

**"INFORMAL CONTROL AND MANAGERIAL
FLEXIBILITY IN NETWORK
ORGANIZATIONS"**

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ABSTRACT

This paper discusses the effect of the structure of a manager's contact network on his or her flexibility in a network-type of organization. While some contact networks can be turned into efficient managerial tools, other networks may become a serious constraint on the manager's flexibility, hindering his or her ability to develop, maintain, and leverage the adequate relationships to coordinate interdependence. A network built on a set of coordinated contacts, or a network dominated by one or a few contacts, curtails the manager's ability to successfully develop those relationships and negatively affects his or her capacity to coordinate critical interdependencies. Data from the Italian subsidiary of a multinational computer manufacturer furnish evidence supporting our hypotheses. The analysis also shows how informal structures, often embedded in the organizational history, may create bonds of interpersonal subordination that hinder the firm's ability to enact a network-type of organization.

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INFORMAL CONTROL AND MANAGERIAL FLEXIBILITY IN NETWORK ORGANIZATIONS

This paper discusses how the structure of a manager's contact network affects his or her flexibility in a network-type of organization. Deprived from the mechanisms of the traditional command-and-control structure, managers in network organizations must develop alternative tools to effectively coordinate their interdependencies. A manager's contact network can be a precious resource from which to build such tools. Managers can actively use their contact networks to coordinate the uncertainty surrounding their interdependencies. Not any network, however, will serve such a purpose. While some contact networks can be tuned into efficient managerial tools, other networks may become a serious constraint on the manager's flexibility to allocate time and energy to develop, maintain, and leverage the adequate relationships to coordinate critical interdependencies. Drawing on some recent contributions of network theory (Burt, 1992), we argue that a network built on a set of coordinated contacts, or a network dominated by one or a few contacts, curtails the manager's flexibility and increases his or her chances of incurring in coordination failures. Data on managerial networks from the Italian subsidiary of a multinational computer manufacturer furnish evidence supporting our hypotheses. The analysis also shows how informal structures, often embedded in the organizational history, may create bonds of interpersonal subordination that hinder the firm's ability to enact a network-type of organization.

Managerial Behavior in the Network Organization

In the last two decades, organization scholars have witnessed the emergence of a set of new managerial practices rather different from those of the traditional hierarchical organization (Williamson, 1975; Chandler, 1977) and even from the so-called "matrix firm" (Davis and Lawrence, 1977). These practices have promoted a new structure often labeled "network organization." (Miles and Snow, 1986; Powell, 1990; Baker, 1992). A definite specification of this new type of firm is still on the way, but there is a growing consensus about some of its key features. At the organizational level, network organizations display a process of vertical disintegration, where the traditional market-versus-hierarchy duality (Williamson, 1975) is replaced by a new type of relationship between the parties to a transaction. This process can be also observed inside the

organization. Network organizations often promote competition between internal units, which have to bid against external suppliers to provide resources, thus re-introducing market mechanisms in the hitherto bureaucratic relationship between organizational units. The ways in which market mechanisms are brought in are, however, different from those of the traditional market ideal of how to organize transactions. The link between the parties in the network differs from the traditional arms-length relationship that characterized the market ideal of the buyer-supplier transaction (Miles and Snow, 1986; 1992). In the network organization, economic transactions are embedded in a more comprehensive relationship where the two parties share information, ideas, and resources, often playing a proactive role in defining the content of the exchange.

At the managerial level, the network organization is often associated with flatter structures, teamwork, entrepreneurial initiative, and decreasing reliance on authority relations to handle interdependence (Kanter, 1984; Ditcher, 1991; Baker, 1992). In this sense, network organizations are a radical departure from the traditional command-and-control structures typified (and prescribed) by the scientific administration movement (i.e., Gulik and Urwik, 1937). This departure poses some important challenges to the way managers must perform their work in the organization. In a review of this new managerial work, Kanter (1989) stressed the importance of individual initiative and lateral relationships as an essential part of the managerial role in the 90s. The image of this new manager is in many respects closer to the idea of "entrepreneur" than to the traditional notion of the "boss." Pinchot (1985) has characterized this new situation under the idea of "intrapreneurship."

Redefining the Managerial Role

While the new organizational model gives the manager considerable more latitude to perform his or her role, it also increases the uncertainty surrounding the managerial task and career. The manager of the 90s has to handle a growing number of what Thompson (1967: 54-55) labeled "reciprocal interdependencies" that link him or her to players outside his or her line of authority. As a result, the formal structure of the organization does not offer the manager a reliable basis to deal with uncertainty. Like an entrepreneur, he or she has to find ways to coordinate these interdependencies to accomplish his or her task effectively. Moreover, the dynamic character of the network organization makes interdependencies shift, following the changes in the resources and expertise a manager has to coordinate to perform his or her task. The fluidity of the interdependencies is one of the main arguments against attempts to coordinate them through formal mechanisms and standard procedures. In this context, flexibility becomes one of the most valuable attributes of a good manager. He or

she must be able to tailor coordination efforts to match the intensity and the salience of his or her interdependencies.

Sociologists and organizational theorists have stressed the crucial role of social ties in reducing the uncertainty of interdependencies (Pfeffer and Salancik 1978; Granovetter 1985; Gargiulo, 1993). In the same vein, a manager's contact network can be a critical resource to apply to this task (Kotter, 1985). An adequate network can help the manager to coordinate critical interdependencies that fall outside his or her line of authority. Without coordination, the uncertainties that surround these interdependencies may force the manager to devote a disproportionate amount of time and energy to handle the situation, thus affecting his or her overall performance. In this sense, an efficient manager in a network organization should be able to create, maintain, and leverage relationships to handle the interdependencies that characterize his or her role. Moreover, relationships may also play a proactive role in helping the manager to identify and to have privileged access to new opportunities that may boost both organizational entrepreneurship and the manager's career. In a network organization, relationships are more than ever a strategic resource for the manager. Deprived from the traditional tools of the command-and-control structure, the manager of the 90s has to rely on networks to get his or her work done (Eccles and Crane, 1987, Nohria and Eccles, 1992). These networks are the manager's "social capital" (Campbell, Marsden, and Hulbert, 1986; Burt, 1992), that is, a set of relationships that allow him or her to have privileged access to information and to reduce the uncertainty surrounding his or her multiple and often conflicting transactions.

The topic has more than academic interest. Bundled in the complexities of the role, a manager may fail to develop a network that effectively helps him or her in coordinating critical interdependencies. Two elements make this risk a genuine threat. The first element is tied to the context in which network management is likely to occur. Most organizations adopting a network form do not start afresh but are seeking to overcome the rigidities of an existing command-and-control structure. The managers have to learn not only new practices but to "unlearn" the existing, well-established ways. Organizational inertia is always a major obstacle to successful change (Hannan and Freeman, 1989). As White (1992) has recently pointed out -- and any general manager has experienced -- organizations crystallize control by blocking fresh social action and thus are inherently hostile to change. This peril is even greater in the transformation into a network organization: More than any other change, this transformation ultimately relies on the initiative of the people who have to enact the new structure, since there are no formal blueprints that can be easily imposed from above.

The second element that makes managerial failures a real risk goes beyond the transitional stage from a hierarchical to a network form. The dynamic character of the network organization makes the salience of interpersonal dependencies shift, thus requiring careful monitoring of the way in which managers allocate their time and energy among their contacts. It is this need to modulate the strength of the tie with their various contacts that makes flexibility a key component of the new managerial role. As Eccles and Crane (1987) pointed out in their analysis of investment bankers, the ability to create and to maintain a flexible network is essential to successful management in network organizations. Managers who, for whatever the reason, are unable to attain this flexibility are more likely to fail in a network type of organization.

Where Does Flexibility Come From?

Flexibility has been often recognized as one of the main underlying characteristic of the network organization at the organizational and at the managerial levels (Peters, 1978). At the organizational level, partners should be free to withdraw from relationships they perceive as no longer beneficial to their interests (Miles and Snow, 1992). In the hierarchical form, this freedom is curtailed by ownership ties at the organizational level and by bonds of formal authority at the managerial level. Yet formal mechanisms are not the only way in which freedom, and hence flexibility, may be curtailed. Severe dependencies can also emerge from the structure and the history of a tie, which may create bonds that are difficult, if not impossible, to break. In a recent review of the causes of failure in network organizations, Miles and Snow (1992) pointed out that a logical yet dangerous extension of the network form may lead to a progressive over-utilization of a given supplier or distributor. This process reinstates under a different substance the dependence bonds of vertically integrated firms, thus loosing the flexibility that gives the network organization its competitive advantage.

At the managerial level, flexibility results from having autonomous control over the way a manager allocates time and energy to perform his or her role. While this autonomy is substantially curtailed in the traditional command-and-control structures, the mere attenuation of the role of authority in organizing the managerial task may not suffice to grant the autonomy necessary for flexibility. Like an organization, a manager can fall into a situation of unhealthy dependence on a set of contacts who will be ultimately the ones having actual control on the way he or she allocates his or her time. A flat formal structure may be a necessary condition to create a network organization, but it is not a sufficient one.

An understanding of how relationships matter is important not only to understand the role of contact networks as managerial tools, but also to devise

strategies to improve their effectiveness. The effectiveness of a network organization relies largely on the entrepreneurial effectiveness of its different units, which in turn depends on the capacity of their managers to enact the fluid structure of a network organization. We argue that this capacity is a function of the manager's autonomy, which in turn depends on the structure of the manager's contact network. This paper explores how this structure affects the manager's flexibility in a network-type of environment. Drawing on some recent developments in network theory (Burt, 1992), we argue that managers that build constraining contact networks are more likely to fail to coordinate critical interdependencies affecting their task. We argue that, by reintroducing control in an informal setting, high-constraint contact networks curtail individual flexibility and thus jeopardize the managers' ability to build ties that help to coordinate their interdependencies. Using available models of network constraint, we propose an operational specification of the conditions for managerial flexibility in network organizations.

A Network Theory of Managerial Flexibility

Following the logic of resource-dependence theory (Pfeffer and Salancik, 1978), we expect that effective managers will build contact networks to maximize their capacity to handle the interdependencies affecting their roles. To do so, however, a manager must have autonomy in the way he or she allocates his or her time and energy to the various players in his or her network. Network theory has shown that autonomy to pursue one's own interest is a function of the structure of ties around a player (Burt, 1982; 1992). A key intuition of exchange theory is that control in a relationship is a positive function of the availability of alternatives (Emerson, 1962; Blau, 1964). This intuition has been confirmed in a series of experimental and simulation studies whose results show how power and influence accrue to players with access to several exchange partners who themselves lack such alternatives (Cook and Emerson, 1978; Marsden, 1982, 1983; Cook, Emerson, Gillmore, and Yamagishi, 1983). Looking into the structure of the ties around an actor and on its impact on the actor's ability to control his or her own behavior, Burt (1992) has proposed a network model based on the assumption that lack of autonomy results from dependence on unique, coordinated actors. The more an actor depends on parties who are difficult to substitute and who can coordinate their behavior, the less his or her autonomy to allocate his or her time and energy among the various players in the network. Conversely, lack of contact among those parties creates "structural holes" that enhance the actor's autonomy. Available results from research on managerial careers and networks within a large computer manufacturer that has

adopted a matrix form furnish evidence that supports these propositions (Burt, 1992: Chapter 4).

The notion of structural autonomy can be directly linked to the idea of flexibility. A manager whose contact network is composed by a small set of coordinated players has low structural autonomy to perform his or her role. Lack of autonomy means that the way in which the manager allocates his or her time is to a large extent determined by his or her contacts, not by him or herself. The manager's strong dependence on these contacts may have similar effects than the authority bonds of the bureaucratic structures, in the sense that he or she is no longer free to negotiate the terms of the relationship nor to build alternative ties that may better serve his or her needs. The network is no longer a resource to manage critical interdependencies or to explore new opportunities, but a constraint that prevents the manager from doing so. This results in a lack of flexibility that violates one of the essential principles of the network organization and, therefore, it is likely to have a negative impact on the manager's ability to handle interdependence. Thus, we expect managers facing high levels of network constraint to be more likely to fail to coordinate some critical interdependencies.

The specific mechanism through which network constraint curtails managerial flexibility can be twofold. First, a manager's autonomy to allocate time and energy to his or her network can be affected by the aggregate level of constraint in the network. Some managers may have flat contact networks, where each contact's ability to pose demands on the manager is similar to the ability of the other contacts in the network. In this case, the manager does not depend on any single contact but on the overall structure of his or her network. The manager's autonomy is a function of the aggregate level of constraint posed by this structure. Second, flexibility can be curtailed by the *distribution* of the aggregate network constraint across contacts. Managers may build "hierarchical" networks around some key players who then will be able to pose comparatively high levels of constraint on the managers' ability to allocate time to their contacts. In this second case, the manager's lack of autonomy stems largely from his or her dependence on one or on a few contacts who dominate his or her network.

Network theory predicts a negative effect of the level of aggregate constraint on performance. The evidence on the relationship between the distribution of constraint and performance is more ambiguous. In his analysis of a similar population of managers in the U.S., Burt (1992:147-153) found robust negative effects of aggregate constraint on early promotion for all managers, but positive effects of hierarchical contact networks on early promotion for women and entry-rank men, who benefited from networks built around a strategic partner. The positive effect of network hierarchy on promotion captures the well-documented influence of mentoring in managerial careers (e.g., Kram, 1985).

From an organizational standpoint, however, a "hierarchical" network dominated by a small subset of contacts resembles a command-and-control structure where authority bonds have been replaced by informal dependencies on specific players. Although a hierarchical network may be essential for players in a weak social position (such as women in a male-dominated environment), its impact on the manager's flexibility should be nonetheless noticeable. A manager who chooses or is forced to build a hierarchical network may attain the necessary legitimacy to be recognized as a player, but this legitimacy may have a price in terms of lack of flexibility. Whether this price will have an impact on his or her career may depend on other contextual factors, since promotion is not fully determined by performance.

Going back to the specific problem discussed in this paper, we argue that hierarchical contact networks built around dominant players constitute a severe violation of the logic of the network organization. In this sense, we expect hierarchy to have a strong negative impact on managerial flexibility. Existing network theory does not offer a definite argument to assess whether this impact on flexibility is greater than the impact of the level of constraint and thus we will not advance a hypothesis on the relative importance of each mechanism. The previous discussion yields the two hypotheses tested in this paper, which can be stated as follows:

Hypothesis 1: *In a network-type of organization, the rate of managerial failure in coordinating critical interdependencies is a positive function of the level of constraint posed on the manager by his or her contact network.*

Hypothesis 2: *In a network-type of organization, the rate of managerial failure in coordinating critical interdependencies is a positive function of the hierarchy in distribution of the constraint posed on the manager by his or her contact network.*

We tested these hypotheses using data on managerial networks in the Italian subsidiary of a multinational computer manufacturer. In response to the challenges of increasingly difficult market conditions, the firm is trying to promote horizontal linkages within a traditional command-and-control structure. Our research focused on the managers of an internal unit promoting such linkages. In the next two sections of this paper we discuss the characteristics of the study as well as the data and methods used to test our hypotheses.

The Study

The study focuses on a unit within the Italian subsidiary of a leading multinational computer company. Like most firms in the industry, the company is dealing with increasingly difficult market conditions. According to market

experts, the rate of growth in the information technology market expressed in current value went from 18 percent at the beginning of the eighties to 13 percent in the second half of the decade. This figure dropped even further thereafter: In 1990, the average growth rate for the top twenty firms was only 7.2 percent (Confindustria, 1991). This scenario is not likely to get better. A special report predicts that the industry's sales will grow by 6 percent or less a year, scarcely more than the nominal growth rate of the world economy (The Economist, 1993). Impressive price-cutting and accelerating competitive dynamics driven by dramatic advances in chip technology have made profit margins plummet, forcing the firms, and especially the large firms, to reshape their activities. In this context, the search for more effective organizational configurations is a major endeavor for large computer manufacturers.

The company we examined is engaged in a worldwide restructuring process. The firm is explicitly committed to move from being a single, centralized company to a network of competitive, autonomous business that should optimize their efforts on a worldwide basis, selling their products both inside and outside the organization. Several initiatives are under way to facilitate this transformation into a network-like organization. Some of these initiatives were made explicit from the onset, while others are emerging out of the everyday practice of organizational transformation. Our study focused on one of these emergent strategies. A small unit operating in one of the Italian plants is promoting alternative forms of voluntary cooperation among business units within and outside the organization. Although our unit was not originally conceived as an organizational architect, its style of work has created an emergent strategy leading towards a radical organizational change.

The Direzione Processi Industriali (DPI) is a small unit formally created in January 1991 and staffed by 19 members, all but one of them male. Its origins can be related both to a process of organizational change and to individual initiatives. Early in 1991, the existing functional structure was substituted by a business unit organization and new centers of competence were created to deal with the emerging issues the company was facing. At the same time, an autonomous research initiative undertaken by a group of people working at the Italian plant focused on new technological strategies and on alternative models of conceptualizing the overall activity of the firm, both at the national and the international levels (Berchi and Fontanazza, 1991). The creation of DPI gave an institutional form to the new and disperse expertise that resulted from this initiative.

DPI's scope of activity is very broad. The unit operates both inside and outside the company, providing solutions to internal business units, top management, and international functional managers, as well as to external clients. Its competencies include devising manufacturing strategies for the Italian

plants, developing a market-driven quality approach, promoting marketing-manufacturing cooperation, and creating tools and methods to implement the different initiatives. It also coordinates activities of managers in charge of setting long-term strategies and represents the Italian plant in international company hearings. To an important extent, these tasks resulted from autonomous initiatives that became institutionalized in the new unit and were then formally recognized by the company. In this sense, DPI clearly resembles the entrepreneurial image associated with the network organization. This image also corresponds with the flat internal structure of the unit. Although formal hierarchy and task differentiation do exist, barriers among task groups and individuals are insignificant. Personal initiative is not only strongly encouraged within DPI: It is a requisite to do the job. Its members know that solutions are driven by multiple contributions and that external and internal relationships are crucial for getting things done. They believe that traditional organizational mechanisms are no longer valid to accomplish the complex task they have at hand. Instead of relying on the formal hierarchical structure, members leverage horizontal relationships and promote cooperation among internal departments. These initiatives have often lead to the identification of new business opportunities for the firm, both inside and outside the formal boundaries of the organization. In this sense, one could say that DPI has its own "network theory" on how to perform its task (Johansson and Mattson, 1992). Although DPI had the support of top management, its location in the formal structure made it a peripheral part of the organization. The head of DPI reports to the plant manager, who is two steps below the top management.

DPI has favored working through project teams by which the unit pools resources from within and outside the organization to provide specific solutions to both internal and external customers. Between January and October 1991, the unit was directly involved in 73 of such projects. At the time of our survey, 70 percent of the projects were still under way, 20 percent were recently completed, and 10 percent abandoned. One third of these projects was a continuation of those carried out by previous units. The remaining ones were either a direct initiative of DPI (43 percent) or were launched upon customers' demands (57 percent). In more than 60 percent of the projects, DPI acted as leading unit. Eight of the 73 teams were formed exclusively with people from DPI. On average, project teams had 6.64 people representing 3.71 different units. DPI contributed an average of 2.79 team members per project. Typically, one of these people was the team leader on DPI's side. Each member of the unit was on average responsible for more than 4 projects. In addition, he or she would participate in other project teams. Putting the two together, an average DPI manager participated in about 10 different projects. Although managers did have initiative regarding their participation in the projects, the composition of

the teams was largely driven by reasons of technical expertise and experience, and was ultimately the responsibility of the head of the unit. In this sense, DPI managers were not self-selected into the project teams they participated.

The managerial approach and the internal structure of DPI made the unit a small scale example of network management. Its members autonomously develop and leverage relationships both inside and outside the firm, actively seeking to promote cooperation ties that cut across the formal structure and the boundaries of the organization. To attain that goal, DPI personnel must also manage the reciprocal interdependencies created by their joint participation in teams and by their attempts to coordinate resources from independent areas of the organization. This setting makes the unit a fruitful laboratory to analyze the conditions for effective network management.

Data.

Our study gathered both ethnographic and quantitative data. The ethnographic research began in June 1991 and continued until the end of December 1991. During this period, one of the authors was allowed to engage in daily observation of the DPI operations. For most purposes, the researcher was considered as another member of the unit. He participated in the overall activity of the unit as well as in team meetings for some of the projects. He had also easy access to the unit members for interviews, could consult written communication and formal documents, and attended common meetings. The researcher was also able to collect information from other departments and key people inside the plant.

The ethnographic research was the basis for a self-administered questionnaire distributed to all members of DPI in October 1991. The survey was responded by all 19 managers working for DPI. It consisted of two parts. First, a general questionnaire covered information on the manager's involvement in projects, as well as an evaluation of the functioning of the unit. Each member was also presented with a list of his or her colleagues within DPI and asked to rank his or her level of discussion of problems relevant to his or her work with each of these colleagues, in a scale from 0 (no consultation) to 3 (strong consultation). This question yields a 19-by-19 matrix of consultation ties among DPI managers. Second, those managers who were responsible for the coordination of at least one of the 73 projects implemented by DPI were asked to fill out a booklet with information about each project under his or her supervision. The booklet surveyed detailed information on the project and on the people involved. It also included a matrix in which the coordinator had to list all the people that participated in the project team, including himself, and to estimate the level of cooperation between all pairs of members, in a scale from 0 (no cooperation) to 3 (strong cooperation).

Methods

To test the hypotheses presented in this paper requires independent measures of two different networks linking the 19 managers working for DPI. The first network measures interdependence among managers as a function of their joint involvement in the projects implemented by DPI. This interdependence is both direct and indirect. First, managers working in the same projects are directly interdependent and thus they must coordinate efforts to make the project a success. Second, by working in the same projects, the managers are also indirectly interdependent, since they are demanding resources from the same units in the firm, that is, from the ones that jointly participated in these projects. For any two managers $\{i, j\}$, a relationship z_{ij} is defined as the number of projects in which managers i and j were jointly involved during the period covered by our research. This yields a 19-by-19 matrix defining a pattern of interdependence among DPI managers.

The second network measures consultative ties among the same 19 managers. They were presented with a complete list of their unit's colleagues and asked for the extent to which they routinely consult with each colleague for matters concerning their work in the unit. Managers could rank their answers from 0 (no consultation) to 3 (strong consultation). The raw response data generates a 19-by-19 matrix of consultative ties. The consultation network reveals a relatively flat structure. The score for the least prominent player is only 60 percent of the score of the most prominent manager.¹ The consultation network is also very dense: The average strength of the ties in the network is 1.32, with a range from 0 to 3. The average DPI manager cited 11 different colleagues. Out of the 342 possible consultation ties, 62.6 percent are present; 23.1 percent of them are strong, 23.7 percent medium and 15.8 percent weak. Any member of the unit can be reached by any other member in a maximum of three steps. These features of the consultation network are consistent with the image of the network organization (Baker, 1992).

Interdependence and consultation. In measuring the strength of interdependence and consultation ties, we are interested in how a manager allocates the time and energy he or she devotes to his or her network. This is a function of both the attention he or she seeks from others and the demands that other colleagues make on him or her. Yet managers may vary in their tendency to seek (or to be asked for) advice, as well as in the number of colleagues with whom they jointly participated in project teams. To take into account these two

¹ The prominence scores used here are Bonacich's (1987) eigenvector measure. It reflects the actor's tendency to be cited by people who are themselves the object of citations. The measure varies from a maximum of 1, for the most powerful actor(s), to near 0, for the weakest actors. In the consultation network, prominence scores varied from 1.00 to .594, with an average of .791 and a standard deviation of .118.

factors and to focus purely on the pattern of relationships we use a proportional measure of both dependence and consultation ties. Taking actor i's perspective, each of his or her $\{i,j\}$ relations can be represented as the ratio between his or her interaction with alter j and the sum of his or her interaction with all the alters q, including j.

$$p_{ij} = (z_{ij} + z_{ji}) / \sum_q (z_{iq} + z_{qi})$$

In the interdependence network, z_{ij} is measured as the number of projects in which i and j were jointly involved. In the consultation network, z_{ij} is the strength of the self-reported consultative relationship from i to j. Within each network, the measure is made proportional by dividing each interaction by the sum of all the interactions in which the focal actor i is involved. Thus, for all actors i, $\sum_q p_{iq} = 1$.

Constraint and Hierarchy. These two variables describe the characteristics of the managers' consultation network in terms of level and distribution of constraint across contacts. Following Burt (1992), the constraint posed by an alter i on j is defined as a function of both the direct interaction between i and j and of the extent to which j is tied to the other alters q in i's network:

$$c_{ij} = [p_{ij} + \sum_q (p_{iq} p_{qj})]^2,$$

where p_{ij} is the proportional measure of consultation ties discussed before. The total constraint posed by actor i's consultation network on his or her autonomy to allocate his or her time and energy is simply the summation of the constraint posed by each of his or her alters ($\sum_j c_{ij}$).

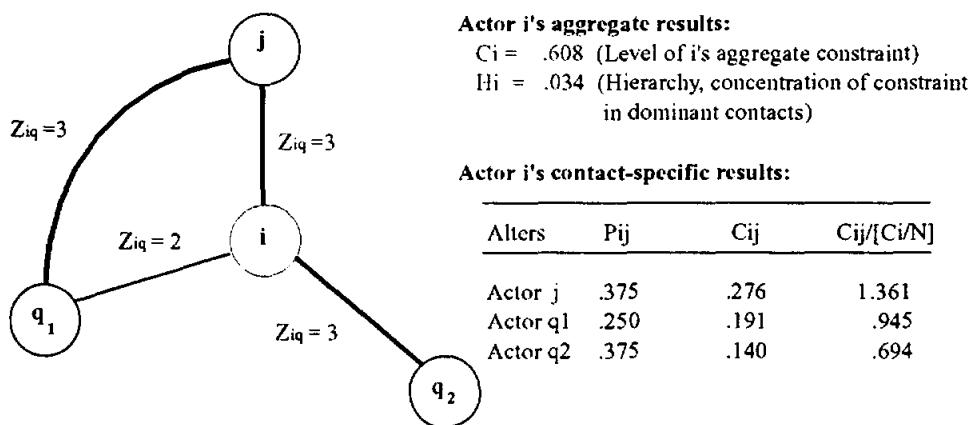
Finally, the distribution of constraint in actor i's consultation network is measured by the Coleman-Theil disorder index (see Burt, 1992:71):

$$H_i = \frac{\sum_j \frac{c_{ij}}{C/N} \left[\ln \frac{c_{ij}}{C/N} \right]}{N \ln(N)}$$

where C is the total constraint on actor i ($\sum_j c_{ij}$) and N is the number of alters in i's network. Note that the quotient C/N yields the average constraint posed by i's alters, and thus $c_{ij}/(C/N)$ expresses the constraint posed by actor j in terms of the average constraint in i's network. The higher the hierarchy index, the more actor i's consultation network is dominated by one or a small set of contacts j who pose a constraint much higher than the average contact in i's network. Actor j's dominance is a function of the strength of the consultation between actors i and j (p_{ij}) and of the extent to which j's advice is also sought by the other contacts q to whom i goes also for advice ($p_{jq} p_{qi}$).

Figure 1 illustrates these different measures in a hypothetical four-actor symmetric network where the intensity of relations among players has been measured on a scale going from 0 (no relation) to 3 (strong relation). Actor i, the focus of our attention, has three different contacts; she is strongly tied to actors j and q_2 ($z_{ij} = 3$) and has a weaker tie with q_1 . ($z_{iq_1} = 2$). Actors j and q_1 are also connected by a strong tie. Proportionally, actor i devotes an equal amount of her time and energy to both actors j and q_2 (37.5 percent), and a lesser amount to q_1 (25 percent). These are the p_{ij} (or p_{jq}) proportional measures of the interaction between i and each of her alters, from i's perspective. Actor i's level of aggregate network constraint is .608. This is distributed unequally across alters, which generates a hierarchy index of .034. Actor j is the dominant player in i's network: his ability to constrain her is 1.36 times higher than the average ability of all three actors in i's network. This dominance is the result of the strong tie between i and j and of an equally strong tie between q_1 and j. The difference between j's and q_2 's position in i's network does not originate in the strength of their ties to actor i, but in their ties with the rest of i's contacts. Although both alters are strongly tied to i, q_2 's isolation from the rest of the network lowers his ability to put constraint on her.

Figure 1
An illustration of constraint and hierarchy measures



Coordination Failures. We expect that effective managers will build support networks to maximize their capacity to handle the interdependencies affecting their roles. In an extreme case, this would mean an almost perfect mapping of the consultation network on the interdependence network. Individual managers, however, are likely to deviate from this pattern in two ways. First, a manager may consult with people he or she does not depend upon. We may refer to these as cases of "excess" consultation. Second, a manager may have a low level of

consultation (or no consultation at all) with people he or she strongly depends upon. We call these situations of missing consultation "coordination failures."

From the standpoint of resource-dependence theory, the impact of each type of deviation on managerial performance should be different. Although ties with people a manager does not depend upon to carry his or her task may be at times an inefficient way to allocate effort, these ties need not have a negative impact on the manager's performance. Moreover, these ties may be useful to get resources or information not controlled by the people the manager depends upon. More specifically to this case, joint participation in project teams may not have been the only source of interdependence in the system, albeit it was the most important one. The consequences of the second type of deviation are different. Failure to consult with a colleague a manager depends upon should make coordination more difficult and time-consuming, which in turn should affect the manager's performance. Our focus on coordination failure captures the theoretical difference between the two types of deviation.

Operationally, we define as coordination failures those cases in which the interdependence between manager i and manager j (p_{ij} in the projects network) is greater than the mean interdependence in the network and the level of consultation between these two managers (p_{ij} in the consultation network) is lower than the mean level of consultation in the network.² As we noted before, DPI managers had large consultation networks, which in all but one case exceeded the size of their interdependence networks. In this setting, the strength of the consultative tie is relevant. By focusing on the joint occurrence of high interdependence and low consultation, we make sure that failure cases corresponded to strong interdependencies that are not coupled with a consultative relation that is at least higher than the expected intensity of consultation among any two managers in the rather dense structure of consultative relations inside the unit. Following this criterion, each of the 342 dyads was coded as either failing (1) or not failing to coordinate (0). On the basis of this coding, we computed an individual failure measure for each manager, defined as the sum of coordination failures across all the people with whom he or she jointly participated in at least one project team. This measure may vary from 0 when the manager had successfully allocated above average

² The mean proportional interdependence between actors is .056, with a median of .038 and a skewness coefficient of 2.035. Our using the mean as a criterion to define strong interdependence leaves aside about 60 percent of the ties to focus only on cases of strong interdependence. Thus, a low level of consultation with a sporadic project partner will not constitute a coordination failure. The distribution of proportional consultation ties is more normal (.056 mean, .057 median; .033 skewness). Note that the proportional measure of interdependence and consultation used here (p_{ij}) removes differences in the volume of interaction of individual managers, making average figures a good indicator of the socially expected levels of interdependence and consultation between any two managers in the unit.

consultation ties to all his or her strong interdependencies to a maximum of N when he or she fails to do so for all his or her strong interdependencies, being N the number of different project partners within DPI. One of the managers participated in 12 project teams, which put him in touch with 13 different colleagues, 9 of which were strongly interdependent with our manager. His level of consultation with these colleagues, however, was below average in 5 of the cases, which we coded as coordination failures. On average, DPI managers committed 3.68 failures in coordinating 10.63 interdependencies.

We do not have a good direct measure of individual managers' performance to test the impact of our failure measure, but we can provide some indirect evidence showing how coordination failures were consequential for the task of the project teams. The main goal of the DPI managers participating in these projects was to promote cooperation within the teams. Yet coordination failures between DPI managers jointly participating in a project prevented them from attaining such cooperation. The proportion of failing DPI dyads within a project team is negatively correlated with the average level of attained cooperation among all team members ($r = -.420$; $p < .001$). The effect was also significant for both the average cooperation between DPI managers and other members of the team ($r = -.476$; $p < .001$), as well as for the cooperation among non-DPI team members ($r = -.395$; $p < .001$).³

The effect of weak ties. Before moving to the results we should discuss an issue that may raise doubts about the true meaning of our findings. Both the failure and the constraint measures are contingent upon having "weak" ties in the consultation network. Given our proportional measure of the strength of the ties, which makes all managers have the same total amount of interaction, there are two possible sources of weak ties: A large consultation network, or a network with a rather unequal distribution of interaction across alters. Let's examine how these two situations affect our theory.

First, let's look at network size. Since managers are treated as having the same amount of attention to allocate to the people they consult with, managers with a large consultation network are more likely to have many weak ties, which, according to our operationalization, may prompt high failure rates. This suggests that failure could be just the trivial consequence of the size of the consultation network: Managers who spread their energy across many contacts, and especially

³ At the project level, we defined a coordination failure index as the ratio between the number of DPI dyads in the project team who failed to coordinate and the total number of DPI dyads in the project. Projects with a single DPI participant were coded as having zero failure rate. There were 65 projects in which at least one member of another unit participated. Twenty-two of them have a single DPI participant. Cooperation is measured as the average level of cooperation reported by the manager coordinating the project. These measures may vary from 0 (no cooperation was reported among the specific members) to 3 (the cooperation among all pertinent members was the strongest).

managers whose total number of contacts exceeds their total number of dependencies, should have more weak ties and thus more failures. Failure, however, was not significantly associated with the size of the manager's consultation network ($r = .200$; $p = .206$), nor with the number of "excess" consultation ties ($r = .197$; $p = .209$). The number of failures, therefore, cannot be explained as the trivial result of having a large consultation network nor by the managers' tendency to have consultation networks larger than their dependence networks.

The second source of weak ties is the distribution of the manager's attention across his or her alters. A network may contain a large number of weak ties if the manager's interaction is heavily concentrated in one or in a few alters, thus leaving the rest relatively unattended. Yet this is precisely the definition of a hierarchical network. By definition, managers with many weak ties will have a hierarchical distribution of constraint and, other things being equal, they should be also more likely to have many coordination failures. Following this logic, a correlation between hierarchy and failure would be spurious, since it would merely show the common effect of weak ties. Insofar as the system displays a strong correlation between the level and the distribution of constraint, an association between level of constraint and failure could be dismissed on similar grounds.

There is, however, an important misunderstanding behind this argument. A large number of weak ties will prompt coordination failures only if these weak ties are allocated to alters with high levels of dependence. Yet both the level and the hierarchy of constraint are independent from how weak ties are allocated to specific alters. If the theory proposed in this paper is incorrect, the distribution of constraint should have no effect on how a manager allocates his or her weak ties. There would be no reason preventing the manager from allocating weak consultative ties to weak dependence, saving strong ties for strong dependencies and thus avoiding coordination failures. On the contrary, our interpretation suggests that the allocation of the manager's attention is affected by the controlling role of the players in the manager's network. The more these players are in a structural position to exercise control on the manager, the more this manager will make an inadequate allocation of weak ties, which will prompt coordination failures.

There is a way to test the validity of our interpretation. If our emphasis on the influence of network constraint on the allocation of consultative ties is correct, the level and the distribution of constraint in the consultation network should still have an impact on failure rates once the effect of weak ties is controlled for. To this end, we report results using our standard measures of aggregate constraint, hierarchy, and failure, along with results obtained after removing the effect of weak ties from these measures. The adjusted measures are

the residuals obtained by regressing failure, constraint, and hierarchy on the number of weak ties in the manager's consultation network. Consultation ties whose proportional strength (p_{ij}) was below the criterion level used to define the failure measure were coded as weak. On average, DPI managers had 8.90 weak ties, ranging from 4 to 12. As expected, the number of weak ties in the consultation network was significantly correlated with our three study variables, that is, the number of failures ($r = .533; p < .05$), the level of constraint ($r = .488; p < .05$), and the hierarchy in the distribution of this constraint across contacts ($r = .682; p < .01$). If the effects of the network characteristics are merely an artifact, they should disappear after the impact of weak ties has been removed from the measures. On the contrary, if network constraint does affect the manager's flexibility to decide which consultation ties should be weak, the adjusted level and distribution of constraint should still have a significant positive impact on failure.

Control Variables. A manager's failure to maintain adequate consultation ties with people he or she depends upon can be affected by the particular workload conditions in which the manager has to perform his or her task. We can expect that the larger a managers' workload, the higher the probability of failing to keep an adequate level of coordination of all the interdependencies defining his or her role, and thus the higher his or her total number of failures. Two workload dimensions are particularly relevant here: The number of project teams in which the manager participated and the number of different colleagues with whom the manager jointly participated in at least one project team. The last variable is in fact the size of the manager's interdependence network, as defined in this paper. As one might expect, these two dimensions are strongly correlated ($r = .744; p < .001$): The size of a manager's dependence network is a positive function of his or her involvement in different project teams. This correlation creates multicollinearity problems if we attempt to enter both controls in the equation. To avoid that problem, we estimated two separated equations. We expect both variables to have a significant positive impact on failure rates. We are not, however, interested in this impact, but only on changes in the effects of network constraint once workload conditions are controlled for.

Results

Table 1 presents standardized regression coefficients measuring the impact of network constraint on the number of coordination failures, using both ordinary and adjusted measures of the variables. The results furnish evidence supporting both of our hypotheses. The hierarchy of the managers' consultation networks explains more than 40 percent of the variance in their number of coordination failures. After removing the effect of weak ties, a manager's

tendency to have a consultation network dominated by few alters still explains 23 percent of his or her failures. The last result is particularly important, because it shows that the effect of hierarchy is not merely an artifact of the necessary existence of some weak ties in any hierarchical network. This result supports our interpretation that the distribution of constraint in a manager's consultation network affects the way in which the manager allocates his or her weak ties across levels of dependence. The impact of the level of constraint on coordination failures also conforms to our predictions. Although the result of the univariate model using the adjusted measure of level of constraint is not significant ($p = .147$), the introduction of the control variables reveals effects that support our first hypothesis. In all cases, the impact of the control variables is positive and significant at the .05 level. The increments in R^2 for the models with control variables show that workload conditions were an important factor contributing to managerial failures. The effects of network constraint, however, are not substantially affected by the introduction of the control variables, thus suggesting that they are independent of the managers' workload.

Table 1
Effects of network constraint on coordination failures
(Standardized OLS coefficients)

Network constraint	Beta	t-value	R^2	F ^a
Level (aggregate constraint)	.514**	2.481	.266	6.154**
Controlled by project participation	.508***	3.128	.578	10.978***
Controlled by size of dependence network	.586***	3.337	.527	8.927***
Removing weak tie effect ^b	.346	1.519	.119	2.307
Controlled by project participation	.408**	2.176	.444	6.394**
Controlled by size of dependence network ^c	.448**	2.343	.434	6.136**
Distribution (hierarchy)	.661***	3.631	.437	13.187***
Controlled by project participation	.536***	3.135	.579	11.007***
Controlled by size of dependence network	.627***	3.863	.581	11.098***
Removing weak tie effect ^b	.480**	2.259	.231	5.103**
Controlled by project participation	.382*	1.950	.418	5.745**
Controlled by size of dependence network ^c	.444**	2.353	.435	6.167**

* $p < .10$; ** $p < .05$; *** $p < .01$;

N = 19

^a There are 17 degrees of freedom for the univariate models and 16 for models with control variables.

^b Weak tie effects removed from both the independent and the dependent variables.

^c Number of DPI colleagues jointly participating in project teams.

The univariate results suggest a preeminence of the concentration over the level of constraint mechanism in explaining coordination failures. The difference in the magnitude of the two effects, however, disappears once workload controls are entered into the equation. The strong correlation between the two network characteristics ($r = .661$ for the standard measures and $r = .465$ for the adjusted scores; in both cases, $p < .01$) and the relatively small number of observations ($N=19$) creates multicollinearity problems that made it difficult for a straightforward evaluation of the relative impact of each of these structural properties on coordination failures. Attempting an approximation to such an evaluation, we obtained instrumental measures of both hierarchy and level of constraint by removing the effect of the level of constraint from hierarchy, and vice-versa. Regressing failure on the level of constraint and on the instrumental hierarchy measure, we obtained estimates for the impact of each variable on coordination failures. A similar estimation was done using the instrumental measure of constraint and hierarchy. A comparison of the corresponding standardized regression coefficients shows that the impact of the instrumental measure of hierarchy is slightly higher than the impact of the instrumental measure of constraint (.361 for hierarchy and .138 for constraint). These results, however, do not hold after controls for workload conditions are entered into the equation: here the two coefficients are similar both in magnitude and in significance levels ($\text{Beta} = .265$; $p = .17$).⁴

To summarize: Our analysis of the DPI managers furnished evidence supporting the two hypotheses discussed in this paper. The results are robust and largely independent from both the potentially spurious influence of the number of weak ties in the consultation networks and the differences in workload conditions across managers. The results, however, did not provide information about the relative importance of the two mechanisms through which network constraint may affect managerial flexibility. We will return to this point in the Discussion session.

Discussion

This paper uses network theory to specify how the structure of a manager's contact network affects her flexibility and performance in a network organization. Faced with a growing number of reciprocal interdependencies that are mostly beyond his or her control, a manager must develop mechanisms to effectively coordinate the uncertainties surrounding her task. In this context, a

⁴ These results were computed using the adjusted measures of our variables and thus are independent of the number of weak ties in the manager's consultation network. None of the coefficients for the instrumental measures were significant at the .10 level.

manager's contact network may become a critical resource to cope with the resulting uncertainty. Not any kind of network, however, will be useful for such purposes. Managers in a network organization should be able to strategically tailor their personal contact networks to handle interdependence. To do so, however, they must have the flexibility to develop, maintain, and leverage relationships, thus keeping control on how they allocate time and energy to the different parts of their networks. Factors that reduce such flexibility increase the likelihood of failures in coordinating critical interdependencies, which in turn have a negative impact on performance. Here we focus on how the manager's contact network may create conditions leading to failures in his or her ability to maintain flexibility. We have identified two mechanisms through which this may happen. Our results show that a contact network where the manager is dependent on a set of coordinated players, or a network dominated by a small set of players dramatically curtails this ability.

The particular features of the system analyzed in this paper does not allow us to clarify the relative importance of each mechanism on empirical grounds. There are two reasons for this limitation. First, the strong correlation between constraint and hierarchy suggest that high levels of network constraint among DPI managers were largely caused by a small set of dominant players in their consultation networks. This may lead us to conclude that the real trap for a network manager is to let a small set of people be in control of the way he or she allocates his or her time. The observed correlation between the level and the concentration of constraint, however, may not be present in other settings, which would be therefore more appropriate to study the independent effects of these two structural properties on managerial flexibility.⁵ Second, although our data is adequate to furnish credible evidence for the effects of network constraint on flexibility, the small size of our study does not allow us to draw inferences that are not theoretically grounded. As we discussed before, there is little research on how the two mechanisms represented in our hypotheses may affect performance. Burt (1992) has suggested that a hierarchical network may be a necessity for a manager in need of a legitimating sponsor. This did not apply for the managers in our study, who were relatively homogeneous in terms of seniority and gender (only one of them was female). Our field observation did not offer any evidence in this respect either. Beyond the specific case, however, Burt's observation and our own findings pose an interesting puzzle for managers who may face legitimacy problems in a network organization, as well as for the organization itself. We will return to this point in our conclusions.

⁵ Burt (1992: 145) reports a correlation of .36 between aggregate network constraint and hierarchy for a sample of middle managers in a similar firm for the US.

Leaving aside the debate on the specific causal mechanism that links constraint to coordination failures, we can ask about the sources of variation in constraint among the managers. More specifically, we are interested in examining possible organizational sources of constraining relationships. To explore this question, we examine constraint scores at the dyad level to identify high constraint relationships. To this end, we focus the analysis on the constraint posed by each alter relatively to the average constraint in the manager's network. Note that such relative constraint, given by the ratio $c_{ij}/(C/N)$, is responsible for the level of hierarchy measured by the Coleman-Theil index.

We found no significant association between relative constraint and similarity in background variables such as educational level, major, seniority, or age. The average DPI manager was neither more nor less likely to be constrained by a colleague like him or herself, when similarity is defined along these personal attributes. Relative constraint is also unrelated to formal reporting relationship. There was, however, a strong association between relative constraint and organizational background: average relative constraint is significantly higher among people who were together in the same unit before being assigned to DPI (1.054 vs .898; $t = 2.66$; $p < .01$). Similar results are obtained using raw constraint scores (c_{ij}) or the relative strength of the tie (p_{ij}). In other words: The dominant players in a manager's network were more likely to be the people the manager used to work with in his or her previous assignment in the organization.

This finding confirms some well-known ideas about the origin of strong relationships. Granovetter (1973: 1361) has pointed out that the strength of a tie " ... is a (probably linear) combination of the amount of time, the emotional intensity, the intimacy (mutual confiding), and the reciprocal services which characterize the tie." Looking at the origin of ties, Feld (1981) stressed the importance of joint participation in similar organizational contexts as one of the main sources of relationships. Common organizational history put people in contact, prompts the exchanges of advice and services, and allows for repeated exchanges that are the basis for a strong relationship. These relationships are likely to outlive the specific context in which they arise. Scholars have long ago recognized the potential contribution of this system of informal exchanges to the effectiveness of the organization (Blau, 1958). Yet informal relations may at times crystallize in social structures that curtail managerial flexibility. The unobtrusive nature of these ties may make their effect less apparent than the conspicuous impact of the formal hierarchy, both for the observer and for the participant. Such an effect, however, may be equally consequential.

Conclusions

The research reported in this paper has several implications for the study of the managerial role in network organizations. We have argued that the attenuation of authority embedded in the idea of "flat" organizational structures may not suffice to promote entrepreneurship within a traditional organization and to move towards a "network" firm. This is especially so in context of rapid organizational change. Like the bird that remains inside the cage despite the open door, a manager adapted to a command-and-control structure may fail to use the freedom created by flatter structures. Scholars have recognized the role of previous socialization in this inability to take advantage of the new freedom. Yet our argument suggests that the freedom itself may be sometimes a mirage: Powerful control mechanisms stemming from the informal network structure within the firm may maintain the old hierarchical control under a different and yet still consequential matter. This informal structure, often embedded in the organizational history, creates bonds of interpersonal dependence that may severely curtail the organization's ability to enact a network form. Although necessary, the attenuation of authority is not a sufficient condition to promote managerial entrepreneurship. Informal hierarchies and controls may still operate as an effective obstacle to flexibility.

This warning is specially relevant in contexts of organizational innovation, such as the transformation into a network organization. Moving away from the well-established command-and-control structures is a task that requires more than administrative decisions at the top. Top management decisions of reshaping and leaning the overall organizational through a general reduction of managerial levels are important. However, such decisions may not be enough to promote entrepreneurship at different organizational levels: Past organizational characteristics can survive even though formal structures have been revised or the chain of command reduced. Organizational inertia can be a serious trap that affects the success of this type of innovation at the level at which the innovation must succeed: The transformation of the manager from a "boss" into an "entrepreneur."

This is perhaps one of the main reasons for which network organizations are easier to project than to realize. The enactment of the network organization requires a radical change in the way managers go about doing their work. Although this change can be promoted by removing bureaucratic barriers and by introducing appropriate inducements, it cannot be directed in the same way that traditional organizational forms did, that is, by formally establishing lines of authority and report. The traditional organization operated by introducing restricted access and prescribed exchanges within the firm. The network form cannot rely on any of these instruments, because they are the features it seeks to eliminate. The shape of the new structure cannot be designed by top

management; it must be created from within the organization. Yet a "grass-root strategy formulation" such as the one observed by Eccles and Crane (1988) within investment banks supposes the autonomous action of the people enacting the organization. If left unattended, ties of interpersonal obligation embedded in the informal structure of the firm may belittle the gains in autonomy attained through the elimination of formal dependencies.

Within the informal structure, the role of informal hierarchies deserves special attention, for it poses an important dilemma for both the individual manager in need of a legitimating sponsor and for the organization. On the one hand, the "illegitimate" manager may need to obtain a strong informal sponsorship to become a legitimate player. On the other hand, he or she needs to keep control on how to allocate time and energy to his or her different contacts to successfully cope with the shifting interdependencies associated to his or her role. Yet these two needs are likely to be incompatible: A legitimating sponsorship may also translate into an informal hierarchy within his or her contact network, which may seriously curtail the manager's flexibility. For the manager, there is no easy way out of this dilemma. For the network organization, the solution lies in efficiently combining the benefits of sponsorship with the benefits of autonomy. Like a wise father, a wise sponsor must not only know how to help his or her protégé, but also to grant the manager the necessary autonomy to perform his or her role.

From a theoretical standpoint, the emergence of a network organization out of a traditional hierarchical structure presents a typical case of interaction between organizational structures (macro) and managerial behavior (micro): A manager cannot act as a flexible network entrepreneur if the organizational structure does not allow him or her to do so. Yet the emergence and consolidation of this structure are largely the result of effective managerial networking. Rather than discussing the attitudinal components of managerial flexibility, we looked at the informal organizational conditions that may curtail this flexibility. We have also provided a systematic definition of these conditions in network-analytical terms. By cutting across micro and macro levels, network analysis allowed us to show how informal structures that are the result of the very dynamics of the organization can have a direct impact on individual managerial behavior, which in turn may affect the organization's ability to effectively enact change.

References

- Baker, Wayne 1992 "The network organization in theory and practice." In Nitin Nohria and Robert G. Eccles (eds.) Networks and Organizations: Structure, Form, and Action. Boston, MA: Harvard Business School Press. Pag. 397-429.
- Benassi, Mario 1993. Dalla gerarchia alla rete: modelli ed esperienze organizzative. Milano: Etas .
- Berchi, Roberto and Mario Fontanazza 1991. La semplificazini dei processi aziendali. Milano: Etas.
- Blau, Peter 1955 The Dynamics of Bureaucracy. Chicago: The University of Chicago Press.
- Blau, Peter 1964 Exchange and Power in the Social Life. New York: Wiley.
- Bonacich, Philip 1987 "Power and centrality: a family of measures." American Journal of Sociology 92: 1170-1182.
- Burt, Ronald S. 1982. Toward a Structural Theory of Action. Network Models of Social Structure, Perception and Action. New York: Academic Press.
- Burt, Ronald S. 1992 Structural Holes. The Social Structure of Competition. Cambridge, Mass.: Harvard University Press.
- Campbell, Karen; Peter Marsden, and Jeanne S. Hurlbert 1986 "Social Resources and Socioeconomic Status." Social Networks 8:97-117.
- Chandler, Alfred 1962. Strategy and Structure: Chapters in the History of the, American Industrial Enterprise. Cambridge, Mass: MIT Press.
- Chandler, Alfred 1977. The Visible Hand: The Managerial Revolution in American Business. Cambridge, MA. Harvard University Press, Belknap Press.
- Confindustria 1991. "L'industria dell'elettronica e dell'informatica in Europa." In Previsioni dell'economia italiana, 1.
- Cook, Karen S. and Richard M. Emerson 1978. "Power, equity and commitment in exchange networks." American Sociological Review 43:721-739
- Cook, Karen S. Richard Emerson, Mary Gillmore, and Toshio Yamagishi 1983. "The distribution of power in exchange networks: theory and experimental results." American Journal of Sociology 89:275-305.
- Davis, S. M. and P. R. Lawrence 1977. The Matrix Firm. Reading, MA: Addison Wesley.
- Ditcher, Steven F. 1991 "The organization of the '90s." The McKinsey Quarterly, 1: 145-155.

- Eccles, Robert and Dwight Crane 1982. *Doing Deals: Investment Bankers at Work*. Boston, MA: Harvard Business School Press.
- Eccles, Robert and Nitin Nohria 1992. *Beyond the Hype. Rediscovering the Essence of Management*. Boston, MA: Harvard Business School Press.
- Emerson, Richard M. 1962 "Power-dependence relations." *American Sociological Review* 27:31-40.
- Feld, Scott L. 1981 "The focused organization of social ties." *American Journal of Sociology* 86:1015-1035.
- Gargiulo, Martin 1993 "Two-step leverage: Managing constraint in organizational politics." *Administrative Science Quarterly* 39: 1-19.
- Gulik, Luther and L. Urwik 1937 *Papers on the Science of Administration*. New York: Institute of Public Administration, Columbia University.
- Granovetter, Mark 1973 "The strength of weak ties." *American Journal of Sociology* 78:1360-1380.
- Johanson, J. and L. Mattson 1988. "Network positions and strategic action: An analytical framework." In B. Axelson and G. Easton (eds.) *Industrial Networks: A New View of Reality*. London: Routledge.
- Kanter, Rosabeth M. 1984 *The Change Masters. Innovation and Entrepreneurship in the American Corporation*. New York: Simon and Schuster.
- Kanter, Rosabeth M. 1989 "The new managerial work." *Harvard Business Review*, Nov-Dec: 85-92
- Marsden, Peter V. 1984. "Restricted access in networks and models of power." *American Journal of Sociology* 88:686-717
- Miles, Raymond A. and Charles S. Snow 1992. "Causes of failures in network organizations." *California Management Review*, 34: 53-72.
- Pfeffer, Jeffrey and G. Salancik 1978. *The External Control of Organizations: a Resource Dependence Perspective*. New York: Harper & Row.
- Pinchot, Gifford 1985. *Intrapreneuring*. New York: Harper & Row.
- Powell, Walter W. "Neither market nor hierarchy: Network forms of organizations." In Barry Staw (ed.) *Research in Organizational Behavior*, vol. 12, Pp. 295-336. Greenwich, Conn: JAI Press.
- The Economist 1993 "Within the whirlwind. A survey of the computer industry" (February 27, 1993).
- Thompson, James D. 1967 *Organizations in Action*. New York: McGraw-Hill
- Williamson, Oliver 1975. *Markets and Hierarchies. Analysis and Antitrust Implications*. New York: Free Press.

Appendix

Means, Standard Deviations, and Zero-Order Correlation Matrix

Variables	Mean	σ	Failure	1	2	3	4	5	6	7
0. Failure	3.684	2.136								
1. Level of Constraint	0.219	0.006	.516							
2. Hierarchy	0.043	0.015	.661	.630						
3. Dependencies	10.632	3.862	.436	-.136	.088					
4. Project teams	10.158	5.786	.566	.014	.315	.744				
5. Adjusted Failure	0.000	1.807	.846	.302	.352	.490	.529			
6. Adjusted Level	0.000	0.005	.292	.873	.340	-.179	-.109	.346		
7. Adjusted Hierarchy	0.000	0.011	.406	.406	.732	.081	.223	.481	.465	
8. Weak Ties	8.895	1.823	.533	.488	.682	.042	.223	.000	.000	.000