

## **Network Conditions for Organizational Change**

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Understanding the overall network structure of organizations can help managers to support change. This article describes three different network theories of change, exploring the underlying assumptions and implications of each model. First, the E-I model predicts that cross-departmental friendship ties will help generate positive response to change in organizations by fostering trust and shared identity. The viscosity model predicts that introducing controversial (not clearly good or bad) change into the periphery of an organization and carefully regulating the interaction of innovators and nonadopters provides the best chance that it will diffuse successfully. Finally, the structural leverage theory presents a mathematical model that supports broad diffusion of clearly superior change, informing as many people as possible about the change.

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Networks are a natural focus for change agents. We often look for central opinion leaders to be the leverage points for change (Baker, 1994; Rosen, 2000). Once we have identified them, we focus our change efforts on them, and according to the theory, the rest of the organization follows (e.g., Krackhardt, 1992). But one issue that has often been overlooked is the nature of the network as a whole and how that affects change efforts. That is, what is the shape of the network as a whole, and how does that shape affect the speed or even probability of a successful change?

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To address this, we draw on three opposing theories, each of which makes some sense, yet each predicts very different conditions for successful change. Just as organization development specialists often present differing perspectives on organizational change strategies (Alderfer, 1977), we suggest that there are different and occasionally conflicting network conditions for change.

The network models we will discuss here have some assumptions in common. First, they assume change is an ideational process. That is, one must first change people's awareness, attitudes, and beliefs about the change (e.g., Argyris & Schon, 1978). Second, they assume that change is a dynamic process of social influence. Change does not occur overnight but instead often involves a long process of convincing a string of people, who in turn convince others, of the feasibility of the change effort (Rogers, 1995).

But beyond these integrating assumptions, there are deep differences among these models suggesting very different preconditions for organizational change. In the following sections, we present three models for change, discussing their preconditions and the conditions for change that they suggest.

### **MODEL 1: DENSE INTEGRATION THROUGH EXTERNAL TIES**

The first model suggests that change is more likely to be successfully implemented when the social network in the organization is strongly connected (Krackhardt, 1994a; Krackhardt & Stern, 1988). The line of reasoning behind this is that diffusion of innovative ideas happens along network paths. If an idea is successfully installed or adopted at one seed location, the extent to which it carries to other parts of the organization is a function of the paths of network ties to those distant locations.

Krackhardt and Stern (1988) go one step further to state that the conditions for successful implementation of radically new changes include an abundance of ties that cut across formal organizational subunit boundaries (departments, divisions, etc.). Their argument can be summarized as follows:

1. Change often is threatening to people because of the uncertainty it causes about the future.
2. This perceived uncertainty will result in conflict among various subunits in the organization.
3. This conflict leads to increased commitment to the local subunit and to reduced cooperation with other subunits.
4. Yet to successfully implement the change, more cooperation, not less, is required across these subunits.

Thus, unfortunately, this reduced cooperation comes at exactly the time when adaptation to change requires cooperation among subunits. Krackhardt and Stern (1988) suggest a counter measure to this logical pessimism:

1. Increased cooperation is enhanced when individuals trust each other.
2. Strong friendship implies trust.

3. In times of change, then, organizations in which friendship links exist between subunits will be more effective than those in which strong friendship links exist only within subunits.

Krackhardt and Stern (1988) suggest an additional benefit that such interlocking patterns of friendship ties will have for the organization undergoing change. They argue that friends influence people's general motivations through identities. If a person has friends only within the department, then one identifies with the subunit (department, team, division) alone. On the other hand, if one has friends spread throughout the organization, then one's identity becomes tied to this larger entity, the organization as a whole. That is, these friendships influence the part of the organization that one is trying to protect in the change process. As one's individual friendship ties are spread more widely throughout the organization, one identifies more with the larger organizational entity and is more willing to engage in cooperative and altruistic behaviors necessary to make the change work for the organization.

Krackhardt and Stern (1988) propose a simple and direct measure of this structural feature, which will facilitate change. This measure, called the E-I index, indicates the extent to which the overall organization is characterized by interunit, as opposed to intraunit, strong ties. The E-I index is calculated as follows:

$$EI = \frac{E - I}{E + I},$$

where E = number of ties that cut across subunit boundaries, and I = number of ties that connect people within the same subunit.

When adaptation to change is necessary, organizations in which members maintain friendship ties with others outside their own unit are likely to perform better because their members will be making decisions to benefit the organization overall, not just their own subunit.

Krackhardt and Stern (1988) are quick to point out, however, that exhibiting a high E-I index is not that simple. Indeed, E-I indices tend to be negative; that is, informal ties tend to occur among people within subunits. This happens for two reasons. First, people tend to be collocated within these subunits. The "law of propinquity" (Allen, 1977; Krackhardt, 1994b) states that people who are physically closer together are more likely to interact and form stronger relationships among each other. Therefore, we naturally expect and observe more and denser ties among people within a subunit than among people of different subunits. Second, even if they are located across large spaces, people within the same subunits often are forced to interact with each other because of the task dependencies that occur within subunits (Krackhardt, 1994b). Over time, these interaction patterns (or at least some subset of them) become the foundation for friendships. Therefore, it may be posited that a high E-I index will facilitate the cooperation necessary for change, but it also is unlikely that an organization will naturally emerge with such a structure without purposeful and strategic intervention on the part of management to encourage and produce such a structure.

Krackhardt and Stern (1988) put their theory to an empirical test. They set up a series of experiments as part of a course exercise. The protocol for the experiment was

as follows. As part of the requirements for a course, all the students participated in an organizational simulation exercise over a weekend. The class was divided into two organizations, and each organization was divided into four departments. The organizational exercise required the four departments to define a role for themselves as well as figure out how to make "money," the rules for which were stipulated in the exercise manual. Some methods for making money required cooperation across departments; some did not. Overall performance, a formula that also was given in the exercise manual, combined financial performance with other objective indicators of efficiency and human resource issues.

Each organization played independently. Unbeknownst to all the participants, the only difference between the two organizations was the way in which the students were assigned positions within the organizations. A week before the start of the exercise, students were asked to fill out a friendship questionnaire in which they indicated which of the students in the class were their personal friends. In one organization (the "natural" organization), groups of students who were friends of each other were assigned to the same departments, and there were relatively few friendship ties between departments. This natural organization, therefore, had a low (negative) E-I index value. In the other organization (the "cross-tied" organization), students were assigned to roles such that they had few friends within their department, mostly their friends were scattered among the other three departments. This gave the cross-tied organization a high E-I index value.

The exercise administrators punctuated the exercise with mini-crises. For example, at one point they announced a recession that required the organizations to lay off 10% of their work force; at another, they changed the payoffs for successfully completing a task. These new problems gave the participants the opportunity to respond creatively, to deal with the resulting uncertainty, and to plan and implement a change effort to address the mini-crisis. As with most change, dealing with the specific problem imposed by the administrator was not the real dilemma; it was dealing with the political fallout from the implementation of the attempted solution.

Both the natural and its paired cross-tied organization were subjected to identical crises at the same time. This design allowed direct comparisons between the two organizations' responses to these imposed crises. This exercise was replicated six times over several years of offering this particular class in three different schools. As Krackhardt and Stern (1988) report, in all six trials, the results were the same: The cross-tied organization—the organization with the higher E-I index—performed better than its natural counterpart with the low E-I index. They suggest that high E-I index structures always will facilitate successful response to change efforts in conditions of uncertainty.

## **MODEL 2: VISCOSITY AND ISOLATION**

The second model predicts almost the exact opposite from the E-I index model above. Borrowing from the literature on the genetics of altruism in biology (Boorman & Levitt, 1980), Krackhardt (1997) proposed a model that suggests successful change

is more likely when organizational subunits are not well connected with each other, when interaction between these subunits is minimal, and when the seed for change is planted at the periphery, not the center, of the network. But before we understand the different predictions of this model, we must first clearly outline the differences in the assumptions this model makes.

This model considers the diffusion process of change. That is, it assumes that some small fraction of organization members propose and support a change or innovation in the organization, and that the problem they face is convincing the rest (the majority) of the organization members that such a change is a good idea. We can think about such proposed innovations in three broad categories: innovations that clearly are superior to the status quo, innovations that clearly are inferior to the status quo, and innovations that are controversial—that is, not clearly superior or inferior, but rather having value influenced by other people's perceptions.

Everyone will adopt clearly superior innovations once people are made aware of them. Clearly inferior innovations will not be adopted. But in the case of controversial innovations, successful diffusion depends on the ability of adopters to establish a critical mass of support for the innovation. The likelihood of adoption for the innovation depends not only on the nature of the innovation but also the process of diffusion, which in turn is influenced by the structure of interaction among organization members.

The key that Krackhardt (1997) explored was the extent to which successful diffusion of such controversial innovations was affected by particular features of the social structure under very reasonable assumptions of social influence. He built a dynamic computer model to simulate the diffusion process to understand how controversial innovations might diffuse through organizations. In each time period, people (adopter or nonadopter) would seek out a set of others within the local part of the organization that they currently found themselves in and confer with those others on their beliefs about the innovation. They would retain their original belief that either the innovation is a good idea and should be supported or it is a bad idea and should not be implemented if they found anyone who agreed with their original beliefs about the value of the innovation. If they were surrounded by people who disagreed with them, they would tend to convert to the other belief (in other words, change from being a nonadopter to being an adopter or vice versa).

To be specific, Krackhardt (1997) specified the following set of assumptions:

1. Each adopter searches randomly through  $L_a$  others to find a likeminded individual. Each nonadopter searches randomly through  $L_n$  others to find another likeminded individual. Adopters are more likely to proselytize the status quo-oriented nonadopters than the converse; therefore,  $L_a > L_n$ .
2. If in the process of the search, individuals find at least one other individual who agrees with them, then they retain their current belief. This assumption acknowledges the work of Asch (1951) who found that it required only one person to agree with the participants of his experiments to allow them to retain their beliefs, no matter how many confederates disagreed with the participants.
3. If an adopter fails to find at least one other adopter in the course of his or her search, then the adopter will convert to being a nonadopter with probability  $\alpha$ . This is the probability of conversion from adopter to nonadopter for those who find themselves isolated.

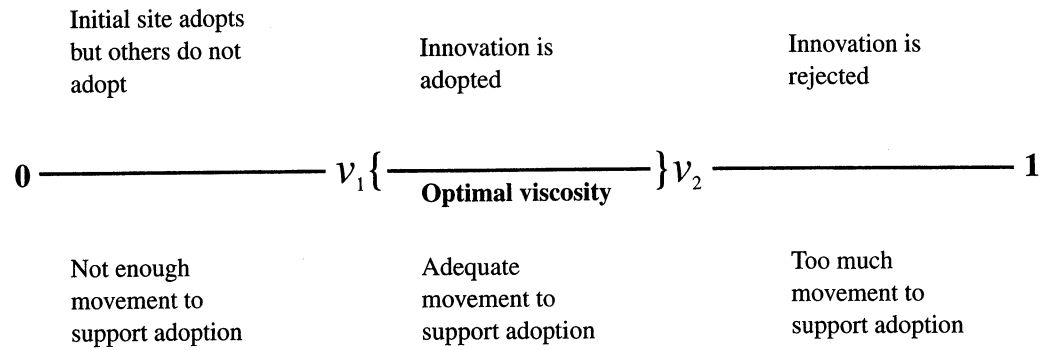
4. If a nonadopter fails to find at least one other nonadopter in the course of his or her search, then the nonadopter will convert to being an adopter with probability  $\tau$ . This is the probability of conversion from nonadopter to adopter for those who find themselves isolated.

This set of drivers for the model was a reasonable way to capture the micro decision-making process as to whether any individual would become an adopter of the innovation. Krackhardt (1997) further stipulated a macro structure that constrained people from interacting with just anyone else in the organization. He posited that interactions were a function of two structural features: (a) clusters of individuals in the organization permitted free and random interactions among people within a cluster and (b) interactions between people in different clusters was restricted (probabilistically) by a viscosity parameter  $v$ . On occasion, individuals could "visit" or "migrate to" some subset of other clusters. When they did, they would be confronted with a new subpopulation of people who may be adopters or nonadopters or (most likely) a mix of the two. Depending on this mix, this individual then would either be converted or not depending on whom they interacted with and the parameter values in the assumptions of the model above.

Krackhardt's (1997) computer simulation of this process allowed him to explore how sensitive the adoption of the innovation or change was to the various parameters in the model. What was most intriguing about his results was that the long-term survival of the change was relatively insensitive to the particular parameters in the micro part of the model relating to individual characteristics of how far actors search to find likeminded individuals and how likely they are to change, to convert from one position to the other when isolated ( $L_a$ ,  $L_n$ ,  $\alpha$ ,  $\tau$ ). Instead, the success of the change was a function of three features of the overall structure of the organization: (a) the location of the original proponents of the innovation within the structured arrangement, (b) the permissible bridges between clusters that described which clusters different people could visit or migrate to, and (c) the rate  $v$  at which people were likely to visit these other clusters. Across a wide range of structures and parameter values, Krackhardt discovered that the following general principles held:

**Principle of Peripheral Dominance:** It is more likely that a change will be adopted throughout the organization if the adopters occupy a cluster that is at the periphery and has relatively few bridges to the organization than if they occupy a position at the center of the organization's structure.

In contrast to the E-I model, this result suggests that if the innovation is controversial, the change agent is better off focusing on a relatively secluded island or cluster to begin the change process. This peripheral location is less likely to attract a backlash from the nonadopters who, because of their superior strength in numbers originally, can overwhelm the adopters. Similarly, controlling the amount of movement between the cluster containing the original adopters and the clusters of nonadopters allows the innovation to become established among the adopters before being introduced to nonadopters within the organization. This leads to Krackhardt's (1997) second general principle:



**FIGURE 1: Range of Optimal Viscosity**

**Principle of Optimal Viscosity:** The degree of viscosity,  $v$ , the rate of migration from one cluster to another, has two threshold values,  $v_1$  and  $v_2$ , such that  $0 < v_1 < v_2 < 1$ . As Figure 1 shows, if  $v$  lies below the first threshold  $v_1$ , then the migration rate is so slow that very little conversion occurs at all. In this case, in the long run the organization will forever have a small group of adopters and a majority of people in the rest of the organization who remain nonadopters. If on the other hand,  $v$  lies above the second threshold,  $v_2$ , then the larger group of nonadopters will invade and dominate the adopters, yielding in the long run an organization returning to the status quo state. However, if the migration rate  $v$  lies in the narrow range between  $v_1$  and  $v_2$ , then the adopters will convert nonadopters at a greater rate than the converse, and in the long run the entire organization will successfully adopt the innovation.

Again, this result contrasts with the E-I model. The E-I model suggested that strong, dense, and bridging ties across organizational boundaries were the prerequisite to successful change in cases where response to change required common identity and trust. In this case, where the innovation is controversial and where the nonadopters are as likely to convert adopters as vice versa, strong interconnecting ties tend to give the advantage to the status quo so that the innovation is squashed. But as shown in Figure 1, there exists a narrow window of opportunity between  $v_1$  and  $v_2$  wherein the adopters can focus their efforts on a few adjacent clusters, can slowly convert them, and then once they build a base, can carefully move forward through the rest of the organization. With a slow, steady infusion of adopters into “foreign” cells, the nonadopters are not mobilized to invade back into the adopters’ territories. It is a delicate balance, but Krackhardt’s (1977) simulation suggests that there is a possible path using this strategy.

This viscosity model emphasizes that change is threatening to some and may involve institutional and cultural changes that are difficult and not clearly all good or all bad. If change agents spread themselves out too quickly and too thinly, they can inadvertently mobilize this backlash, which could diminish the prospects for change. On the other hand, if change agents are completely isolated from the rest of the organization, then the innovation will not diffuse. However, if the innovators are located on the periphery, with some limited contact and exposure to the rest of the organization, they can safely establish the change, demonstrate its effectiveness, and then spread the

