The Role of Networks in Fundamental Organizational Change

A Grounded Analysis

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Utilizing a grounded-theory approach, this study examines 8 organizations and finds that social networks make a difference in the capability of organizations to implement fundamental organizational change. Specifically, this study examines whether networks enable the learning required for local units to develop the new schemata—understandings, behaviors, and interaction patterns—required to adopt and appropriate planned organization-wide change. A mixture of organization-wide and local learning networks in organizations successfully implemented change, whereas the unsuccessful organizations relied primarily on hierarchical change implementation networks. In accelerated change units compared to those that are lagging, a greater abundance and diversity of networks, strong and weak, internal and external, and across system levels were found. These network connections facilitate change implementation not only by sharing information but also by providing the capabilities to exchange and combine knowledge and by enabling local self-design.

Keywords: *grounded theory; learning networks; organizational change; self-design*

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Companies undertake large-scale, fundamental organizational change to implement new strategies and develop the competencies to accomplish outcomes not possible simply by refining and enhancing an organization's current way of organizing and doing work. Such change is deep, in that it entails shifts in the behaviors, beliefs, and values of members, and pervasive, in that it affects subsystems throughout the organization (Beer & Nohria, 2000; Ledford, Mohrman, Mohrman, & Lawler, 1989). Structures, work processes, technologies, and human-resource practices may be intentionally redesigned to foster new behaviors and performance. Results are achieved, however, when formal design changes are accompanied by changes in the cognitions and behaviors of organizational members (Tenkasi, Mohrman, & Mohrman, 1998). Individuals collectively develop new understandings and behavior patterns as they participate in both punctuated and ongoing self-designing activities to plan and implement changes in what and how work is done in the organization (Weick, 1993, 1997). Organization-wide change conceived and initiated at the macro organizational level also entails changes in and across local units carried out through interactions among people and facilitated by social network connections. In this study, we look at fundamental change as a learning process mediated by purposefully designed and emergent social networks. We conduct a grounded analysis (Glaser & Strauss, 1967; Locke, 2001) of 8 organizations undergoing fundamental change. Our purpose is to explore whether, how, and what kind of social networks contribute to the sense-making and self-design processes through which organizational participants learn to operate differently in their local contexts.

In the organization development field (Cummings & Worley, 2001), limited attention has been paid to the role of social networks in the process of planned change. Many normative planned change models do, however, prescribe social networks, such as for cascading change communication or to define and lead the implementation of change. Organization theory research increasingly has employed network perspectives to examine organizational adaptation to change (e.g., Davis, 1991; Kraatz, 1998), but the predominant emphasis has been on the influence of interorganizational networks on change, competitiveness, and adaptation (e.g., Baum & Oliver, 1991; Uzzi, 1996). Limited attention (Tsai, 2001; Tsai & Ghoshal, 1998) has been paid to social networks within organizations in relation to change adaptation, although their critical role in effective change implementation has been indicated by network theorists (Krackhardt, 1994, 1997). Furthermore, with a few exceptions (Barley, 1986, 1990;

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Stevenson & Greenberg, 2000), network theorists and researchers have primarily emphasized the structural properties of networks, such as network position (e.g., centrality) or network strength (e.g., density). Few have attempted to describe types of network structures and the forms they take or to link network structures to action in specific contexts (Stevenson & Greenberg, 2000). In this study, we explore the relationship of network forms and capabilities to the sense-making and self-design processes so important to organizational change.

PLANNED ORGANIZATIONAL CHANGE, SOCIAL NETWORKS, AND LEARNING

Planned change presents participants with a sense-making challenge. Human behavior and understanding are guided by contextually determined interpretive schemes, norms, and power relationships that shape sense making (Giddens, 1984; Poole & DeSanctis, 1994). When crafting changes, organizational designers intend to enable new strategies and performance. They generate designs that may include changes in structures and roles, ways of relating to customers, technologies, work processes, reward systems, and human-resource practices. These changes embody reasoning about how particular designs will foster intended patterns of behavior and performance. Failure to understand or accept the meanings embedded in organizational changes often leads to faulty or delayed implementation (Tenkasi et al., 1998). Change logics may not take into account, or may be inconsistent with, realities that emerge. Fundamental change requires changes in organizational schemata and behaviors. Because these are deeply embedded in social communities, change is necessarily a collective process that entails sense making and learning.

Structurational theorists (Archer, 1995; Giddens, 1984) point out the systemic nature of social relations, defining a social system as an "interdependence of action" made up of an established network of relationships and network conditions (Giddens, 1979, p. 78). These network conditions moderate any change effort targeted at a subsystem. Subsystems have established patterns of interaction that characterize how they interrelate with each other. New patterns of interaction can have difficulty taking hold because they imply a break from this preexistent network of relations. The whole social system must unlearn old ways of interacting, which requires connectivity among subsystems as they engage in collective, reflexive, self-monitoring of the changes. In the absence of such connectivity and change in the network conditions, new patterns may be undercut as adjacent subsystems resort to preexisting patterns of interaction.

If organizational members are to make sense of the organizational changes and to develop the new patterns of interaction necessary to achieve intended outcomes, knowledge must be effectively transferred by the designers of the change so that receiving units are able to faithfully appropriate the "intentions of the change" (Poole & DeSanctis, 1994). Irrespective of how well knowledge has been embodied in new technologies and organizational features and communicated, a unit that receives, adopts, and uses this knowledge has to go through a learning process by which the

changes are reconfigured or adapted to fit the local meaning systems and demands of the local task environment (Tenkasi & Mohrman, 1999). These modifications are an integral part of "appropriating" the knowledge or fitting it into particular contexts. This is particularly critical for the adoption of a new organizational form because social designs are abstractions that have to be "made" in the realm of action (Perlmutter & Trist, 1986). Learning occurs unit by unit, team by team, and situation by situation if participants are to find new ways to operate and interrelate in the changing organizational context and in response to local tasks and opportunities (Tenkasi et al., 1998). Through their actions they create, or self-design, new approaches and simultaneously develop new understandings or schemata.

Successful learning depends not only on formal, planned, organizational implementation activities but also on the capabilities of the existing and emergent social networks. The idea of social capital rests on the notion that network connections set up for particular purposes can be appropriated for other purposes (Adler & Kwon, 2002; Coleman, 1990). Exchange and combination of knowledge among organizationally linked participants with differing perspectives and knowledge bases may facilitate both the definition and the implementation of new organizational approaches and mediate self-design processes and the appropriation of changes.

Networks have been characterized by the strength of connections or ties among members. Both strong and weak network ties may play a role in change implementation, albeit different ones (Hansen, 1999; Haythornthwaite, 2001). Strong ties, characterized by higher quantity, quality, and frequency of interaction, facilitate intense and rich communication between individuals (Granovetter, 1982; Uzzi, 1996). They afford extensive interaction important for assimilating, combining, and contextualizing complex knowledge associated with the fundamental organizational change (Chesmore & Tenkasi, 2002). Weak ties enable exchange among a wider variety of contacts and can prevent insularity through communication among groups (Constant, Kiesler, & Sproull, 1996; Granovetter, 1982; Hansen, 1999). Weak organization-wide ties also enable groups to focus on overall goals (Haythornthwaite, 2001) and allow actors to see the systemic nature of the changes and their mutual interdependence (Tenkasi et al., 1998).

Yet, as Emirbayer and Goodwin (1994) note, many network analyses suffer from structural determinism. Structural properties of networks, such as network position or strength of ties, reveal only the potential for action. Stevenson and Greenberg (2000) indicate that "the context in which actors create networks will have effects on action taken by individuals and organizations. Researchers in the social network and interorganizational relations literature have tended to neglect context" (p. 658). Furthermore, much of the literature on social networks, although recognizing the emergent aspects of networks, takes a cross-sectional picture of the network and treats its measured characteristics as enduring and explanatory. In fact, network connections can be dynamic and ephemeral and can be easily formed and reformed (Palmer, Freidland, & Singh, 1986), and their establishment and utilization may depend on situation and context. This study examines the role of social networks—preexisting, emergent, or purposefully created—in a particular context: organizations implementing planned, fundamental change.

STUDY CONTEXT AND APPROACH

Our data come from longitudinal research during a 3-year period examining large-scale change in 8 companies located in the natural resources, consumer electronics, aerospace, defense, health services, insurance services, computer systems, and financial services industries. Each company was trying to fundamentally change its organizational design to enact a changing business strategy. Key aspects of change in all the participating organizations included: (a) structural change from a functional organization to one characterized by cross-functional business units; (b) a shift from accountability for individual performance to accountability and rewards based on collective systemic performance (including technical, financial, customer, quality, and speed metrics); (c) a shift from organizing around disciplines to organizing around key processes; (d) flattening the organization and consolidation of roles; and (e) new information technology (IT).

The "companies" we examined were large (ranging from 1,300 to 4,500 employees), relatively self-contained divisions of 8 corporations. We studied four business units in each company. These were product lines, regions, programs, or customer-focused units, ranging from 50 to 150 employees. In each company, half of the business units were chosen because they were implementing the changes and achieving the new business targets in an accelerated manner compared to other business units, whereas the other half were chosen because they were lagging behind. During the study, the overall redesign efforts in 4 of the 8 companies were discontinued or seriously curtailed because of the slow implementation progress. Quite unintentionally, this enabled us to contrast the use of networks in successful and unsuccessful company efforts as well as the planned comparison between accelerated and lagging business units.

Our investigation was an open-ended exploration using a grounded-theory-building approach as we were dealing with an exploratory research question and neither hypotheses nor theory were well formed prior to data collection (Eisenhardt, 1989; Glaser & Strauss, 1967). Data were subjected to continuous, cyclical, evolving interpretation and reinterpretation that allows patterns to emerge. The grounded-theory approach is based on the researchers' interpretation and description of phenomena based on the actors' subjective descriptions and interpretations of their experiences in a setting (Locke, 2001). This "interpretation of an interpretation" strives to provide contextual relevance (Silverman, 2000).

Constant comparison (Glaser & Strauss, 1967; Locke, 2001), a critical cornerstone of the grounded-theory-building process, is designed to develop rich descriptions of social phenomena allowing the researchers to discern differences in patterns between comparable units, discover the categories that differentiate the units, and generate hypotheses and theory about them. We first applied this method among the 8 companies to discern differences in the types of networks that are created and/or emerge during the process of change. Then, in the 4 companies where the change persisted, we focus more specifically on comparing units to examine whether there are differences in the types of networks that emerge and/or are adopted by units that relatively quickly and successfully implemented the changes, compared to those lagging behind.

Our primary data collection method for this study was extensive semistructured, in-person interviews lasting from 75 to 90 minutes with a theoretical sample (Glaser & Strauss, 1967) of more than 350 informants across these 8 organizations. Theoretical sampling refers to selecting informants/units that are most relevant to understanding the dynamics of the phenomena under investigation. Initially, we chose a cross-sectional sample of informants from each company who could give us a high-level description on the types of networks that were created and/or emerged at the overall company level and also could identify the units that were leading and lagging in implementing the change. These company-level interviews also helped us select key informants from the business units. To identify the leading and lagging units, we administered a short survey to our high-level informants to rate the level of progress being made by each unit in implementing the various elements of change and achieving business results. We also administered a similar survey to the informants from the business units as a cross-validation and found general agreement. After the initial round of high-level interviews, we conducted interviews in the selected units both with key informants and with a representative sample of the roles in the unit. To capture the dynamics of change, a second round of interviews, similarly constituted and with the same people when possible, was conducted about 18 months later in each company. The interviews were complemented by documents pertaining to the change program.

Case study research relies on two complementary forms of analysis, within-case analysis and across-case analysis. Using the interviews and secondary sources, we constructed a detailed case description for each organization and for each business unit to become intimately familiar with the unique patterns of each case as a stand-alone entity before generalizing patterns across cases. Each of the three researchers read through all the interviews and archival materials and formed subjective views of each case. We each began to identify theoretical categories and make comparisons across categories at both levels of analysis. Dialogue among the researchers was used to compare among the texts and our own subjective views, both within and across cases, and to develop construct definitions and criteria for explaining the patterns observed. Our initial case comparisons were used to identify common dynamics and to refine the unique understandings of each case. We further compared the cases to develop the emerging constructs and logic of the conceptual framework. As more cases were folded into the analysis, the level of abstraction was elevated. The next section reports the results of our analyses. We present the major variables and themes that we found and build the conceptual model using examples from our sample.

FINDINGS

We first define some language conventions to aid in communicating the findings. Each term has been derived or clarified through our grounded methodology. We follow this with discussions of each of five major themes that emerged from our analysis. Together, the themes constitute a learning-oriented model of change facilitation by networks.

We focus on two main systemic levels: the companies (organizations) and their primary business units. These units, themselves sizable and complex, focus on major business segments or programs. We also examine networks at other systemic levels: the organization's environment and the teams and individuals within the primary units. This approach fits with the observations of Adler and Kwon (2002) that network connections operate at all levels simultaneously, and that an artificial focus on elements at only one system level may limit the understanding of social networks.

Our terminology reflects the kinds of networks we found to play a role in change. We label networks among member entities within the unit or within the organization *intraunit* and *intraorganization*, respectively. *External* networks link the organization or the unit to entities in the organization's environment. *Cross-level* networks span levels of hierarchical authority in the organization or unit; they may or may not also reflect the crossing of systemic levels. The prefix *inter* refers to networks and ties among particular kinds of entities (e.g., interteam, interunit).

We found that the contribution of network ties to organizational learning reflects four levels of network capabilities. From the most rudimentary to the most complex: (a) *Information sharing* is the communication of information and data that are codified using a preexisting shared schema by which they can be interpreted and understood; (b) *Knowledge sharing* is the communication of a schema that enables the contextualization of information by attaching meaning in terms of the local reality and experiences. This may include the exchange of tacit knowledge (Polanyi, 1966/1967) and entails two-way interpretive interactions among people as well as common experiences; (c) *Knowledge combination* occurs when multiple knowledge bases are combined into new knowledge that transcends the original knowledge bases and results in the creation of a new, shared schema. This requires multidirectional network linkages capable of reflective and interpretive interaction; and (d) *Self-design* occurs when new and newly combined knowledge yields new practice, and by implication, new networks that embody new shared schema.

In comparing the 8 companies, a striking finding was that the establishment of company-wide design and implementation networks was insufficient to achieve the level of organizational learning required to implement fundamental change. Where lasting organizational change occurred, learning occurred in networks throughout the organization at all levels. Five overarching themes emerged about the way these networks facilitated change. These themes build on one another with increasing levels of network capabilities and increasing systemic complexity. In the following sections, each successive theme adds a conceptual layer to those preceding.

Theme 1: The Failure of Hierarchical Information-Sharing Networks

Managers in hierarchical, functional organizations have a natural tendency to approach fundamental change using familiar directive methods that rely on the existing chain of command and departments. We found that this approach supports neither the emergence of new networks nor the development and permeation of new schemata. This pattern was graphically illustrated in Electronco, a consumer electronics firm.

Electronco was a highly functionalized organization. Its top management formally designed and directed the implementation of cross-functional product line business teams composed of members from various functional departments. Top management, composed largely of functional managers, went through a series of workshops to define a new way of operating. These managers were expected to cascade the strategies, new design elements, and new expectations through the organization. In turn, many functional unit managers took their groups through similar learning activities and tried to cascade the changes through their respective subdepartments. After 18 frustrating months and the dedication of a large amount of time, Electronco management realized that the cross-functional product line teams were barely meeting, let alone achieving the vision of market-focused, new product planning and integrated product development. According to the human resources director,

> **Electronco:** We [the top management team] kept going offsite. We'd come back and expect each other to be bringing about change in the way we operated, but we found out that things stayed the same. So we went offsite again and tried to learn more so that we could be more effective in changing our units. But people in the organization didn't learn what we were trying to do. They were operating in their functional world and thought "Oh yeah, we'll have to coordinate better to customize our products to meet customer demands," but didn't realize that would take a change in how they interacted with other functions day to day.

Cascading the implementation through existing functional networks did not yield new operating norms and cognitive schemata. Although the organizational changes were expected to yield greater teaming across functional units, learning and planning activities were hierarchically and functionally segmented. This reinforced the functionally delineated and controlled social networks and functionally differentiated schemata. Learning activities were not occurring in the newly established networks—the product business unit teams. Electronco never did solve this problem and consequently never successfully implemented the change.

Three other companies in the study employed similar approaches to designing and implementing their changes; and in each case the implementations eventually petered out.[1] These 4 companies will not be discussed further. Instead, we will concentrate on the comparison of the most accelerated and slowest units within the 4 companies that were successfully implementing the new organizational design. Table 1 provides a short description of the 4 remaining companies, the changes they were implementing, and a short summary comparison of their accelerated (A) and slower (B) units.

One of these companies, Oilco, began its transformation with a design-team process by which it learned the limitations of a hierarchical information-sharing approach. Design teams are purposefully constructed social networks. In Electronco, the design team was the top management, an approach that is often criticized because the top managers do not have the perspectives and knowledge of the lower levels. As a remedy to this problem, design teams may be composed of and draw input from diagonal slice networks so that all units and levels are represented (Pasmore, 1988). Oilco established such a diagonal slice network as its design team. Although a deeper and broader slice of perspectives was included, the diagonal slice design team network nonetheless was segmented from the rest of the organization.

TABLE 1
Four Change Cases and Their Comparison Case Units

Company (Purpose) and Change	*Leading Unit*	*Lagging Unit*
Insurco (provided insurance services for medium to small businesses)	Region A	Region B
Reengineered work processes underpinned by new Information Technology (IT). From many narrow functional jobs to cross-functional, team-based selling and servicing and multiskilling. Regions are the business units (managing total costs and book of business) with autonomy (e.g., strategy, products, and organization). Regional and team rewards based on return on equity.	Rapidly achieved effective team functioning and cross selling to key customers. New operating norms developed that included open sharing of information, greater business and customer orientation, and much greater teamwork. Used IT capabilities for learning.	Business as usual despite new formal design and rewards. IT seen as irrelevant. No new behavioral norms and common understanding. Little teamwork.
Aeroco (provided navigation and avionics systems for aircraft)	Unit A	Unit B
From functional design to programs as cross-functional, accountable business units broken into component teams. Flattened organization with nonhierarchical team leader positions. Cross-functional process groups to evolve technical processes, consult to programs, and ensure technical excellence.	Learned how to work cross-functionally and became effective in its new mission. Intense connectivity and knowledge combination between team members and customers. Norms of teamwork, learning, and interpersonal trust.	Had not changed their understanding of the organization and confused about new mission. Continued to work individually with little teamwork. Weak connections and no new behavioral norms.
Defensco (provided defense systems such as missiles and components)	Division A	Division B
From single integrated functional organization to cross-functional product divisions divided into process teams that dealt with a subprocess in the value chain. Continuous flow and demand-pull production. Team accountability for performance and for customer and supplier relationships.	High level of agreement about the required new ways of operating. Strong formal and informal network ties internally and externally for learning how to implement the new design and for sharing knowledge to enable better process integration. Work teams active in solving problems and making improvements.	Frustration with the lack of progress in implementing and achieving performance success in the new organization. Little shared understanding of the new organizational design. Process teams managed through hierarchical control; few lateral or vertical ties.

(continued)

TABLE 1 (continued)

Company (Purpose) and Change	*Leading Unit*	*Lagging Unit*
Oilco (explored and drilled for natural gas and petroleum) From a functional design to one of geographically delineated, self-contained, cross-functional business units to explore for and produce oil. These units were charged with advancing the technology of exploration and production while at the same time being held accountable for financial performance and for decisions about how and whether to explore and develop production capability.	All units By the time of data collection, differences among units were not stark. All units were performing reasonably well and had implemented the change to a high degree.	None

Oilco's cross-discipline design team was a new network in an organization that previously had been divided into many functions and at least 12 technical disciplines, and in which the prevailing schemata were of specialization and sequential work. The design team members learned quite a bit about each other's domains and developed structural and process blueprints for the new cross-functional business units. But the business units they created found it difficult to develop a shared understanding of the new norms and performance strategies that would be required for successful performance. According to the chief technologist,

> **Oilco:** One of the things we learned about a design team being sequestered for half a year and then coming out and trying to impose their learnings on the organization was that that was a very difficult task. The new units couldn't figure out how to make our design work.

New shared schemata arise when people with different experiences and "thought worlds" (Dougherty, 1992) combine their knowledge and fashion a new social order. That this process occurs effectively within a cross-functional design team does not mean that the same learning and internalization of new schemata have occurred in any other units or among other members of the organization. Oilco was able to adjust its approach and to avoid the hub-and-spoke failures of the other 4 companies. As Oilco's chief technologist continued,

> **Oilco:** Part of the implementation . . . we learned was to give more ownership to every unit to be flexible on the design we delivered. It was a bunch of good ideas, it was a blueprint, and if they didn't like it, it wasn't the end of the world. We purposefully tried to give them principles and a skeleton and a process to begin to refine it.

Learning processes during fundamental organizational change must occur throughout the organization to offset the limitations of segmented learning. Oilco began to foster local learning processes—signaled by flexibility in the design—through which different groups could craft their own work systems built from the diversity of perspectives, values, and aspirations of the individuals involved. Through these processes, social networks were built and expanded and the organization-wide change was locally adapted.

Theme 2: Flexibility, Emergence, and Network Capabilities

The new work units in each of the 4 companies were differentially able to implement the change features and to learn how to function effectively in the new organization design. In a number of the lagging units, local managers used a high prescription approach:

> **Insurco, Region B:** The changes have not been flexible. We are expected to do it just the way it was rolled out. We're like a football team. We have assigned roles and we're expected to carry them out.

In Insurco's Region B, prescription prevented adjustments. Changes were prescribed through an intraunit network with one-way hierarchical communications. Such links are suitable only for information sharing using commonly shared schemata. In a change situation, the schemata are not yet shared.

Flexibility and Cross-Level Networks

Less hierarchical prescription and greater flexibility can hasten the development of new schemata and the emergence of new network behavior:

> **Insurco, Region A:** In this region the teams are encouraged to be creative and flexible. We're not bogged down in formal procedures. Our manager is very flexible. We can go to him informally to get advice any time we want to and he's acknowledged to be very expert in our industry.
>
> **Insurco, Region A:** I'm the regional actuary. My job is to help each of the teams to evaluate their risk profiles and decide on good and bad business. To do this, I have to make sure I am personally connected to every team, and I do a lot of informal educating when they ask for help. People are getting more comfortable in questioning things and pushing back and not just following steps.

Flexibility enables cross-level, two-way knowledge sharing interaction so that the schemata adjustments develop through mutual interaction and are not perceived as threatening. The stronger two-way knowledge sharing and cross-level ties can help achieve what weaker information-sharing ties cannot.

Aeroco's Unit A used even stronger cross-level ties for both knowledge sharing and knowledge combination in pursuing the unit's mission:

> **Aeroco, Unit A:** [We have] strong links to our president and engineering VP. We make recommendations about our goals based on the needs of our customers and the strategy of the business. We have easy access to them—our executive sponsor schedules chunks of time when he's available to us.

In contrast, strong cross-level ties tended to be nonexistent in the lagging units in all companies:

Insurco, Region B: Nobody even feels that our regional head is part of our team. There's a big chasm between management and us. I can't think of anything management has done that's helping us work differently.

Aeroco, Unit B: I thought there was going to be more consideration and communication between the work teams and the management, but a lot is helter-skelter.

Flexibility and Lateral Networks

Prescription and inflexibility also prevent the emergence of lateral networks, as is illustrated in Defensco Division B's implementation of demand-flow processes that were aimed at increasing integration across the complex assembly process teams:

Defensco, Division B: Management gives each team a list of things to work on. But we have immediate problems. When we see rejects, we can tell what caused it and we need to share the information with other teams. They want us to stay focused on the problems in our work area, but it's hard because the flow problems involve the whole shop. They don't want us talking to each other. Just documenting problems. And yet, they want us to understand that we are each other's customers. They try to force communication through a very rigid process of documentation.

Limiting communication to formalized documentation prevents the sharing and combining of knowledge required for establishing the common schemata needed before documentation can be used effectively. Documentation of problems theoretically allows all-channel communication, but during the implementation process it negated the needed network integration capabilities. People became isolated in their units, with little visibility to the larger system and thus little capacity to flexibly adapt to the new structure and to the performance needs of the system. In the next section we explore the role and capabilities of lateral networks during change when these restraints are overcome.

Theme 3: Lateral Networks That Foster Implementation and Learning

Social networks are both the locus of learning and (in the form of newly defined units) often are among the elements of the change.

Intraunit Knowledge Sharing and Information Sharing

Developing and using the shared schemata to underpin a new way of operating occurs through high degrees of knowledge and information sharing within units undergoing change. One network mechanism by which schemata become shared is through lateral knowledge sharing. The contrast between Insurco's Regions A and B is instructive:

Insurco, Region A: We had several people in the region who were part of the original training and design of our new systems. Thus, we have several people who are experts in certain aspects of the new processes. We can go to them informally and get help.

Insurco, Region B: I don't know what it means to be a team. It is hell trying to get someone to help me—the most knowledgeable people are always busy.

Necessary information sharing can be very efficient if knowledge has been shared and new shared schemata have developed:

Insurco, Region A: We share a lot of information in our team and also with other teams in the region. If one of us in the region becomes aware of changes that have been made in our systems, if we notice it on the screen, we make people in the office aware of them.
Insurco, Region A: If we think we want to change something, we send it out on e-mail and get input.

Without common schemata pertaining to the changes, information sharing is impossible and people revert to preexisting schemata to understand their work:

Insurco, Region B: We don't have a good idea of what other regions are doing or even other teams in our region. We reinvent the wheel. We each go about our own work.
Insurco, Region B: We have fallen back to the patterns of work that we always had. We aren't working together to make the new organization work.

Intraunit Knowledge Combination

Accomplishing the mission of Aeroco's new units demanded cross-functional knowledge combination. Unit A went beyond knowledge sharing and jumped to the next intensity level of network interaction:

Aeroco, Unit A: We have to learn each other's worlds. I used to deal with one type of language and knowledge world (my manufacturing engineering team), and now I'm in a group that is very highly expert in many fields. We have a lot to learn about each other. I bring a depth of knowledge but have to talk their language. When these guys talk about software and hardware I have to learn their jargon. We do informal cross-training.
Aeroco, Unit A: In the old organization you could work in isolation. Our new roles on this cross-functional team don't allow someone to sit in the corner isolated from others, even if you're quite expert. In some of the other projects they still have their hierarchy and their divisions among themselves. They've just changed the title and they do their old roles. They're still acting out the old organization.

Aeroco's Unit B is an example of a unit relying on weak network ties. The communication that does exist takes place only in terms of old schemata and subnetworks:

Aeroco, Unit B: We aren't really a team. We don't get together and resolve issues and problems, just information sharing. We are a combination of specialists.
Aeroco, Unit B: It was less chaotic before the change. People knew where they fit and who to talk to. Now it's hit or miss.

The Insurco and Aeroco cases have illustrated the importance of intraunit dynamics, both lateral and (in an above section) cross level, as well as the importance of flexible intraorganizational cross-level ties. The additional functionality of lateral intraorganizational connections to the larger system will be explored next.

Interunit Networks for Intraunit Self-Design

In the quotes below, we can see the functionality of knowledge sharing and combination in a complex environment. In Defensco's Division A, we see an intraunit network that has also achieved self-design capabilities:

> **Defensco, Division A:** We share expertise and knowledge all the time. Help each other out all the time. Take responsibility for the whole area. Each team sends a representative to the morning meeting. Sees the whole factory in front of them and the problems and the issues. Brings this back to the team so we can shift resources and send people over to help where it's needed. People are closer to coordinating their own work and have more visibility and connection to the bigger picture.

Defensco's Division A also illustrates the usefulness that connections with other units can have as sources of knowledge for internal use:

> **Defensco, Division A:** There are so many things to learn to make this new organization work. Sometimes we visit other teams and see how they do it. Sometimes we set up fairs where teams pass out information about how they're handling things and you pick up the information and then call the people and set up meetings and visit the other teams. "We're having a problem—how did you handle this?" It's informal. We've gotten good ideas from other teams about things like hiring and setting priorities.

These ties enable interunit information and knowledge sharing that contribute to local self-design. No such external ties existed for Division B, which as we saw earlier, also suffered from impoverished intraunit network ties.

Intraunit and Interunit Networks for Self-Design

Successful units engage in local self-designing activities, often in interaction with other units with which they are interdependent. This lateral mutual-adjustment process occurs through cross-boundary network connections. For example, Aeroco's new cross-functional process consulting groups had to contract with various programs to work with them to develop new tools and methodologies. Unit A rapidly discovered that although highly interdependent internally, it could not design its own operations in isolation from the program units that it supported. Self-design necessarily occurred in interunit networks:

> **Aeroco, Unit A:** We spent a number of weeks talking among ourselves about what kind of a model we could use for providing services that addressed whole work processes rather than to narrow specialties. This was a big mind shift change for us. And when we started trying to work with our customers [program units], we found out that our vision of how we wanted to operate didn't fit with how they were organizing to do integrated product development. So we had to set up a network of representatives from each of the new program units to work with us and agree how we should operate.

Interunit networks became part of the continuing capability of Aeroco's Unit A and facilitated ongoing mutual self-design:

Aeroco, Unit A: We invite our customers that we are working with to our meetings so we can work through [operational issues] together.

In contrast, this kind of interunit networking was completely absent in Aeroco, Unit B. This illustrates the interdependence of the layers of purpose to which networks can be put. Without adequate networks to achieve the lower level capabilities of knowledge sharing and knowledge combination as described above, there are no prospects for self-design in Unit B. Interviewees in Unit B could not conceive of, let alone set up, interunit networks. Unit A established interunit networks as a result of its own internal self-design processes: the members collectively thought through the best ways to interface with their intraorganizational customers.

Theme 4: External Ties and Fundamental Change

In Theme 3, we saw that a unit's ties to other organizational units contribute to learning about and understanding the big picture, which facilitates intraunit design and enables mutual self-design with other interdependent units. Ties outside the organization likewise can facilitate change. The impetus for fundamental change often comes from outside the system when the environment demands different kinds of performance that the organization cannot deliver given its embedded schemata. If the social networks that are the forums for design and learning in the company are entirely internally constituted and focused, the dialogue may be constrained by existing schemata. Linking to external parties who may be guided by different perspectives and who hold different schemata can expand the knowledge and interpretations that are available as members of the system focus on developing new capabilities. This section discusses the role such linkages played in facilitating information and knowledge exchange, knowledge combination, and self-design.

Several of the leading units set up network linkages to their external customers. In these cases, the customer's perspective facilitated change by catalyzing the integration and refashioning of previously segmented perspectives. For example, Region A of Insurco made a practice of having teams of employees conduct service reviews in customer sites. One previously cloistered analyst reported that it was "shocking" to see the system from the customer's perspective and described how the information from these visits enabled her team to design new policy issuance and renewal processes and to greatly increase customer satisfaction. Employees were given responsibility for keeping in touch and informally monitoring service with the customers they had visited.

Another example of extending the social network occurred in a research program in Defensco (a leading unit not portrayed in Table 1). The research unit was introducing organizational changes to foster quicker and more effective transfer of new technology to the product divisions. Research project teams became responsible for pulling together a network of potential internal product division engineers and marketers for early dialogue and to help shape research efforts and build the relationships for technology transfer. One highly successful research project included university research-

ers who were doing contracted research to familiarize them with potential business applications. Rather than simply pull together dialogue and planning meetings with one or two representative members of internal customer units, this project team increased the scope of the network by encouraging members of the research team to be available to help with technical troubleshooting with their customer units and encouraged members of their customers' engineering units to attend research reviews to become familiar with the work being done in-house and in collaboration with university partners. The project director's intent was to build connections that enabled the combination of different perspectives:

> **Defensco, Research Unit:** The awareness and easy communication in our extended team has made a big difference in our sense of urgency and how we're going about our work. We also get much richer ideas on the table. We haven't even finished with the technology development, but the process engineers in the product division are beginning to talk about the process improvements that will be required for manufacturing. We don't expect the usual pushback about how our ideas are great but there isn't time to develop the new processes that would be required.

This research project took the original formal elements of the change in the research organization and adapted them locally, based on the nature of the work they did and their sense of what would be required to carry out the spirit and intent of the change rather than just its letter. Ties were set up that enabled knowledge sharing and combination.

External network connections also can help with the implementation and learning processes involved in appropriating a social design. Some units of Oilco attended conferences and visited other companies that were implementing similar innovative designs. Such exposure had both a substantive and motivational impact, as described by a manager in one of the units:

> **Oilco:** One of the things that has worked well for us is exposure to other companies. Through conferences where we meet a lot of other organizations and through site visits. It's exciting for us. We get the sense that we can do that too or we can even do better. And we pick up a lot of their learnings. If nothing else, it really engages people.

Although these were generally "one-time" contacts rather than ongoing networks, contacting, visiting, and learning from other companies became a pattern of activity. Materials were exchanged and approaches were shared with people in the companies they visited, and in one case they used each other as ongoing resources. Several Oilco units also held change implementation reviews that included participants from other units and from external companies such as customers and vendors. Through this mechanism people's networks were expanded and improvements were designed based on feedback from within and outside the organization:

> **Oilco:** We had ongoing dialogues with groups we pulled together to talk about how we could improve the new design. They included the leadership and technical experts from the old organization as well as representatives from our customer organizations, other organizations that support us, vendors, purchasing, and finance. The discussions included a wide net. They included the whole system or

> context that allows us to do our work. We thought from the beginning about the relationships and how they can be built to enable us to succeed as we go about the change.

Even if infrequent, these networks went beyond information sharing and included rich, often in situ knowledge sharing and combination as well as some self-designing capabilities.

Theme 5: Overlaying Networked Communities Supporting Fundamental Change

Change-oriented task teams such as design teams, process-improvement teams, innovation teams, commercialization teams, and venture teams are pervasive during fundamental change (Chesmore & Tenkasi, 2002). The members of these networks draw on their extended networks for ideas, information, support, and resources. Many dynamic and crosscutting social networks facilitate access to and dissemination of knowledge and resources across the organization and enable self-design of new and often temporary networks and network connections. In this section, we describe some additional crosscutting networks that overlay the task-oriented and change-oriented networks we already have described and which also moderated the change process.

Personal Networks

Friendship networks are formed through common experiences that may or may not be task related. An Oilco superintendent, faced with pressure to change a lagging facility quickly, led the unit through an extraordinarily quick transformation. This superintendent made extremely good use of his personal network connections by appropriating them to establish learning networks:

> **Oilco:** We had a very short time frame so we had to go out and see what we could shamelessly steal and apply rapidly. A friend of mine was a superintendent of another facility that was ahead of ours in the transformation. He and I have worked pretty closely together in the past. I kept abreast of what he was doing, was learning, and how he was working. We also sent teams to other facilities where I had contacts to talk to the people and find out what their successes and failures were and what we could learn from them.

Personal networks need not be left to chance. Aeroco's Unit A built an interpersonal foundation for intense task linkages by focusing on the affective dimension to their networks:

> **Aeroco, Unit A:** People are handling the stress of the new transformation. We band together to help each other both in a social and work sense. We have team parties. Sometimes we go out for a drink and sometimes we go bowling or swimming. It is part of building trust. We include previous members who have moved into other units.

The original purpose of creating these personal connections was stress reduction. Their existence, however, and the quality of ties that are developed, allow appropriation for other uses. Again, Unit B did not invest any energy in building personal linkages.

Discipline Networks

Employees in technical firms represent various knowledge disciplines. The organizational changes often redeployed these deep experts into cross-functional teams, but the importance of discipline knowledge did not decline. In Insurco, actuaries had always been centralized experts. The new regional actuaries found themselves struggling with how to add value in the operational world. Four of them established a network that met (telephonically) monthly to share ideas and learning and set up a Web site for sharing tools and cases. The other regional actuaries declined to participate. These four actuaries were in regions that were leaders in implementing the changes. Team members reported that the speed of the development of new schemata and behaviors in these four regions was enabled because the actuaries quickly transferred business acumen to the teams in their regions. A number of corporate risk and financial managers linked in to the actuaries' network, and many of the approaches that were tested and implemented in these four regions were eventually incorporated into company-wide practice guidelines.

To ensure that reorganization into cross-functional teams did not erode its core technical competencies, Oilco established discipline-learning networks around problems such as extracting oil from particular geological structures. Attendance at network meetings was voluntary, members of the discipline identified topics, and the meetings were working sessions among interested parties. Facilitators placed interesting outcomes on Web sites and set up electronic workspaces for a continuation of work by these geographically dispersed members:

> **Oilco:** These discipline networks provide peer assistance in problem solving and can help the discipline members resolve technical challenges faced by their business units much more quickly. The business pressures for speed and technical breakthroughs are intense, and these people are busy. They will only continue to be active in the discipline network if they feel it is providing value by helping them become aware of new approaches and solve problems more effectively.

Social Networks Using IT Networks

The companies in our study were learning how to use electronic connections to support and extend their networks. Information about best practices or about customer issues, for example, could be disseminated to various units and teams and directed to relevant parties. Even though IT-mediated networks are core to many new organizational designs, we have seen that their presence is not an automatic cause of change implementation or improved organizational functioning. As noted above, the dissemination of codified information even can impoverish the social networks it travels. Learning to use electronic networks for further learning requires supportive interpersonal networks. Oilco had liaisons in each business unit who received best practice information electronically and routed it to the relevant parties:

> **Oilco:** To address technology changes and developments that were going on at the same time that we were going through the transformation, and to try to incorporate them in ongoing designs and existing designs, we established [IT] networks across the different facilities. There are safety networks, surveillance networks, and so forth—so we can share best practices and learning. If one project is in

> a certain phase of their life and is experiencing problems, we get a beacon that we may run into these same sort of things [*sic*].

The narrow focus of each network might facilitate information sharing by making it more possible that a common schema can be developed.

Defensco also had some standing company-wide networks dealing with various topics such as software certification, safety, and security to ensure technical excellence as the company went through its transformation. Each business unit had representatives to the networks, which met face-to-face to share best practices and then shared information electronically broadly throughout the organization. Effective network representatives passed the information to others in the business units where it could contribute to appropriation and self-design of new practices.

Insurco set up the IT capability for employees to access business performance trends and information from other regions. A team member of Unit A regularly scanned the Internet for significant accomplishments in other regions that might be useful to learn about. She often followed up with a call or an e-mail to a counterpart in the other region to find out more about how they were operating and then passed interesting information on to her teammates.

Networks That Incubate Networks

Facilitating network formation was an intentional change strategy at Oilco. It set up a Corporate Learning Center that offered change-oriented development sessions and encouraged units to schedule open meetings at the facility and to attend special topics meetings. A typical comment came from a manager in an accelerated unit:

> **Oilco:** The creation of a Learning Center has been a great help. People come for classes and meetings—all walks of life and you almost certainly meet people from other parts of the company. We learn what they're doing that is working or isn't working. It sets up a broad group of people that we can call upon to ask a question, which I have done frequently as we've gone through this transformation.

Thus, although learning occurs through task-oriented and change-oriented networks, the more diffuse overlay networks that rely on friendship, discipline membership, and opportunities to congregate provide a rich set of network connections that contribute to change.

DISCUSSION

We set out to explore the role that social networks play in the change process with the view that fundamental organizational change is a learning process that yields new understandings and schemata to guide new ways of functioning. We found many more examples of the use of networks in successful as compared to unsuccessful company change efforts and in units that implement the new approaches in an accelerated fashion compared with those that lag behind.

At the overall organization level, effective change implementation is better achieved by simultaneous organization-wide and local self-design networks than by simply cascading the change through the organization's hierarchical network linkages. Existing hierarchical networks fail on two counts: they are capable only of information sharing within the existing schema and they are overly reliant on prescriptive commands.

Cross-functional, cross-level networks enable knowledge sharing and combination capabilities and provide flexibility for self-design. Intraunit, interunit, and organization-wide networks supported the implementation learning process. This supports Adler and Kwon's (2002) perspective that researchers who examine networks at only one level of analysis lose the richness of the networks that actually exist, emerge, and affect action in an organization, as well as the ability to address the complexity of the system they are trying to understand.

Similarly, we found that both internal and external networks contribute to implementation learning. The organization and each unit within it are open systems. Change has to fit with requirements from, interdependencies with, and changing trends in the external environment—and one unit's changes are best made through mutual learning with other interdependent units. Network links to external elements allow a changing organization to take into account external perspectives and knowledge. In the most accelerated change units, linkages to outside the units were not left to a small number of managers or boundary spanners.

We found that the change process both draws on existing organization-wide networks and benefits from the establishment of new ones. As pointed out by Coleman (1990), networks established for one purpose can be appropriated for other purposes. People drew on their connections in friendship and/or discipline networks to provide knowledge and perspective in the change process. Several companies catalyzed and built opportunities for organization-wide connections that could be used for many purposes through such mechanisms as learning centers and support of problem-focused networks. This rich constellation of overlaying networks is a critical resource in addressing the learning challenges during large-scale change.

The networks that facilitated fundamental change primarily enabled sharing and combining of knowledge to create new approaches and solutions through a self-design process. This supports Nahapiet & Ghoshal's (1988) contention that intellectual capital and social capital coevolve. Implementing fundamental organizational change indeed is a knowledge-creating process in which new structures, processes, and technologies are defined through rich social connections.

We found a very close connection between change-oriented networks and task-performance networks. New behaviors and schemata may be catalyzed through change-oriented networks such as design and implementation teams. But they take shape in the newly created work units where employees using newly developed processes and IT talk together about how best to get their work done in the new context. As people work in these new task networks, they collectively encounter novel situations and problems and make a myriad of adjustments, large and small, in how they work together.

The patterns of knowledge transactions depended on the work interdependencies. In Aeroco, for example, team members who were deep experts in specialty disciplines

had to learn to provide integrated products and services. This required intense network interaction in which the knowledge of individuals with different disciplines was combined. In Insurco, by contrast, the tasks were more routine and were carried out by generalists. Much of the network exchange dealt with questions of "how we work together to achieve business success in these new structures and using these new processes." In Defensco, subunits existed in a highly interdependent system, and network exchange across units was required to attend to the needs of the larger system. Despite these contextual differences that drove different patterns of networks, all successful units had a combination of the different kinds of networks and the different knowledge functions in all the successful units. In particular, they all had networks that exchanged and combined knowledge and engaged in self-design.

We found substantiation for the view that there is a role for both strong and weak ties in the change and innovation process (Hansen, 1999; Haythornthwaite, 2001). However, the nature of the knowledge exchange that occurred within the network was more important than the strong or weak nature of the ties. For example, the temporary, one-time connection entailed in visiting other companies may have a profound impact on the participants by allowing them to see whole integrated systems that work but embody very different schemata. This might be useful in the reframing required for the emergence of new schemata. Similarly, very strong ties, such as we saw in Defensco Unit A across the various subunits, can provide a systemic perspective that allows ongoing knowledge exchange and combination and flexible redesign across and within subunits.

Our study provides strong confirmation of the inseparability of fundamental planned change and social networks. Schemata are embedded in communities and emerge and are maintained through interpersonal interactions. Lasting change does not result from plans, blueprints, and events. Rather, the changes must be appropriated by the participants and incorporated into their patterns of interaction. It is through the interactions of the participants that the social system is able to arrive at a new network of relations and new ways of operating, of which some aspects will conform to the intended designs whereas others will be creative and more effective departures from the original intentions.

A major limitation of the study is that the question of whether network interactions can also impede change is left unaddressed. Our conclusions are based on the answers to open-ended questions about how the change unfolded and what facilitated or impeded change. There was almost no mention of network connections, supportive of the change or not, in the lagging units where respondents claimed not to understand the change and to be unclear about what management wanted them to do and why. Lagging units have had fewer network contacts, or they may have relied on preexisting networks and patterns of knowledge exchange that reinforced deeply embedded ways of functioning.

These results have important implications for the practice of planned change. Setting up design teams and cascading-change networks is insufficient to foster the deep learning that is integral to successful change. Attention should be devoted to catalyzing learning and self-design in the local networks that must appropriate the change. This implies a new role for management during change—encouraging dialogue and

connectivity within their units and across the organization. Building network connections should be an intentional change strategy and a strategy for building ongoing change capability. The kinds and uses of network connections in the organization also may be a diagnostic indicator of the robustness of the implementation process.

NOTE

1. The three other companies that failed to implement their new design were: Financo (a financial services firm), Healthco (a health maintenance organization), and Consultco (a consulting firm specializing in software, hardware, and information technology/organizational issues).

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