed, the larger firms expect subcontractors to supply for several competing firms. This increases their capacity for cross-learning, or so is the expectation. Both parties depend on the sale of the final product; in this sense, they have a shared interest. The smaller subcontractor, however, has little protection against future cuts in demand. Clearly, the smaller firm is in a more vulnerable contractual position, is it not? The strategy of the large firm, in many cases, has been to improve its efficiency, reduce its costs, and increase its flexibility by shifting more of the risk onto the subcontractors.

But the movement toward substituting outside procurement for in-house production can have a double edge for the large firm as well. Once key suppliers have responsibility for delivering entire subassemblies, it is sensible for the larger firm to allow the smaller partner to further modify components, if such changes reduce costs or improve performance. As Sabel et al. (1991) point out, such efficiency-enhancing moves may then entail further alterations that can have systemic effects. As they point out in an intriguing paper on "col-
PROBLEMATICS: UNDERSTANDING NETWORK PROCESSES

The many strands of research in economic sociology that use network concepts display, in our opinion, a good deal more intellectual coherence than is commonly thought. These disparate lines of research share the assumption that location in an overall pattern of relationships shapes the behavior of individual units. The analytical thrust behind these research programs focuses on the relations among units rather than sorting the units into categories based on attributes. But despite the common focus on linkages, clusters, and patterns of reciprocity and asymmetry, there has been surprisingly little intellectual cross-fertilization. In this concluding section, we focus on a handful of topics that we consider most pressing, as well as potentially amenable to input from various strands of network research.

At the outset, we should recognize both the risks and opportunities present in any effort at intellectual convergence. Let us assume a general willingness on the part of scholarly camps to speak to one another. What would such a dialogue look like? Modelers would assert that the ability to explain and predict complex multiple network relations is dependent on translating descriptive studies into well-understood, relatively simple models. Scholars with an empirical bent would respond with concern that any analytical models would necessarily be so elemental as to do injustice to their portraits of real-world complexity and nuance. Both concerns are valid. Stinchcombe (1989) reminds us that linkages have both form and content. Consider the case of care for the elderly. He asserts that we have no usable quantitative methodology to show that the gender of the caregiver has a big effect on the quality of the care that is rendered. Or take our discussion of subcontracting. In formal terms, U.S., European, and Japanese subcontracting networks are becoming more alike, but any researcher who has observed these relationships first-hand knows that both the quantity and quality of what flows through these linkages is considerably different. Systematic, transferable methods for studying both the form and content of the linkages are needed.

Two illustrations of potential advantages of cross-fertilization might persuade the skeptical. Let's return to the complex multilateral networks
of subcontracting. How would we ascertain whether some production arrangements are more hierarchical than others? Under what circumstances is there an imbalance of power? These are important substantive and comparative questions. Scholars have argued that vertical linkages, in contrast to horizontal ones, cannot sustain cooperation (Putnam 1993). When linkages are asymmetric the relationship is lopsided and breeds resentment. Explaining the differences between linkages should permit us to develop predictions about their durability. The social exchange tradition, based on laboratory studies of power and dependence, offers clean measures of power imbalance (Cook et al. 1983). To what extent do both parties have alternative exchange partners? Does the pattern of linkages enable a party to obtain resources from other members of the network? What are the possibilities for the weaker party to the exchange to form coalitions with other less-powerful units? These questions could be readily translated into tangible measures of the extent of reciprocity or asymmetry in subcontracting relations.

A reverse example would be to move from careful historical study of the contents of relationships to more formal methods of network analysis. Gerlach (1992b) provides one of the first examples of testing ideas developed through years of field work and interviewing with network methods. His blockmodel analysis of intercorporate relations in the Japanese keiretsu showed that the nominal groupings of everyday practice corresponded to the empirical patterns evident in his analysis. The formal logic of structural equivalence permitted verification of taken-for-granted classifications, and revealed subtle patterns of network stratification (e.g., a strong element of financial hierarchy) that he had not previously emphasized.

Morphology and Demography. The various accounts of the development of network forms of governance do not reveal a simple causal chain. In some cases, the formation of networks anticipates the need for this particular form of exchange; in other situations, there is a slow pattern of development which ultimately justifies the form. In still other circumstances, networks are a response to the demand for a mode of exchange that resolves exigencies that other forms are ill-equipped to handle. A critical research question, then, is to account for patterns of network formation.

Why is there considerable cross-national variation in the frequency of network forms? Do rates of formation vary across industries? Why do some industries exhibit a mix of forms of governance and others display less diversity? Answering these questions will require detailed historical and ethnographic studies of network relations, but such research needs to be guided by network sampling procedures and attention to developing multiple quantitative measures of the kinds of relationships that occur. Again Stinchcombe (1989) points out that workable models arise from other disciplines—for example, kinship studies in anthropology and evolutionary trees in biology—that would be valuable in tracking the evolution of network structures, providing ethnographic accounts with both a temporal storyline and a picture of causal direction.

A good deal more attention needs to be paid to the demography of network relationships. Not only do we need detailed quantitative profiles of the size, shape, and direction of network linkages, we need some method for measuring their scope. Can we develop sophisticated input-output models (along the lines initiated by Burt 1992) that also measure the content of ties? What percentage of a firm's external connections are collaborative? What percent are characterized by a significant power imbalance? What is the relative weight and importance of activities performed internally versus those externally?

Two brief illustrations should suffice to illustrate the importance of these issues. Explaining the pattern of an organization's involvement in external networks over time is a subject of obvious interest. Recall Palmer's (1983) insight into the board of directors debate; that is, which ties were reconstituted after a director stepped down from a corporate board and which ones were broken? A comparable broken tie analysis of interfirm collaborations would reveal a great deal about the durability and logic of cooperation.

Another key question is whether the various accounts of industrial districts are biased in that they isolate the higher wage, high tech core and ignore the periphery of lower-level semiskilled work. We need a map of the stratification system alongside a map of the network structure. How do wages and careers differ across various stages of a network? In Japan, some evidence shows that wage differentials between big and small firms have declined considerably, and that prospects for advancement are superior, especially for women, in the smaller firms (Dore 1987; Brinton 1992; Nishiguchi 1993). These are pressing issues about
the degree of inequality in networks, but we currently have little data to inform the debate.

Network Dynamics. Even though the descriptive and formal literatures on networks are replete with such terms as embeddedness, cohesion, and multiplex ties, little is actually known about network processes. For example, when a job is secured through a weak tie, what kinds of expectations are set as to how an individual should reciprocate? How do those expectations differ from strong-tie patronage? In the literature on professional information trading, a strong norm of reciprocity was found; nevertheless, that obligation was exercised with discretion and a concern for the value of the trading partner. In cases of interfirm collaboration, most of the participants approach collaboration warily, aware that they will lose some of their freedom to dictate their future and will grow dependent upon an outside party. This trepidation is clearly mitigated in circumstances where trust and norms of reciprocity are plentiful supply. Does this mean that networks based on preexisting forms of solidarity will develop differently from those that grow out of strategic considerations?

Starting points obviously matter. But equally important is whether initial advantages or constraints can be built on or overcome. How do network ties develop when the parties to a relationship have dissimilar capabilities, for example, linkages between organizations of considerably different size and/or skill? Is cooperation among equals fundamentally different from that among parties who are unequal on a key dimension?

The origins of networks and the types of resources that actors bring to relationships are clearly crucial. Indeed, one can readily imagine rather simple but potentially powerful models being elaborated based on degree of solidarity at the outset of a relationship, and an index of homophily based on organizational characteristics. Such an effort would be a valuable first step in understanding the dynamics of networks. But the problem of capturing learning effects, and their consequences, appears much more difficult. Observers of interfirm collaboration recognize that some parties are simply more skilled at learning from, and exploiting (even in a nonopportunistic way), network ties. The kind of information that passes through networks is partially influenced by each party's interpretation of its situation. If a party sees collaboration as vital rather than of secondary importance, if its professional reputation is partially shaped by its standing in a broader community, and if its organization is structured in a more decentralized, as opposed to a pyramidal, fashion, then a party's interpretation of the importance of networking to its personal situation will be heightened. The older literature on personal influence and on cosmopolitans and locals taught that communication flows were shaped by an individual's self-perception of where he or she fits into local or national structures. These definitions of the situation can generate several potentially powerful outcomes. First, the existence of a dense network of ties, and the ability to utilize those ties effectively, may provide a strong alternative to integration. As Granovetter (1985) suggested, vertical integration may represent a second-best strategy, a costly option pursued by those organizations that lack access to critical resources. Second, success at using weak ties may lead to a redefinition of identity (Sabel 1993). Successful experiences with collaboration may evoke a change in an organization's preferences such that cooperation is preferred to going it alone. Finally, network ties clearly promote the diffusion of common understandings and principles, thereby facilitating further exchange.

Network Failure. Common expectations may enhance the flow of information through networks, but the ties that bind may also turn into ties that blind. When repeat trading becomes extensive it can turn inward, leading to parochialism or inertia. Powell (1985, pp. 202–7) showed how the ossification of an editor's networks eventually led to a decline in a publishing house's list; Glieme (1991) described how embeddedness produced inertia on the part of Swiss watchmakers in responding to digital technology; and Grabher (1993) studied how cognitive lock-in contributed to the decline of steel-making in the Ruhr; all of these examples point to serious limits to networks. The key message from each of these accounts is that networks may restrict access (Marsden 1983); the lesson to absorb is that diversity and weak ties are critical to the viability of networks.

But what are the limits on diversity? Critics of the industrial districts (Amin and Robins 1990; Harrison 1994) argue that their very success has led to invasion by large companies on the prowl for new opportunities. In these accounts, networks are damned to a future of staleness or to becoming victims of their own success. Obviously networks take considerable energy to establish,
develop, and sustain. As with any expensive investment, efforts are made to recoup costs through usage. Moreover, the transaction costs of repeated cooperation shrink dramatically after initial success. Consequently, networks can constrain the ability to adapt to changing circumstances. But sorely missing from these discussions is any kind of comparative evidence. How do networks stack up against other forms of governance? How do networks respond to changing economic circumstances; are they superior or poorer at sharing both the gains of good times and the losses of hard times?

In our view these are fundamental questions for the world of both theory and practice. If networks are to be a cornerstone of a revitalized economic sociology, then we need much better theory and evidence regarding their performance characteristics. In the so-called real world outside the academy, the challenges of competition in a global economy will bring network forms to even greater prominence. In the twenty-first century, power will not rest on the ability to control resources, reward supporters, and inflict harm on opponents; the new competition is one of access to information, resources, and partners. In this view, the worlds of theory and practice merge—capability will depend on recognition that position within a network means everything.

NOTE

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1. In this survey chapter, we cannot provide detailed coverage of the burgeonizing literatures on network analysis and interorganizational relations. For more comprehensive reviews of networks, see Mitchell (1969), Barnes (1972, 1979), Burt (1980), Burt and Minor (1983), Wellman and Berkowit (1988), Knorr (1990), Scott (1991), and Wasserman and Faust (1993). For surveys of research on interorganizational relations, see Bunyan (1978), Laumann et al. (1978), Mizruchi and Schwartz (1986), Oliver (1990), Davis and Powell (1992), Powell (1994), and especially, Mizruchi and Galaskiewicz (1993).

2. See Mitchell (1969), Bott (1971), and Barnes (1972) for reviews of the British social anthropological tradition. Sociometry has a less orderly history, but key insights emerged from the writings of Georg Simmel and Jacob Moreno, the latter best known for the development of sociograms (Moreno 1934). See also Bavelas (1948, 1950), Lazarsfeld (1951), and LaFave and Milgram (1969). Harrison White was concerned with holes, or breaks in the social structure. His work on vacancy chains (1970) offered a new way of analyzing mobility, examining how chains of opportunity moved down a promotion ladder when an individual departed from a position. White and his collaborators developed formal network models—blockmodels—to analyze social structure (White, Bavelas, and Breiger 1976). Granovetter pursued other critical leads in his research on job searches through friends of friends (i.e., the strength of weak ties, 1973, 1974). Breiger's work (1974) added insight into the duality of persons and groups.

3. Knorr (1990) represents an important exception, although his fine synthetic review of the structural perspective focuses primarily on the political, not the economic arena. The collection of papers in Nohria and Eccles (1992) is perhaps the first concerted effort to bring the two lines of research into contact. Also see Schaprio (1993), which is designed to bring together game theory and a work theory to analyze governance structures.

4. Note the strong parallels with Dore's (1983) account of dispute resolution in the Japanese textile industry. He offers the example of a finisher who re-ups with a more efficient process, which gives him a cost advantage. This finisher, however, does not win much new business by offering a lower price. More common consequences are that merchants go to their own finishers and say, 'Look how X has got his price down. We hope you can do the same because we really would have to reconsider our position if the price difference goes on for months. If you need bank financing to get the new type of vat we can probably help by guaranteeing the loan.'


6. There is some evidence that the norms of appropriate behavior vary for strong-tie and weak-tie referrals. Powell (1988) reports an editor's surprise upon receiving a manuscript from a young scholar at Harvard that did not come with appropriate sponsorship. Rather than calling on a more distinguished senior scholar to provide a referral, the young scholar had drawn on a young colleague whom the editor knew on a personal basis. "This is not how things are done," muttered the editor.

7. In this section we draw freely on writings in the new institutionalism; for an up-to-date survey of this line of research, see Powell and DiMaggio (1991).

8. It is crucial to keep in mind the content of the network ties being considered. Although many network ties are multiplex (that is, the ties have multiple contents), this is not necessarily so, and an organization that is central in an information exchange network may be peripheral in a resource exchange network (e.g., a trade association). Thus, network position (such as degree of centrality) is only meaningful in terms of the ties that compose the network. A trade association has little exchange-based power over its members, which limits its ability to compel action. As an information broker, however, it can be crucial for mobilizing collective action: it may be able to persuade, but it cannot force.


10. Stinchcombe (1990a) laments the fact that outside of the "new" sociology of science, there is very little eth-
that Company B collaborates with, but on its bigger cancer projects it turns to the Swiss and Japanese firms that Company A works with on stroke research. This hypothetical example, which is actually less intricate than the reality of biotech, could easily have been culled from alliances in the auto, airline manufacturing, or semiconductor industries.

16. Sassen’s (1994) fascinating comparison of the vibrancy of Silicon Valley and the rigidity of Route 128, Massachusetts, raises a general question about the boundaries of industrial districts. Harrison (1994) argues that studies of industrial districts focus only on “good jobs” while ignoring the low-wage subcontracting work performed outside of the district. A more abstract taxonomic debate has developed over what qualifies as a district. This argument is at least as old as Marshall’s original writings, but its contemporary relevance is heightened by the apparent fiscal health of the more notable districts. But even in the Third Italy, there are debates over where exactly districts are located (see Storzi 1990). And is the concept stretched beyond plausibility when electronics and aeronautics in southern California (Scott 1990), mechanical engineering in Lyons, France (Lorenz 1988) or watchmaking in Switzerland (Glaesemer 1991) are also regarded as industrial districts?

17. Perrow (1992) argues that the combination of small networked and supportive local institutions generates socially positive externalities: (1) economic power is dispersed rather than concentrated; (2) wealth is more broadly dispersed; (3) consumption is more locally based; and (4) public sector services are of much higher quality because they draw on a healthy resource base and derive support from both the public and the business community. In his words, social and political activities are not absorbed by large firms for their individual purposes, but are pursued for collective interests.

18. See Granovetter, chap. 18 in this Handbook for a more detailed discussion of business groups.

19. In our discussion, we draw freely on several key sources: Dore (1987); Fruin (1992); Geerlach and Lincoln (1992); Gerlach (1992a); and Sako (1992).

20. The term “alliance” comes from international politics, where it describes temporary affiliations in times of warfare or cooperative relations among states in an anarchic world.

References


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