Bridging the Boundary: External Activity and Performance in Organizational Teams

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This article focuses on the activities teams use to manage their organizational environment beyond their teams. We used semistructured interviews with 38 new-product team managers in high-technology companies, log data from two of these teams, and questionnaires completed by members of a different set of 45 new-product teams to generate and test hypotheses about teams' external activities. Results indicate that teams engage in vertical communications aimed at molding the views of top management, horizontal communication aimed at coordinating work and obtaining feedback, and horizontal communication aimed at general scanning of the technical and market environment. Organizational teams appear to develop distinct strategies toward their environment: some specialize in particular external activities, some remain isolated from the external environment, and others engage in multiple external activities. The paper shows that the type of external communication teams engage in, not just the amount, determines performance. Over time, teams following a comprehensive strategy enter positive cycles of external activity, internal processes, and performance that enable long-term team success.

This paper is about groups. Yet the research presented here differs from that usually found in the dominant social psychology paradigm. This research uses on-going organizational teams rather than one-time laboratory groups. The tasks of these organizational teams are complex and evolving, not simple and set. The task allocators are managers, not academics. The teams' work is interdependent with other organizational units; teams cannot work in isolation. The key element that differentiates this research, however, is its focus. Rather than sitting on the group boundary and looking inward, we have focused primarily on those team behaviors that are directed outward, toward other parts of the organization, using an ''external'' perspective (Ancona, 1987).

Over the past half century, social psychologists have devoted substantial attention to the fine-grained analysis of behavior within groups. Many frameworks exist for that analysis, including models of group decision making (Isenberg, 1986; Nemeth, 1986; Bourgeois and Eisenhardt, 1988), task and maintenance activities (Benne and Sheats, 1948; Bales, 1983; Schein, 1988), norm development (Bettenhausen and Murnighan, 1985), and evolution (Gersick, 1988, 1989), to name a few. Yet it is only recently that the external perspective has been studied in depth.

Our research on new-product teams spans the years 1985 to 1990 and, along with other studies (e.g., Ancona and Caldwell, 1988; Ancona, 1990), forms the foundation of the external perspective. Because much less research has focused on external group activity than on behavior within a group, the first stages of research were necessarily description and classification (Kerlinger, 1973; Gladstein and Quinn, 1985). We sought to discover the relatively unknown pattern of groups' external activities with essential others. This discovery phase involved collecting qualitative data,

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including interviews with 38 experienced product-team managers, daily logs maintained by all members of two product teams, and observation of the activities of those two teams. These methods allowed us to describe a wide range of activities that groups use to carry out their complex tasks. With these data and the extant literature, we generated hypotheses linking external activities, performance, and internal process. In the classification phase, using quantitative data from a separate set of 45 new-product teams, we sought to group similar activities into independent clusters. At this point, we also classified teams by the types of external activities they used, to determine if there are generic strategies teams use to deal with their environments, and tested the hypotheses about external activities and outcomes. This paper describes these several research stages and, thus, the development of the external perspective.

DESCRIPTION OF EXTERNAL ACTIVITIES

Literature Review

The impetus for describing the external activities of teams came from a study of 100 sales teams in the telecommunications industry (Gladstein, 1984), which investigated the relationships between internal group processes and team performance. During preliminary interviews, salesmen frequently spoke of the importance of their interactions with their firm's installation and repair teams. Thus, several survey questions were added to pursue how teams interacted with other groups within their organization. It was hypothesized that these relationships would add another dimension to the task behaviors of the group.

The results were surprising. First, group members did not perceive process as separating into the traditional task and maintenance components (Bales, 1958; Philip and Dunphy, 1959; Schein, 1988). Instead, they saw process as divided into an internal and an external component, behaviors taking place among group members versus those with outsiders. Second, while internal group process predicted solely team-member satisfaction and team-rated performance, external process was associated only with sales revenue, an objective, external measure of performance. Thus, an aspect of group process that had been virtually ignored in the literature affected organizational performance in ways that internal processes did not. This study, however, did not specifically examine those external activities. Research using the external perspective began, then, with the simple realization that organizational group process was not fully represented by internal activities. Group members interact with one another, but they are also proactive with outsiders, seeking information and resources, interpreting signals, and molding external opinion.

Although the bulk of small-group research has focused on internal dynamics, some research has examined external initiatives. One set of researchers has studied the amount of information exchanged between teams and their environment. This research indicates that groups must

match their information-processing capability to the information-processing demands of the task environment (Allen, 1984; Nadler and Tushman, 1988; Gresov, 1989). This work has contributed greatly to understanding the importance of external communication to group success. Because the primary focus of the work has been on the frequency rather than the content or purpose of communication, however, it has not attempted to identify typologies of external interactions.

Other researchers have investigated specific types of groups' interactions with others. Those studying innovation have focused on boundary spanning and the transfer of technical information across team boundaries (Aldrich and Herker, 1977; Katz and Tushman, 1979; Allen, 1984), those studying interdependence have focused on intergroup coordination (Malone, 1987), and those studying power and resource allocation have focused on political or persuasive action with external constituents (Pfeffer, 1981; Dean, 1987). While these researchers have identified key dimensions of external activity, because they were studying specific organizational phenomena they did not use the group as a focal unit and have not tried to map the full range of external activities that groups use to deal with their environments. Although a variety of studies have demonstrated the importance of external communication to group or organizational outcomes, there has not been a systematic effort to identify the full set of specific activities in which teams engage. Thus, the first task in building the external perspective was to describe what externally dependent teams actually do across their boundaries.

Methods

We studied new-product teams in high-technology organizations. These teams enabled us to describe a diverse range of boundary activities because they depend on other parts of the organization for information, resources, and support and must deliver products and services to others. These complex transactions are carried out with a diverse set of functional groups, including marketing, manufacturing, and top management, groups that represent other ''thought-worlds'' (Dougherty, 1987: 1)—different languages, values, and time frames, as well as different hierarchical levels.

New-product teams face a highly uncertain and complex task. There may be periods of creativity alternating with times when efficiency is the primary outcome of interest. Therefore, most of the interaction with other groups is not clearly programmed in standard operating procedures and routines but evolves to meet task demands. The combination of high complexity, high uncertainty, and multiple forms of dependence with multiple groups of others seemed well suited for identifying a wide range of boundary activities.

Data collection. To identify the range of external activities, we interviewed the managers of 38 new-product teams. Interviews ranged between one and eight hours, with an average duration of three hours. Teams were at various stages of product development: some were just starting,

while others had completed projects within the last month. Using a semistructured interview, we asked each manager to describe the activities that the manager and team members carried out with people outside the group boundaries. Questions dealt with the timing, frequency, target, and purpose of interactions across the entire life of the product-development process.

In addition, 15 new-product team members from two of the 38 teams were asked to keep logs for a week. In these logs, individuals recorded all interactions they had with people outside the team, including meetings, telephone calls, electronic mail messages, or other contact, and the purpose of those interactions. Once the interview and log data were collected, the two authors and two graduate students reviewed transcripts, notes, tapes, and logs to identify all references to interactions with outsiders. We also reviewed the data for reports of decisions not to interact with others; for example, a manager might speak of not wanting to meet with a member of another group until a specific part of the product had been completed. We included these reports in our analysis.

Identification of External Activities

Through a review of the complete set of interactions, we identified a set of 15 distinct activities, including mapping, gathering information and resources, scanning, feedback seeking, opening up communication channels, informing, coordinating, negotiating, molding, allowing entry, translating, filtering, classifying, delivering, and protecting. These activities are not unique to product teams, and many represent phenomena that have been extensively studied from many different levels of analysis. For example, what we term molding is conceptually similar to impression management (Chapman, Bell, and Staw, 1986; Ginzel, Kramer, and Sutton, 1993). Similarly, feedback seeking has been studied at the individual level of analysis (Ashford and Cummings, 1983; Ashford and Tsui, 1991), and mapping has analogues in socially constructed realities (Weick, 1979) and sense making (Louis, 1980). Our goal was not to impose a category scheme from existing literature but, rather, to discover as wide a range of external activities in groups as possible. While space does not allow a full description of each activity (see Ancona and Caldwell, 1988, for such a description), four examples illustrate how we moved from data to activity.

Mapping. Mapping entails constructing a picture of the external environment, including predicting future trouble spots or potential allies. Mapping represents the team's attempt to answer questions such as "Who supports us and who doesn't?" and "What do people want us to do?" Mapping was often done by combining information that team members had from prior experiences with updated information gleaned from conversations with outsiders. The following quotation illustrates data that helped us to identify this activity:

> The first thing I did was go to talk to lots of people to find out what they thought the product was and how to get there. . . . I started out with the guy who brought me here, he sent me to someone

else, and so it went that I came to talk to a lot of high- and middle-level people. . . . So I gained knowledge about details of what the product ought to be, who the players were, what they did and what they wanted.

Molding. This activity involves a group's attempts to influence the external environment to suit its agenda by shaping the beliefs and behaviors of outsiders. In essence, molding involves persuading and influencing; it may mean representing the group in an extremely positive light if resources are needed or in a less positive light if that is what is required. An example follows:

I'm like a cheerleader, trying to get those guys excited about our product. . . . I went to a meeting and explained that the company was riding on this project and we were going to do it fast and do it right.

Coordinating and negotiating. Although these two activities appear to be separate, our interviewees typically discussed them together. Coordinating usually involves resolving the issues of interdependent schedules. Although the focus of this activity may be integrating work schedules, there is often negotiating going on as well. This negotiating is particularly common because of shifting power and dependency relationships between the new-product team and other groups. One quotation that is indicative of this activity follows:

We had to explain (to manufacturing) how certain things worked. I had lots and lots of meetings about the status of the project. We wanted some last-minute changes on the machine, but manufacturing was not able or not willing to put them in all the machines. There were great arguments and the Product Committee was involved. By April we had worked out a compromise agreement.

Filtering. Filtering consists of taking information from outsiders and delivering a smaller amount to the group. Often filtering would be done to buffer the team or absorb pressure by keeping troubling information or political maneuvering from the team. Buffering also took place when the volume of information was considered too great for the team to absorb. An extreme form of buffering is actually to separate the group physically from the rest of the organization. One illustration follows:

Near the end I talked to the top management group a lot. I tried to protect the group from that kind of pressure, though. It's like Tom West said, we won't pass on the garbage and the politics.[1]

In all, we found a wide variety of external activities. Some were taken on by one member of the group while others were distributed across many members. In addition, a sequence of boundary transactions often combined elements of several activities. These boundary activities played a key role in determining how group members viewed the outside world and how outsiders perceived the group. Activities also seemed to relate to one another. Thus, a team that engaged in a high level of molding activity might need to spend less time protecting the team from undue influence later.

CLASSIFICATION OF EXTERNAL ACTIVITIES

After identifying boundary activities, we sought to reduce their number of clustering them into larger categories of

1
Tom West is the manager described by Tracy Kidder in *Soul of a New Machine* (Boston: Atlantic-Little, Brown, 1981).

related activities to create a typology of external initiatives. In order to do statistical clustering we needed a larger number of data points and quantitative measures of the types of external activities that team members engaged in. This analysis thus involved a completely different sample and methods. We used data collected through questionnaires completed by members of 45 product-development teams, none of which had any members who had taken part in the previously described interview and log study.

Methods

Description of groups. This phase of the study involved product-development teams in five corporations in the computer, analytic instrumentation, and photographic industries. All of the teams were responsible for developing a prototype new product (not basic research) and transferring it to their firm's manufacturing and marketing groups. All the products used new or evolving technologies. One product, for example, automated the sampling process in liquid chromatography, another combined photographic and computer imaging processes. All of the teams were temporary; they were formed to develop a specific prototype and disbanded once the task was complete. Each was formally headed by a project team leader. Team members had specific functional or technical skills; this assignment was typically the individual's primary responsibility at work.

Each organization provided access to a set of teams that had the following characteristics: (1) all the teams had to be developing a new product (defined as a major extension to an existing product line or the start of a new product line); (2) to ensure some broad consistency in the complexity of products, all products had a development cycle of one and one-half to three years; (3) for comparability in performance evaluations, all the teams had to be located within a single division; and (4) teams had to range in performance, although company executives did not reveal how teams were initially classified until all other data had been collected. Team membership was determined from company records and verified with team leaders; average size was approximately 10 (s.d. = 6.2), with a mode of 12.

The authors met with each team leader to get a history of the product and performance evaluations. Team leaders distributed the questionnaires, including instructions and return envelopes addressed to the researchers. Several follow-up letters and phone calls were made to team members to ensure high response rates.

Data and sample. A total of 450 questionnaires were distributed to team members and leaders of 47 teams. Because many of the items included in the questionnaire related to perceptions of the team, the questionnaires distributed to each team included a list of team members to ensure that individuals had a common referent. Completed questionnaires were returned by 409 individuals, yielding a response rate of approximately 89 percent. Response rates were approximately equal across the five companies; total responses per company varied from 39 to 129. Because

much of the analysis was conducted at the group level, teams were included in the final sample only if at least three-fourths of their members responded. This reduced the number of teams in the final sample to 45.

The average age of the individuals was 38.6 years; 88 percent were male; and 77 percent of the respondents were employed in the engineering or research and development (R&D) functions of their companies; the remaining 23 percent were primarily from the manufacturing or marketing functions.

Measures. In this phase of the project we were interested only in those items that revealed the types of boundary activities undertaken by team members. The fifteen behaviors that were uncovered in the first phase of the study were converted into 24 survey items, including actions such as persuading others to support the team, attempting to acquire resources for the team, and bringing technical information into the group. The number of items is greater than the number of behaviors because during pretesting we found that some constructs, such as coordinating and negotiating, needed to be separated. We also found that we needed to specify more clearly the object of a particular activity. Team members pointed out that scanning for information about the competition, for example, was different from internal technology scanning. We therefore included both. The activities were converted into questionnaire items by asking respondents to indicate on a 5-point Likert scale the extent to which they felt each of the items was part of their responsibility in dealing with people outside the team. The complete set of items is shown in Table 1.

Analysis and Results

The 409 individual responses to the 24 boundary-activity items were factor-analyzed to represent their underlying structure. Individuals' ratings of the extent to which they assumed responsibility for each of the 24 boundary activities were analyzed with a principal component analysis and a varimax rotation. Four factors with eigenvalues greater than 1.0 explained 60 percent of the total variance. Inspection of the Scree plot supported the four-factor solution. Factor scores were then calculated for each individual and averaged to form group scores.[2] Table 1 summarizes this analysis and shows the item loadings greater than .40.

Each factor represents a particular type of boundary activity. The first factor contains 12 items (with loadings greater than .50) that reflect both buffering and representational activities. It contains aspects of the filtering and molding activities described earlier, as well as some aspects of mapping. Members taking on this set of activities protect the team from outside pressure, persuade others to support the team, and lobby for resources. Because these activities include both protective and persuasive goals, we labeled them "ambassador" activities. Members carrying out these activities communicate frequently with those above them in the hierarchy, such as top R&D management, top division, and even top corporate management (Ancona and Caldwell, 1990).

2
Modes of aggregation other than averaging were tested to examine different assumptions about how groups represent all individual members' contributions. For example, we summed individual scores, under the assumption that a team's external activity is simply the sum of individual contributions. Because changes in aggregation procedures did not significantly affect results, we continued to use the mean scores.

Table 1

Varimax Factor Loadings for Boundary-Management Dimensions (*N* = 409)

Item	Factor loading			
	1	2	3	4
Absorb outside pressures for the team so it can work free of interference.	.785			
Protect the team from outside interference.	.740			
Prevent outsiders from "overloading" the team with too much information or too many requests.	.719			
Persuade other individuals that the team's activities are important.	.654			
Scan the environment inside your organization for threats to the product team.	.636		.417	
"Talk up" the team to outsiders.	.602			
Persuade others to support the team's decisions.	.592	.416		
Acquire resources (e.g., money, new members, equipment) for the team.	.587	.417		
Report the progress of the team to a higher organizational level.	.553	.403		
Find out whether others in the company support or oppose your team's activities.	.551		.449	
Find out information on your company's strategy or political situation that may affect the project.	.549		.430	
Keep other groups in the company informed of your team's activities.	.519	.421		
Resolve design problems with external groups.		.776		
Coordinate activities with external groups.		.660		
Procure things which the team needs from other groups or individuals in the company.		.657		
Negotiate with others for delivery deadlines.		.618		
Review product design with outsiders.		.515	.404	
Find out what competing firms or groups are doing on similar projects.			.791	
Scan the environment inside or outside the organization for marketing ideas/expertise.			.719	
Collect technical information/ideas from individuals outside of the team.		.424	.645	
Scan the environment inside or outside the organization for technical ideas/expertise.		.491	.587	
Keep news about the team secret from others in the company until the appropriate time.				.823
Avoid releasing information to others in the company to protect the team's image or product it is working on.				.817
Control the release of information from the team in an effort to present the profile we want to show.				.592

The second factor was defined by five items that represent interactions aimed at coordinating technical or design issues. Examples of activities in this set include discussing design problems with others, obtaining feedback on the product design, and coordinating and negotiating with outsiders. We labeled these "task coordinator" activities. Individuals carrying out these activities show high levels of communication laterally through the organization with such groups as R&D and manufacturing (Ancona and Caldwell, 1990).

The third factor was made up of four items describing behaviors that involve general scanning for ideas and information about the competition, the market, or the technology. This factor included many aspects of the mapping, information gathering, and scanning activities uncovered in the first part of the study. We labeled this factor "scout" activity. These items differ from the previous items in that they relate to general scanning as opposed to handling specific coordination issues. Individuals carrying out

this activity show high levels of communication with marketing, sales, and R&D (Ancona and Caldwell, 1990).

The fourth set of activities represent actions that aimed at avoiding releasing information. We labeled the three items that define this factor "guard" activities. Because these activities differ from the other three in that they do not represent initiatives toward the environment but, rather, internal activities to keep things from the environment, we did not include guard activities in subsequent analyses.

STRATEGIES FOR APPROACHING THE ENVIRONMENT

While the first two stages of this research described a wide range of external boundary activities and clustered those activities to create a typology, it was clear from our interviews that not all teams exhibited all of these activities. Teams seemed to develop distinct styles of approaching their environment; some seemed to specialize in particular sets of activities, others were generalists, and others did not seem to engage in much activity at all. Not all groups have the willingness or the capacity to exhibit the full range of activity. Thus, in the next stage of the research we looked for patterns of external activity across teams to see which combinations or packages of activities occur naturally and whether there are patterns that differentiate teams and how they organize themselves to carry out external activity.

Such an approach has analogues at the individual and organization levels. At the individual level, literally hundreds of traits have been identified. A person can be introverted or extroverted, have an internal or external locus of control, or be dominant or submissive. But much work has gone into identifying personalities, or combinations of traits, that appear to identify people. Thus, a paranoid personality is made up of different traits than a compulsive personality, and each represents a very different approach toward the external world. At the organization level, strategy researchers have long been interested in classification schemes, and several typologies exist, including those by Miles and Snow (1978)—defenders, analyzers, prospectors—and Porter (1980)—cost leadership, differentiation, focus.

We followed the same logic at the group level as we sought to determine the external strategies that groups within organizations use. A typology of strategies would allow us to categorize groups by the distinctive styles they seem to exhibit in interacting with their environments, differentiate their form, and examine the implications of those forms. We use the term strategy to label the patterns of external activity that are found. This is not to suggest that such patterns are necessarily intentional. Rather, they represent the subset of activities a team has demonstrated for a given period of time.

Methods

We used Q-factor analysis of the questionnaire data from the 45 teams described earlier to produce a taxonomy of external strategies indicating how external activities act in combinations. While regression analysis statistically isolates

the independent effects of each activity set, such a technique does not tell us which combinations or gestalts naturally occur (Hambrick, 1983). Q-factor analysis groups together those teams that share common approaches to the environment, and these groupings can then be compared along other dimensions such as internal process and performance. In contrast to the more conventional R-factor analysis, Q-factor analysis is based on the respondents rather than the variables and condenses respondents into distinctly different groups. It differs from cluster analysis in that the groupings are based on intercorrelations between means and standard deviations of the respondents rather than on the absolute distances between the respondents' scores. Thus, Q-factor analysis may be more sensitive to patterns among the variables than absolute differences in magnitude.

Results

A Q-factor analysis with a varimax rotation was performed on the 45 groups, using scores on the ambassador, task coordinator, and scout variables. This analysis identified four distinct sets of groups. The first part of Table 4, below, shows the results of three one-way analyses of variance (with group size as a covariate), using groups' scores on the ambassador, task coordinator, and scout variables as dependent variables.

Our analysis suggested that groups' activities clustered into four distinct strategies that showed no significant relationship to a number of the characteristics of the product under development, including the extent to which the product was revolutionary, the level of competition in the market, the organization's experience with the technology, and the availability of resources to the team. The first strategy concentrated on ambassador activity and very little else; we labeled it ''ambassadorial.'' The second combined scout activities with some task coordination; we called it ''technical scouting.'' The third strategy was low on all dimensions, with some minimal scout activity. We labeled this pattern ''isolationist.'' Finally, groups using the fourth strategy had members who felt responsible for both ambassadorial and task-coordinator activities but did little scouting. This strategy avoided general scanning; it focused on external interaction both to persuade others that the team's work was important and to coordinate, negotiate, and obtain feedback from outside groups. We called it ''comprehensive.'' The number of teams displaying these four strategies was relatively equal, with 13 showing an ambassadorial strategy, 12 a technical-scouting strategy, 10 an isolationist strategy, and 10 a comprehensive strategy. In addition, these strategies were distributed roughly equally across organizations.

FORMULATING AND TESTING HYPOTHESES

While description and classification can be seen as ends in themselves at the start of a scientific inquiry, later progress is made by proposing hypotheses and testing them. By the time we were collecting the questionnaire data, the research had advanced to a point where we could generate

hypotheses. In addition, our own qualitative data were converging with the theory to suggest that external activities are related to team performance and to internal group processes in specific ways. Group theory has tended to concentrate on the link between internal process and performance. If external activities become relevant variables, then group theory will need to be extended to include them. In addition, this hypothesis testing may suggest ways that organizational teams can improve their performance. Thus, we moved from trying to map how highly interdependent teams approached their environment to trying to understand how these external activities related to team performance and internal processes. This section reports on the qualitative data and literature that led to a set of hypotheses linking these variables, describes the methods used to test those hypotheses, and reports the results.

Qualitative Data

The initial set of 38 interviews provided some very rich and detailed accounts of the histories of numerous new-product teams in the high-technology environment. The accounts were quite varied; some told of marvelous successes, others of failure, and others of troubled teams that had somehow dealt with issues as they came up and turned adversity into surprising performance. Some accounts were retrospective, and some were about current activities. Some teams were quite cohesive, and others had members that hardly knew each other. Some had leaders who spoke mainly of technical issues, while others were completely wrapped up in politics. These rich data, combined with our knowledge of previous literature, helped us to develop hypotheses connecting external activities to performance and internal activities that could then be tested with the sample of 45 teams. We describe four cases here that, together, represent disparate points along a range of performance and of strategies for dealing with others. Data like these, from all 38 interviews, were used to formulate the hypotheses.

Swallow. The Swallow story is one of great success. Swallow is a pseudonym for an internal project name given to a computer being designed to serve the computer-aided design–computer-aided engineering market. The project was of major import to the organization and had the difficult goal of coming in at three times the performance of the organization's current offering at the same price. Our interview with the Swallow leader came just as the project was being completed. He reported that they had done the impossible in terms of meeting schedule and product specifications. There was already great market demand. Elsewhere in the organization the Swallow was viewed as a model project.

The Swallow story was told over seven hours and was based on a daily journal the product-team leader had kept throughout the project's history. Key to his account was a great emphasis on external activity. This activity was present from the start of the project and was maintained throughout its life.

The project leader had engaged top management from the very beginning. As the project was being discussed by the Operating Committee, a top management committee that managed new-product development projects, he met often with committee members. He worked to convince committee members that they should go with a revolutionary design rather than a simple upgrade. He insisted they had the talent and motivation to make a great product and make it quickly. When the decision was made to go ahead with the project, the leader asked the president of the company and the vice president of R&D to come to the first meeting to explain the importance of the product to the company and to communicate their support of the team. The leader remained in close contact with the president throughout the project.

Lateral communication was also quite high throughout the project. When the team had put together some preliminary design ideas, the leader set up a design review with multiple representatives from R&D. The review was set up to ''make sure we weren't going off in crazy directions.'' The review group met with the team for two weeks to make sure all questions were asked and numerous points could be debated.

Three people from the manufacturing function were brought in at the very beginning to serve as experts to the team. These people were responsible for reacting to the components the engineers were considering to determine which could be obtained easily and which would be difficult to find. The three men also continuously evaluated the ease of manufacturing the computer and acted as liaisons to others in their area, providing information on product progress and details of what would be expected of manufacturing and when it would be expected. As the leader explained, ''Coordinating was a major task throughout this project. We could never have gotten it out the door if team members hadn't been checking on other parts of the company and pushing to make sure things happened.'' He explained that things had to be checked and double checked constantly. People would say that components had been ordered, but then no one would follow up on why they had not shown up when promised.

Each week a meeting of the team was held to which many outside groups were invited, including purchasing, manufacturing, production planning, diagnostics, and marketing. People were informed of progress and changes. Notes for each meeting were taken and typed up on the computer, where they could be accessed by these other groups. All members of the Operating Committee were automatically sent copies of the minutes.

Not all members of the team were engaged in external activity. The team was housed in a somewhat remote location, making it difficult for outsiders to disturb the engineers at work. This meant extra work for those team members who were engaged in external activity. Many of those people spent days away from the team site, returning regularly to report on ''letters from home.''

Toward the end of the project, external activity increased even more as the product moved to manufacturing, and sales and marketing got more active. There were many, many meetings to train manufacturing people, to make status reports as schedules slipped and tensions rose, and to settle big fights about when the product was "really ready" to be shipped. When the product was finally "let go" the team was credited with a big win for the company, though at the time many team members were too exhausted to take in what they had been able to achieve.

The Devices team. We heard a very similar story of external activity at another company from a team that was making a very different type of product. The team leader had just been promoted to manager, and he was explaining the history of his last project and what he had learned from it. He had been with the company for many years, starting out as a design engineer. Apparently, in the "olden days" products were not that complex and time pressures were almost nonexistent. Thus, one person could do most of the design work, and the product would be easily sold to a technically sophisticated customer. Then things began to change. The products became more complex, and competitive pressures meant that the company had to reduce the time to market from five years to one year. The market for the products had grown to include a nonengineering market that required more help from sales, service, and marketing. The leader decided that his next project would have to involve a team of engineers that somehow split the work into smaller pieces and that worked more closely with other parts of the company.

The leader then described how he and five other engineers who thought they "had the necessary technical experience and could work well together" started meeting to figure out how to design a device in parallel rather than alone. At the time, many people in the company did not support this type of procedure. The leader found a vice president who was intrigued with the idea and who provided some initial funding.

The leader and one member described their roles as "very much the lobbyists for the product." They spoke of "selling" both the product and their team approach throughout the organization. They reported that there was no formal procedure for gaining support as they needed it. You need "personality, good connections, and the perseverance to keep working to keep everyone informed and keep everyone contributing what they've committed to," said the leader. The leader had biweekly discussions with the vice president, mostly concerning the major issues around resources.

The leader reported that although each member of the group could go out and coordinate for his or her part of the project, this was not thought to be a good idea. He stated that it is difficult to communicate with all the other groups. You "need to know where to go, who to see, how to talk to them," and not everyone can do that. Besides, the leader reported, some design engineers work better with uninterrupted time, so specialized liaison activity was organized.

This project was rated a big success, capturing a large market share. The leader attributed much of the success to the team's real belief in the product. This belief, he thought, got translated into an ability to convince others that the product was a real priority, in the willingness to push others to follow through, and in sustaining the team and its allies through the difficult periods.

The Beaver project. This project was done in the same organization as the Swallow project, but it was not such a great success. Although the computer ended up being shipped within a reasonable amount of time, it experienced many delays that the company considered costly. Also, the manager of the project was demoted during the computer's development because management felt that someone else could manage the project more effectively. What is so fascinating about this project is that the changes made to improve this team mirror activities that were "naturally" undertaken in the high-performing teams.

Using numerous interviews with the team leader and several key informants over the life of this project, we put together a history of it. This was the only project we followed as it evolved rather than examining retrospectively. The project leader was from R&D and preferred working on technical issues. Throughout the first several interviews with him, his descriptions of work included interaction with top management, his team, and other members of R&D around product specifications. When asked about how the team would coordinate with manufacturing and marketing, the leader replied, "Have common goal statements. In other words, we have goals around time to market, we have goals around product cost, we have goals around product functionality, we have goals around product quality."

Unfortunately, the reliance on goal statements to handle interdependencies among functions did not work very well. About six months into the project another team leader was put on the team to "help, as an additional resource." When asked why he was put on the team, the new member replied, "I've been a catalyst. . . . to sell the product to other people, to be the champion of the product outside." In addition, the new person was brought in to implement a change in the product's components and to improve the schedule.

When asked why he could do what the team leader could not, the new member replied, "He just didn't know how to make it happen. That was the part he had the biggest struggle with. Because he kept sort of saying we ought to do it this way and nothing would happen. . . . I helped work some of the resource issues and I try to help out when he has a problem." In contrast, the team leader would talk about his frustration with getting things done with other groups. While the new "resource" worked his vertical and horizontal interactions informally, pushing team members into their own direct negotiations with outsiders, the team leader often escalated problems up the hierarchy. As the leader stated, "Every time you elevate something it becomes a great deal more painful. . . . As things get elevated it causes more work because you're dealing with

people who don't understand the fundamental issues and you have to educate them, you're dealing with more players . . . you've got to deal with engineering and marketing VPs, so you end up with the pyramid growing and growing."

But the issues with marketing and manufacturing kept growing. There was a stalemate with marketing over how many configurations of the product had to be made to satisfy a broad range of customers, and this issue got escalated up the hierarchy. Then, when the product was further along, major difficulties with manufacturing developed. At that time, the team leader was demoted and a new leader from manufacturing was put in place. As the old leader tried to make sense of what had happened, he remarked, "Typically what happens, and I'm just finding out . . . there is no justice and you're never right—just understand that and you'll be all set. I try to deal with things in a rational way, manufacturing at this company is not necessarily that nature of beast. Many things that were planned for Beaver six, eight, ten months ago weren't ever really committed by manufacturing."

Thus, Beaver got back on track, thanks to the additional "resource," who worked on many of the management and marketing issues, and to the new team leader from manufacturing, who was able to get real commitments from manufacturing. Both additions pushed team members to handle external negotiations rather than relying on hierarchical intervention. In the end, Beaver filled a big gap in the company's product line and sold very well.

The ID printer project. This project was set up to take the company into a new sphere of activity by combining two existing technologies into a revolutionary new product. The team was put together with very talented engineers and an experienced team leader. It was a complete failure. The story was related by a division manager who had supported the project at its inception but gradually became very disenchanted with its progression. He reported on conversations he had had with numerous people throughout the organization about the project.

The team effort had started with a big send-off, with top managers expressing their hope that the team could take the company in a new direction. The team set out to work with ample financial and personnel resources and six months to "play in the sandbox," meaning to experiment with different technologies and product designs. The work was divided up so that different team members worked on separate aspects of the new design and got input from different parts of the organization and outside world. The team had a great deal of information about "the market potential, all the amazing applications that we could use this technology for," and "the way we could put this thing together." The team was very excited and worked long hours, getting as many new ideas as possible out on the table. After nine months, however, team members could still not agree on what exactly the first product was going to do, nor what components they were going to use in its design. Their response to being behind schedule was to continue to seek additional ideas and change the product design. At first

top management was quite lenient, but then "the pressure started." While management tried to get commitments on schedules, the team was always late. A design would come in, and then it would be followed by another design that ostensibly had some "new and exciting feature that would make the product even better." Design and redesign continued for several more months before the project was finally killed. During this time, the team leader was often hard to find. He often avoided meetings with top managers, always promising that the solution was "coming soon," when he did meet them. The division manager was extremely disappointed in the outcome and later put together another team to continue the work. He never did understand why the team could not get past the continuous search for a better product design.

Members of the ID printer project seem to have been unable to move beyond exploration to commitment to a given design. They seemed to get stuck in this exploration mode and continued to modify concepts rather than thinking through their implications for a final product. While the leader tried to move the group, the engineers kept coming up with more ideas and changes. As the volume and complexity of ideas mounted, the group became overwhelmed with alternatives, and closure on a final design became even harder.

These four cases are similar to many others. Collectively, the cases combine to illustrate several patterns, suggesting hypotheses that might be tested with the larger data set.

Hypotheses

One clear pattern was that all successful teams had high levels of ambassadorial activity. The Swallow team and the Devices team both had leaders that started to exhibit ambassadorial activity even before the project teams were put together, and they continued that activity with other team members throughout the life of the team. The less-successful Beaver team imported a high-level ambassador to help it progress when the leader seemed unable to implement many of his ideas. Top managers considered this activity essential, and when it was not forthcoming, they imposed it on the team. The one failed team, ID, started out with top management support, but it was not garnered through ambassadorial activity. Also, as the team continued to fall behind, the leader avoided top management. He did not engage in impression management but, rather, let others form their own perceptions of why the team was not getting the design out on time.

This positive relationship between performance and ambassadorial activity is also posited in the literature at multiple levels of analysis. Dutton and Ashford (1992) argued that the "issue selling" of middle managers helps to set the agenda of top management and is related to organizational performance. Issue selling is also linked to enhancing individual visibility, perceptions of personal competence, and individual power (Burgelman, 1983; Dean, 1987). Our data show these same effects at the group level. Ambassadorial activity is also similar to impression management, whereby an individual, group, or organization tries to control external

images of itself (Schenkler, 1980; Tedeschi, 1981). The data and literature combine to form the basis for our first hypothesis:

Hypothesis 1: Team performance is positively associated with ambassadorial activity.

The cases also suggest that task-coordinator activity plays a pivotal role in team success. The Swallow team engaged in high levels of interaction with R&D, getting feedback on the project design, and with manufacturing, getting information, coordinating, and obtaining feedback. Coordination and information sharing were considered major tasks throughout the project's history. The Devices team actually organized specialized liaisons who would carry out task-coordinator activity for the whole team. Again, this activity was considered essential for team success. The Beaver team did such a poor job of coordinating with manufacturing that the leader had to be demoted in order to increase the linkages between the team and this area. The activity was considered so important that when it did not naturally occur, it was mandated. Finally, the ID team never got to the point of coordinating. Members spent so much time designing the product that they did not get to the specialized tasks of obtaining feedback and negotiating around implementation of the design.

Existing research from numerous sources provides separate support for a positive relationship between task-coordinator activity and team success. The boundary-spanning literature shows positive relationships between the frequency of external lateral communication and performance (Tushman, 1977, 1979; Allen, 1984). While studies of feedback seeking at the individual level show more equivocal results (Ashford and Cummings, 1983), there is still enough empirical and theoretical evidence to suggest the following hypothesis:

Hypothesis 2: Team performance is positively associated with task-coordinator activity.

The cases seem to indicate that scouting activity is negatively related to team performance. Although these data seem to contradict the literature postulating the need for understanding current market and technology trends (Zurger and Maidique, 1990), they do not. Rather, the data coincide with the notion that teams need, at some point, to move beyond exploring the possibilities of a product to implementing product design and exploiting a chosen technology and market niche (Roberts, 1977; Gersick, 1988). Scouting cannot become an enduring pattern. The ID project failed because the team did not stop scouting activity and commit to a plan. Rather, the team always looked for a better technology or a better design to win in the market. While other teams did engage in scouting activity, this activity apparently took place very early in the life of the project and often involved a subset of the team, either in the early phases of the project or before the team was even put together. Teams that were unable to move from this general scanning to a defined product design early on seem destined to fail. We thus predict the following:

Hypothesis 3: Team performance is negatively associated with prolonged scouting activity.

In all the cases we reviewed, successful teams were deeply engaged in communications with outsiders. This observation is consistent with research by information-processing theorists, who focus on the amount of information that the team acquires from its environment (Lawrence and Lorsch, 1967; Thompson, 1967; Galbraith, 1977). The information-processing approach is normative, positing that groups must match their information-processing capability to the information-processing demands of the external environment (Nadler and Tushman, 1988). Support for this approach comes from studies showing that teams carrying out complex tasks in uncertain environments need high levels of external interaction to be high performing (Tushman, 1977, 1979; Gresov, 1989; Ancona and Caldwell, 1992). In research and development teams, for example, frequency of communication within the teams has shown no relation to performance, while increased communication between the teams and other parts of the laboratory was strongly related to project performance (Allen, 1984). High-performing teams also showed higher frequencies of communication with organizational colleagues outside of R&D than their low-performing counterparts. Given that the new-product development task in high-technology firms is complex, and the environment uncertain, this suggests the following:

Hypothesis 4: Team performance is negatively associated with isolationism, or very low levels of external activity.

All four hypotheses are consistent with a recent qualitative study of five consulting teams in a state-run service that examined team strategies toward the environment and their link to performance (Ancona, 1990). Three strategies were identified there: informing, parading, and probing. Informing teams remain relatively isolated from their environment, although they intend to inform others of their plans sometime in the future; parading teams are primarily concerned with making their own activities visible to outsiders; and probing teams actively engage outsiders.

Although Ancona's (1990) study uses teams with a different task and a different organizational environment than new-product teams, its findings are consistent with the proposed hypotheses. For example, the highest performers, as rated by top management one year after team formation, were the probing teams, who combined upward persuasion with lateral feedback seeking, coordination, and testing of solutions. This suggests that performance is enhanced through ambassadorial and task-coordinator activity (hypotheses 1 and 2). In addition, parading teams, which were very visible in the environment as they continuously monitored external trends and conditions, were not viewed as high performers because they did not achieve high results. This suggests that performance is hindered by continuous scouting activity (hypothesis 3). The lowest performer was the informing team, which remained isolated from both its external task environment (the customer) and top management. Its members were incorrect either in thinking that they had sufficient information to complete the

task by themselves or in assuming that their performance would be evaluated independent of the process and visibility they displayed during the task's lifetime. This finding suggests that performance is negatively related to isolationism, supporting hypothesis 4.

Internal and External Activity

As group theory evolves, it will also be important to take into account how internal and external activities affect one another, as well as how they affect performance. While a large amount of previous work has established links between internal group process and performance, the causal direction between these variables is open to question (Lott and Lott, 1965; Chapman, Bell, and Staw, 1986), and the relationship between external activities and what goes on within the group has received less direct study.

Although our data from the 38 interviews were equivocal about the relationship between these variables, most previous research suggests that external activities interfere with the development of effective internal operations. The internal cohesion that exists under conditions of groupthink (Janis, 1982, 1985) can promote external stereotyping and eliminate the import of external information that might damage group consensus. The intergroup literature (Smith, 1983, 1989) also suggests that a negative relationship between internal and external activities can develop. Groups can be underbounded—having many external ties but an inability to coalesce and motivate members to pull together their external knowledge—or overbounded—having high internal loyalty and a complex set of internal dynamics but an inability to reach out to the external world (Sherif, 1966; Alderfer, 1976). Finally, the conflict literature predicts intensified intragroup conflict when group members collect information from outsiders with different goals, cognitive styles, and attitudes (Shaw, 1971; Schmidt and Kochan, 1972).

Yet not all studies indicate a negative relationship. In a study of eight task forces, Gersick (1988) found that groups shift their basic assumptions and operating procedures over time. Her study suggests that teams may deal with internal and external demands sequentially, first acting on initial information from the environment in isolation and then emerging to get further feedback and information from outsiders. Ancona's (1990) study of five consulting teams also suggests that the point at which the group is observed may be important. Her results suggest that, in the short term, those teams that concentrated on ambassadorial and task-coordinator activity suffered from low levels of cohesion and high levels of disorganization; over time, as they satisfactorily interacted with their environment, internal processes improved. For scouting teams, short-term cohesion and clarity of roles and goals eventually gave way to internal dissension as interaction with the external environment proved unproductive. This is consistent with Homans' (1950) observation that complexity and conflict in the external environment will be replicated within the group when information from the environment is imported into the group. We propose a final hypothesis based primarily on this previous work:

Hypothesis 5: External activity is related to internal cohesion and internal task processes.

More specifically, we posit that ambassadorial and task-coordinator activities are positively associated with internal cohesion and smooth internal processes, while the association is negative for scouting activity, but this hypothesis must be qualified. As we argued earlier, external process is likely to influence team performance. A substantial amount of literature has also established links between performance and these internal variables. We are postulating an additional direct link between external activity and internal process. Because external activity also affects internal process through its impact on performance, however, this direct link will be hard to isolate, observe, and measure. Hypothesis 5 is thus somewhat tentative.

RELATIONSHIPS BETWEEN EXTERNAL ACTIVITIES AND GROUP PROCESS AND PERFORMANCE

This part of the study tests the impact of external team activities and strategies on team performance and internal processes, using the same sample of 45 new-product teams described earlier. It relies primarily on the questionnaire data, although it uses a broader set of questions than described earlier. Thus, this section reports on measures, analysis, and results of hypothesis testing.

Measures

In addition to the measures of boundary activities, three other sets of variables were assessed: frequency of communication, team performance, and internal processes.

Frequency of communication. Team members were asked how often they communicated with nonteam individuals in the marketing, manufacturing, engineering, and product-management functions during the previous two-week period. They responded on 6-point scales, anchored by 1 = "Not at all" and 6 = "Several times a day." Because these functional groups had different names in the different companies, the questionnaires were modified to conform to company-specific terminology. Because these four groups represented everyone with whom team members would normally communicate in their work, these responses were averaged. Team scores were computed by averaging the individual scores ($\bar{X}$ = 2.54, s.d. = .78).

There has been a debate in the literature as to whether organization members can accurately assess communication patterns. Bernard and his colleagues (Bernard, Killworth, and Sailer, 1980; Bernard et al., 1984) claimed that asking people how much they talk to others produces inaccurate results. Individuals forget some communications and overcount others. Other researchers have countered this criticism by showing that organization members may not reproduce exactly the communications that have just occurred, but their bias is in the direction of long-term patterns of communication (Freeman, Romney, and Freeman, 1987). Respondents are thus not actually answering the question, "Who did I speak to in the last two weeks" but "In a typical two-week period, with whom am I likely to have spoken." Because our focus was on this more general pattern of

communication, the broad measure of communication frequency we used is appropriate.

Team performance. Following the stakeholder view of organizations, team performance cannot be seen as a simple, unidimensional, construct. First, as Goodman, Ravlin, and Schminke (1987) argued, group measures of performance must be both fine-grained and related to the task. If a group is responsible for completing an innovative new product, for example, then performance measures should include the group's innovativeness not just general member satisfaction. Second, Gladstein (1984) found that evaluations of group performance differ depending on whether group members or managers are doing the rating. This supports Tsui's (1984) contention that different constituencies often have different definitions of performance and suggests that ratings from these various constituencies be included in a study of group performance. The multidimensionality of performance may be particularly relevant when the outputs of a group are being assessed (Hackman and Walton, 1986). Finally, group researchers have found a lag effect between group process and performance (Gladstein, 1984; Bettenhausen and Murnighan, 1985; Ancona, 1990). This suggests that processes exhibited at time 1 may affect performance at time 1 or time 2. Going one step further, certain processes may have a positive effect in the short term but turn out to be negative over time. Thus, this research examines the impact of external processes on several measures of performance, as rated by both group members and top management, in the short term and at project completion.

We used subjective ratings of performance, albeit from multiple sources. While more objective ratings such as percent over budget or actual sales have been suggested (Clark and Fujimoto, 1987), it was our experience that these numbers were often interpreted through subjective lenses, were influenced by numerous external factors not under the control of the team (e.g., an economic recession), and were less important than managerial ratings in determining promotions, future job assignments, and performance evaluations.

Performance data were collected at two points. The initial performance ratings and measures of boundary activities were collected when the teams had been together an average of 10 months. Thus, the teams were approximately midway through their originally scheduled process (time 1). A second wave of performance data was collected approximately two years later, when teams had completed their projects or were in the final stages (time 2). Top division managers were asked at both time 1 and time 2 to assess the teams in their company on dimensions suggested by Hauptman (1986). Using 5-point Likert scales, they rated each team's efficiency, quality of technical innovations, adherence to schedules, adherence to budgets, and ability to resolve conflicts. Although the sample size was small, the performance items at each time were subjected to a principal components analysis to identify underlying patterns. Using the data collected at time 1, two factors emerged. One factor was defined by the questions about

adherence to budgets and adherence to schedule. We averaged those two items to form a single variable we labeled *budgets and schedules.* The remaining three items loaded on the second factor; we averaged them to create a variable we called *efficiency of innovation.* A different factor structure emerged when we analyzed the performance measures collected at time 2. One factor, which we labeled *innovation,* was defined solely by the single item about the quality of technical innovations produced. The second, which we labeled *team operations,* was defined by the remaining four items, which were averaged to form a scale score. To assure comparability of the performance ratings across companies, we adjusted individual scores for each team by subtracting the mean of the scores assigned to teams within that company. Thus, the performance scores were adjusted for company and the overall means set to zero.

One additional performance measure was collected at time 1. Team members were asked in the questionnaire to rate the performance of their teams on six dimensions, including efficiency, quality, technical innovation, adherence to schedules, adherence to budgets, and work excellence. These items were completed by all individuals, allowing us to do a principal components analysis of the items. The analysis yielded a single factor. A score, which we called *team rating,* was assigned to each team by averaging the individual members' scores (alpha = .83) ($\bar{X}$ = 3.63, s.d. = .38).

Internal processes. As Goodman, Ravlin, and Schminke (1987) have noted, task-oriented group processes may be more directly related to performance than more traditional affect-based measures of group process. Members' perceptions of the teams' work-related group process were assessed with three items. Individuals used 5-point Likert scales to indicate the team's ability to develop workable plans, define goals, and prioritize work; high scores defined better perceived processes (see Hackman, 1983). Since a principal components analysis yielded a single underlying factor, these three items were averaged to form a single scale (alpha = .86). A score was then computed for each of the 45 teams by averaging the individual scores of the members of the team ($\bar{X}$ = 3.69, s.d. = .43).

Many of the arguments suggesting a link between external activities and internal process use cohesiveness as an indicator of process. This more traditional affect-based measure was assessed using Seashore's (1954) four items, which ask members (1) how willing they are to defend one another from criticism; (2) how well they help each other; (3) how well they get along; and (4) the extent to which they stick together. These four items were averaged to form a single scale (alpha = .91). A score was then computed for each of the 45 teams by averaging the individual scores of the members of the team ($\bar{X}$ = 3.7, s.d. = .81).

Analysis

If the composite variables created by combining individuals' assessments of the teams' performance, internal process, and group cohesiveness represent distinct characteristics of a group, small within-group variances and large

between-group variances should be observed. In order to test the extent to which these variables were distinct from one team to the next, an analysis of variance was conducted using teams as the independent variable and the three composite scores as dependent variables. Results indicate that between-group variance was significantly greater than within-group variance for all three variables (team-rated performance: $p < .001$; task process: $p < .01$; cohesiveness: $p < .001$), suggesting that the composite scores reliably represented and distinguished teams.

Regression analysis was used to determine the relationships between both frequency of communication and type of activity and performance. This analysis allowed us to evaluate the usefulness of activity types, independent of the amount of communication, in predicting performance. Correlation analysis was used to examine the relationships between internal and external activity. Finally, additional insight into the relationships among strategies, performance, and internal process was assessed via analysis of variance across the four strategies.

Results

The correlational analysis indicates some significant relationships among external activity sets and performance measures. Table 2 shows means, standard deviations, and correlations among all variables. Ambassadorial activities are positively correlated with task-coordinator activities and negatively with scouting activities. Some performance measures are also interrelated, perhaps because the managements' ratings of performance were adjusted by a subtraction of the company mean to ensure comparability across companies. The two time-1 management ratings of performance were positively related and were both related to the time-2 measures of innovation. The teams' own ratings of performance, however, were unrelated to management's ratings of performance.

Of central interest in this part of the study are the relationships between the boundary activities and performance and between the boundary activities and internal processes. There is clear support for hypothesis 1, which posited a positive relationship between ambassadorial activity and performance. Correlational analysis shows ambassadorial activity to be positively associated with managements' ratings of teams' ability to meet budgets and schedules (time 1) and of team members' ratings of their own performance (time 1). There is also some relationship with managements' ratings of innovation (time 2). Table 3 reports regression equations for each of the five performance measures. Here, ambassadorial activity is only positively related to adherence to budgets and schedules (time 1), thus partially supporting hypothesis 1.

Hypothesis 2 posited a positive relationship between task-coordinator activity and performance. Correlational analysis shows that higher levels of task-coordinator activity were associated with higher ratings (two significant at $p < .05$; two marginal at $p < .10$) on all four management-provided performance measures (time 1 and time 2). The

Table 2

Correlations among All Variables

	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11
1. Frequency of communication	2.61	.86	–										
2. Ambassadorial activities	.14	.47	−.13	–									
3. Task-coordinator activities	.02	.43	.14	.26••	–								
4. Scouting activities	.02	.38	.00	−.38•••	.02	–							
5. Guard activities	−.15	.38	−.05	−.01	.07	.18	–						
6. Internal process	3.69	.44	−.16	.47•••	−.01	−.22•	−.12	–					
7. Cohesiveness	3.30	.46	−.54•••	.24•	−.10	−.23•	.25•	.39•••	–				
8. Budgets & schedules (time 1)	.01	.95	.24•	.45•••	.30••	−.43•••	−.08	.12	.02	–			
9. Efficiency of innovation (time 1)	.03	.79	.21•	.14	.22•	−.36•••	.04	.17	−.04	.42•••	–		
10. Team rating (time 1)	3.63	.38	−.48•••	.31••	.07	−.19•	.18	.58•••	.89•••	.03	.15	–	
11. Innovation (time 2)	.00	.64	.13	.23•	.43•••	−.41•••	−.11	.09	−.03	.53•••	.46•••	.03	–
12. Team operations (time 2)	.00	.63	.14	.02	.21•	.02	−.08	.08	.09	.17	.27	.00	.20

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

regression analysis shows that task-coordinator activity is no longer related to time-1 management-rated performance, perhaps due to multicolinearity. The relationship with innovation (time 2) remains very strong, showing partial support for hypothesis 2.

Hypothesis 3 posited a negative relationship between prolonged scouting activity and performance. Because most of our sample is measured well into the design period, we consider any reports of scouting to reflect prolonged scouting. Correlational analysis shows that scouting activities were negatively associated with ratings on the time-1 measures of budgets and schedules and innovation efficiency and the time-2 measure of innovation and team ratings of performance. The regression results also support the hypothesis, with scouting activities being negatively related to budgets and schedules (time 1), efficiency of innovation (time 1), and innovation (time 2).

Hypothesis 4 posited a positive relationship between the amount of external activity and performance. Correlational analysis shows that frequency of communication was marginally associated with time-1 meeting budgets and schedules and efficiency of innovation and highly negatively related to team ratings of performance. The regression analysis shows only a marginal positive relationship between frequency of communication and adherence to budget and schedule (time 1) and a significant and negative relationship with the teams' ratings of their own performance. Thus there is no support for hypothesis 4.

Hypothesis 5 posited relationships between internal processes and external activities. Correlational analysis shows groups with high levels of ambassadorial activities reported higher ratings of internal process and marginally higher ratings of cohesiveness than groups with low levels

Table 3

Regression Results*

Variable	Budgets & schedules (time 1)	Efficiency of innovation (time 1)	Team rating (time 1)	Innovation (time 2)	Team operations (time 2)
Frequency of communication	.25•	.17	−.46•••	.06	.11
Ambassadorial activities	.31••	−.04	.18	−.05	−.01
Task-coordinator activities	.19	.21	.09	.45•••	.20
Scouting activities	−.32••	−.38••	−.12	−.44•••	.01
Adjusted r^2	.31	.12	.24	.29	.00
F	5.24•••	2.26•	4.61•••	4.87•••	0.51

• $p < .10$; •• $p < .05$; ••• $p < .01$.
* Entries are standardized regression coefficients.

of this activity. No significant relationships between task-coordinator activity and internal process were found. Significant and negative relationships between scouting activity and cohesiveness and between scouting activity and internal task processes were observed, again showing support for hypothesis 5. This pattern of results generally supports hypothesis 5 and illustrates the complexity of the relationships between external activity and group process.

An analysis of variance using group strategy as the independent variable revealed significant differences in communication patterns across strategies, as shown in Table 4. Those teams following the ambassadorial strategy and the isolationist strategy have the lowest frequency of communications with outsiders and, although not shown, members of these teams spend the lowest percentage of their time with outsiders (12 percent and 10 percent, respectively). In contrast, technical-scouting and comprehensive teams have the highest frequency of external interaction and spend the highest percentage of their time with outsiders (18 percent and 16 percent, respectively). More in-depth analysis (Ancona and Caldwell, 1990) shows that ambassadorial activity (found in teams using ambassadorial and comprehensive strategies) may show low levels of external communication because individuals have high levels of communication with top-division and top-corporate management. This concentrated communication requires a lower frequency of interaction than the more diffuse communication patterns found with strategies involving scouting and task-coordinator activity. The latter reported high levels of interaction across manufacturing, marketing, and R&D.

The external strategies show different relationships to performance. While both ambassadorial and comprehensive strategies are related to achieving budgets and schedules in the short term (time 1), only the comprehensive strategy is positively related to performance over time (innovation, time 2). Both the technical-scouting teams and the isolationist teams have poor performance over time.

Table 4

Means of Dependent Measures across Four Strategies*

Strategies	Ambassadorial	Technical scouting	Isolationist	Comprehensive	p†
Characteristics					
Ambassadorial	.52[a]	−.21[b]	−.07[b]	.33[a]	<.01
Task coordinator	−.17[a]	.24[b]	−.32[a]	.36[b]	<.01
Scouting	−.20[a]	.38[b]	.18[b]	−.28[a]	<.01
Frequency of communication	2.17[a]	2.69[ab]	2.47[a]	3.24[b]	<.05
Internal processes					
Task process	3.89[a]	3.49[b]	3.70[ab]	3.78[ab]	<.10
Cohesiveness	3.14[a]	2.59[b]	2.80[ab]	2.64[b]	<.05
Performance					
Budgets & schedule (time 1)	.25[ab]	−.38[a]	−.37[a]	.83[b]	<.01
Efficiency of innovation (time 1)	−.03	−.17	−.01	.39	N.S.
Team rating (time 1)	3.61	3.40	3.45	3.55	N.S.
Innovation (time 2)	−.08[ab]	.01[ab]	−.42[a]	.37[b]	<.10
Team operations (time 2)	−.22	−.04	.13	.24	N.S.

* Common superscripts within the table reflect no significant differences in post-hoc mean comparisons.
† Significance refers to main effects from one-way analyses of variance using size as a covariate.

DISCUSSION

External Activities

We began this study with relatively few models of external activity. Moving from qualitative information gathering to quantitative clustering techniques, we were able to form a typology of four main activities and team strategies directed toward the environment. Ambassadorial activities provide access to the power structure of the organization as members promote the team, secure resources, and protect the team from excessive interference. Task-coordinator activities provide access to the workflow structure; they are aimed at managing horizontal dependence. Through coordination, negotiation, and feedback, these activities allow for a tighter coupling with other organizational units, often filling many of the gaps left by formal integrating systems. Scouting activities provide access to the information structure; they are aimed at adding to the expertise of the group. These activities allow the group to update its information base, providing new ideas about technologies and markets.

Interestingly, not all teams engaged in all forms of external activity but, instead, developed several distinct strategies toward outsiders. Some teams specialized in one particular activity, e.g., ambassadorial and technical-scouting teams; others showed relatively low scores on all activity sets, e.g., isolationist teams; and still others were more like generalists, combining ambassadorial and task-coordinator activity, e.g., comprehensives. These four group strategies are very similar to those found by Ancona (1990), and, together, these two studies provide support for the validity of these strategies as representing real patterns found in organizational teams today. In addition, this taxonomy

provides a basis for categorizing groups and differentiating their forms and the implications of those forms.

These external activities and strategies need to be added to our conceptualization of group process to represent more fully the wide range of what group members actually do. Perhaps by adding external initiatives to the already-present task and maintenance activities we can then go on to predict how external activities will influence the relationships between group process and other constructs. It also remains for future research to delineate more clearly the antecedents of external strategies. Hackman and Walton (1986) suggested examining the organization's treatment and support of groups. Top managers may approach certain teams and not others. Some organizational environments may reinforce some strategies and not others. Ancona (1990) has suggested that the team leader also plays a large role in determining a team's external strategy. The question is how do leaders choose how to direct their team?

External Activities, Performance, and Internal Process

The results of our hypothesis generating and testing point to two major findings. First, the pattern of external activities is a better predictor of performance than simply the frequency of communication. Second, and on a more speculative note, cycles may play a role in team behavior, so that a strategy that works in the early life of a group may not support positive performance over time.

While the information-processing theorists have long pointed to frequency of communication as a key representation of external activity, this study points to the advantages of examining the type of external activity. Our results indicate that frequent communication is marginally related to managements' ratings of performance at time 1 but not at time 2 and negatively related to members' ratings of performance. The activity sets are more strongly related to managements' ratings of performance than to the frequency of communication.

The comparisons of group strategies also illustrate the contribution of a content-based rather than a frequency-based approach to external interaction. If we were to look at external frequency alone, teams following an isolationist and ambassadorial strategy would be grouped together as low-frequency communicators, and teams following a technical scouting and comprehensive strategy would be grouped together as high-frequency communicators. Yet such a classification would mask great differences between teams. The technical scouting teams, for example, show some of the lowest performance and internal process scores, while those following the comprehensive strategy show some of the highest scores. Thus, while information-processing theorists would postulate that teams with a high frequency of communication would be better performers given the uncertainty and complexity of the high-technology, new-product team task and environment, this is not always the case, as shown.

This study also tells us something about the types of external activity needed for team effectiveness. The activity

sets related to the different performance measures in singular ways. Ambassadorial activities were related to managements' ratings of the teams' adherence to budgets and schedules at time 1. Task-coordinator activities, however, were positively related to managements' ratings of innovation at time 2. In contrast to this pattern, very general intelligence gathering—defined by a high level of scouting activity—was associated with low managerial ratings of performance at both time 1 and time 2.

Analyzing the team strategies provides a little more insight into the complex pattern of relationships between external activity and performance. While ambassadorial activities seem to be key to performance, their effect over the long term seems to hold only in combination with task-coordinator activities. Pure ambassadorial teams and comprehensive teams move along on budget and schedule at time 1. At time 2, however, the ambassadorial teams are poor at innovation and team operations, while the comprehensive teams continue to be the highest performers. Too much scouting activity, as shown by technical-scouting teams, is related to low performance ratings.

A very different pattern emerges when the team rates its own performance. Teams feel that they perform well when they concentrate their efforts internally; they reveal perceptions of performance that are negatively related to the frequency of communication and positively related to clear goals and priorities and high cohesiveness. Thus, predictors of management and team-rated performance are very different.

Ratings of internal task processes and cohesiveness show yet a different pattern. While frequency of communication alone and scouting activities are negatively related to cohesiveness and task processes, ambassadorial activities are positively related to internal measures. Comprehensive teams that combine ambassadorial and task-coordinator activities show positive internal task processes but low cohesiveness compared with the pure ambassadorial groups. Finally, isolationist teams show relatively high internal scores.

This set of results suggests that managing the power structure alone produces many positive outcomes in the short term. Ambassadorial teams can move along quickly on budget and schedule and develop effective task processes and cohesiveness. In terms of managerial ratings of performance, however, it is only teams that manage both the power structure and the workflow structure that are able to maintain performance over time. The comprehensive teams move ahead quickly on budgets and schedule in the short term, but they also manage to produce the most innovative products over the course of the development process. This finding is similar to that reported by Zurger and Maidique (1990). These teams pay a price, however, in that they are less cohesive than pure ambassadorial teams in the short term.

The technical scouting teams fare the worst on all dimensions. These teams have low performance ratings

from top management at time 1 and time 2 and low scores on internal task processes and cohesiveness. It may be that such teams constantly react to general environmental data and become unable to commit to producing a specific end product at a specific time. Or it may be that high levels of scouting activity somehow reduce the efforts team members put into the more performance-relevant external activities or into building effective internal processes. Another possibility is that the organization has given the team too general an assignment or expects too much, thus pushing the team to keep searching for the answer to an impossible question. This search can eventually undermine internal cohesion.

The isolationist teams, which most neglect external activity, also do quite poorly in terms of their performance at time 1 and time 2, yet their scores on internal task processes and cohesiveness are quite high. These teams may simply concentrate on internal activities and be oblivious to the negative feedback from other parts of the organization.

These different patterns of external activity, performance, and internal behavior suggest that some teams may enter cycles of activity early on that reinforce themselves over time and determine team outcomes. In this interpretation, external activity, internal processes, and performance all interact and influence one another. For ambassadorial teams this cycle might start with favorable managerial evaluations that give team members confidence and facilitate the creation of effective task processes and cohesiveness, but this cohesiveness, in turn, may cause teams to lessen external activity (Janis, 1982; Katz, 1982) and thus to fail to get the necessary feedback and do the coordination needed to produce an innovative product. This would have been the case with the Beaver project if people outside the team had not forced it to increase task-coordinator activity with other parts of the organization. Comprehensive teams, by contrast, begin both ambassadorial activity and task coordination early, thus providing feedback to the team from other groups from the very start. These networks pave the way for coordination and negotiation throughout the project, as seen in the Swallow and Devices teams. The constant interaction with outsiders and their divergent views and values may, however, account for these teams' inability to achieve the internal cohesion and efficiency achieved by the ambassadorial teams.

The technical-scouting teams seem to enter a cycle of complexity and negative performance. Our observations of these teams suggest that they enter a pattern of exploration that they cannot escape. Whether due to external conditions or their own beliefs, members of these teams continue to search for new approaches to their product. In turn, this exploration brings large amounts of conflicting information into the team, thus requiring complex internal interaction. As the complexity grows, both external and internal frustration develops, leading to negative managerial ratings of performance and internal conflict. Again, this cycle may feed on itself so that these teams cannot move on to reduce the complexity, define a product, and move it through the organization.

Finally, the isolationist teams create impermeable boundaries that allow them a cocoon-like existence. Internally, they work efficiently and cohesively, a cycle that reinforces the benefits of ignoring the outside world. The question here is what would happen to this cycle if these teams eventually were to realize how others view their work. The cohesiveness they've cultivated could dissipate if the outside world views their product unfavorably.

Organizations' increasing reliance on teams to develop products and processes requires that teams span traditional organizational boundaries. Furthermore, teams are being given increasing responsibility to define, market, carry out, and transfer their work. These new responsibilities require extensive external interaction with organization members outside the group's boundaries. The study of such groups thus must reach beyond the traditional research boundaries of groups and their internal processes to the wider organizational arena in which the group does its work.

REFERENCES

Alderfer, Clayton P.
1976 "Boundary relations and organizational diagnosis." In M. Meltzer and F. Wickert (eds.), Humanizing Organizational Behavior: 142–175. Springfield, IL: Charles C. Thomas.

Aldrich, Howard E., and Diane Herker
1977 "Boundary spanning roles and organization structure." Academy of Management Review, 2: 217–230.

Allen, Thomas J.
1984 Managing the Flow of Technology: Technology Transfer and the Dissemination of Technological Information within the R&D Organization. Cambridge, MA: M.I.T. Press.

Ancona, Deborah G.
1987 "Groups in organization: Extending laboratory models." In C. Hendrick (ed.), Annual Review of Personality and Social Psychology: Group Processes and Intergroup Processes: 207–231. Beverly Hills, CA: Sage.
1990 "Outward bound: Strategies for team survival in the organization." Academy of Management Journal, 33: 334–365.

Ancona, Deborah G., and David F. Caldwell
1988 "Beyond task and maintenance: Defining external functions in groups." Group and Organization Studies, 13: 468–494.
1990 "Beyond boundary spanning: Managing external dependence in product development teams." Journal of High Technology Management Research, 1: 119–135.
1992 "Demography and design: Predictors of new product team performance." Organization Science, 3: 321–341.

Ashford, Susan J., and Larry L. Cummings
1983 "Feedback as an individual resource: Personal strategies of creating information." Organizational Behavior and Human Performance, 32: 370–398.

Ashford, Susan J., and Anne S. Tsui
1991 "Self regulation for managerial effectiveness: The role of active feedback seeking." Academy of Management Journal, 34: 251–280.

Bales, Robert F.
1958 "Task roles and social roles in problem solving groups." In E. Maccoby, T. M. Newcomb, and E. L. Hartley (eds.), Readings in Social Psychology, 3d ed.: 437–447. New York: Holt, Rinehart and Winston.
1983 "SYMLOG: A practical approach to the study of groups." In H. H. Blumberg, A. P. Hare, V. Kent, and M. F. Davies (eds.), Small Groups and Social Interaction, 2: 499–523. New York: Wiley.

Benne, Kenneth D., and Paul Sheats
1948 "Functional roles of group members." Journal of Social Issues, 2: 42–47.

Bernard, H. Russell, Peter D. Killworth, David Kronenfeld, and Lee Sailer
1984 "On the validity of retrospective data: The problem of informant accuracy." In B. S. Siegel, A. R. Beals, and S. A. Tyler (eds.), Annual Review in Anthropology: 495–518. Palo Alto, CA: Stanford University Press.

Bernard, H. Russell, Peter Killworth, and Lee Sailer
1980 "Informant accuracy in social network data, IV: A comparison of clique-level structure in behavioral and cognitive data." Social Networks, 2: 191–218.

Bettenhausen, Kenneth, and J. Keith Murnighan
1985 "The emergence of norms in competitive decision-making groups." Administrative Science Quarterly, 30: 350–372.

Bourgeois, L. Jay, III, and Kathleen M. Eisenhardt
1988 "Strategic decision processes in high velocity environments: Four cases in the microcomputer industry." Management Science, 34: 816–835.

Burgelman, Robert A.
1983 "A process model of internal corporate venturing in the diversified major firm." Administrative Science Quarterly, 28: 223–244.

Chapman, Jennifer A., Nancy E. Bell, and Barry M. Staw
1986 "The managed thought: The role of self justification and impression management in organization settings." In H. Sims and D. Gioia (eds.), The Thinking Organization: 191–214. San Francisco: Jossey-Bass.

Clark, Kim B., and Takahiro Fujimoto
1987 "Overlapping problem solving in product development." Working Paper, Harvard University, Graduate School of Business Administration, Paper No. 87-048.

Dean, James W., Jr.
1987 Deciding to Innovate: Decision Processes in the Adoption of Advanced Technology. Cambridge, MA.: Ballinger.

Dougherty, Deborah
1987 "New products in old organizations: The myth of the better mousetrap in search of the beaten path." Unpublished Ph.D. Dissertation, Massachusetts Institute of Technology, Sloan School of Management.

Dutton, Jane E., and Susan J. Ashford
1992 "Selling issues to top management." Working Paper, University of Michigan, School of Business Administration.

Freeman, Linton C., A. Kimball Romney, and Sue C. Freeman
1987 "Cognitive structure and informant accuracy." American Anthropologist, 89: 310–325.

Galbraith, Jay R.
1977 Organization Design. Reading MA: Addison-Wesley.

Gersick, Connie J. G.
1988 "Time and transition in work teams: Toward a new model of group development." Academy of Management Journal, 31: 9–41.
1989 "Marking time: Predictable transitions in task groups." Academy of Management Journal, 32: 274–309.

Ginzel, Linda E., Roderick M. Kramer, and Robert I. Sutton
1993 "Organizational images as negotiated accounts: A dynamic conception of impression management." In L. L. Cummings and B. M. Staw (eds.), Research in Organizational Behavior, vol. 15. Greenwich, CT: JAI Press (forthcoming).

Gladstein, Deborah
1984 "Groups in context: A model of task group effectiveness." Administrative Science Quarterly, 29: 499–517.

Gladstein, Deborah, and James B. Quinn
1985 "Making decisions and producing action: The two faces of strategy." In Johannes M. Pennings and Associates (eds.), Organizational Strategy and Change: 198–216. San Francisco: Jossey-Bass.

Goodman, Paul S., Elizabeth Ravlin, and Marshall Schminke
1987 "Understanding groups in organizations." In L. L. Cummings and B. M. Staw (eds.), Research in Organizational Behavior, 9: 121–175. Greenwich, CT: JAI Press.

Gresov, Christopher
1989 "Exploring fit and misfit with multiple contingencies." Administrative Science Quarterly, 34: 431–453.

Hackman, J. Richard
1983 "The design of work teams." In J. W. Lorsch (ed.), Handbook of Organizational Behavior: 315–342. Englewood Cliffs, NJ: Prentice-Hall.

Hackman, J. Richard, and Richard E. Walton
1986 "Leading groups in organizations." In P. Goodman (ed.), Designing Effective Work Groups: 72–119. San Francisco: Jossey-Bass.

Hambrick, Donald C.
1983 "Some tests of the effectiveness and functional attributes of Miles and Snow's strategic types." Academy of Management Journal, 26: 5–26.

Hauptman, Oscar
1986 "The influence of task type on the relation between communication and performance: The case of software development." R&D Management, 6: 218–244.

Homans, George
1950 The Human Group. New York: Harcourt Brace Jovanovich.

Isenberg, Daniel J.
1986 "Group polarization: A critical review and meta-analysis." Journal of Personality and Social Psychology, 50: 1141–1151.

Janis, Irving L.
1982 Groupthink. Boston: Houghton Mifflin.
1985 "Sources of error in strategic decision making." In Johannes M. Pennings and Associates (eds.), Organizational Strategy and Change: 157–197. San Francisco: Jossey-Bass.

Katz, Ralph
1982 "The effects of group longevity on project communication and performance." Administrative Science Quarterly, 27: 81–104.

Katz, Ralph, and Michael L. Tushman
1979 "Communication patterns, project performance, and task characteristics: An empirical evaluation and integration in an R&D setting." Organizational Behavior and Human Performance, 23: 139–162.

Kerlinger, Fred N.
1973 Foundations of Behavioral Research, 2d ed. New York: Holt, Rinehart and Winston.

Lawrence, Paul R., and Jay W. Lorsch
1967 Organization and Environment: Managing Differentiation and Integration. Homewood, IL: Irwin.

Lott, Albert J., and Bernice E. Lott
1965 "Group cohesiveness as interpersonal attraction: A review of the relationships with antecedent and consequent variables." Psychological Bulletin, 64: 259–309.

Louis, Meryl R.
1980 "Surprise and sense making: What newcomers experience in entering unfamiliar organizational environments." Administrative Science Quarterly, 25: 226–251.

Malone, Thomas W.
1987 "Modeling coordination in organizations and markets." Management Science, 23: 1317–1332.

Miles, Robert E., and Charles C. Snow
1978 Organizational Strategy, Structure and Processes. New York: McGraw-Hill.

Nadler, David A., and Michael L. Tushman
1988 Strategic Organization Design: Concepts, Tools, and Processes. Glenview, IL: Scott, Foresman.

Nemeth, Christine J.
1986 "Differential contributions of majority and minority influence." Psychological Review, 93: 23–32.

Pfeffer, Jeffrey
1981 Power in Organizations. Marshfield, MA: Pitman.

Philip, Hugh, and Dexter Dunphy
1959 "Developmental trends in small groups." Sociometry, 22: 162–174.

Porter, Michael E.
1980 Competitive Strategy. New York: Free Press.

Roberts, Edward B.
1977 "Generating effective corporate innovation." Technology Review, October/November: 21–40.

Schein, Edgar H.
1988 Process Consultation: Its Role in Organization Development, vol. 1. Reading, MA: Addison-Wesley.

Schenkler, Barry R.
1980 Impression Management. Monterey, CA: Brooks/Cole.

Schmidt, Stuart M., and Thomas A. Kochan
1972 "The concept of conflict: Toward conceptual clarity." Administrative Science Quarterly, 17: 359–370.

Seashore, Stanley
1954 Group Cohesiveness in the Industrial Work Group. Ann Arbor, MI: Institute for Social Research, University of Michigan.

Shaw, Marvin
1971 Group Dynamics: The Psychology of Small Group Behavior. New York: McGraw-Hill.

Sherif, Muzafer
1966 In Common Predicament: Social Psychology of Intergroup Conflict and Cooperation. Boston: Addison-Wesley.

Smith, Kenwyn K.
1983 "An intergroup perspective on individual behavior." In J. R. Hackman, E. E. Lawler, and L. W. Porter (eds.), Perspectives on Behavior in Organizations: 397–407. New York: McGraw-Hill.
1989 "The movement of conflict in organizations: The joint dynamics of splitting and triangulation." Administrative Science Quarterly, 31: 1–20.

Tedeschi, James T.
1981 Impression Management Theory and Social Psychological Research. New York: Academic Press.

Thompson, James D.
1967 Organizations in Action: Social Science Bases of Administration Theory. New York: McGraw-Hill.

Tsui, Anne S.
1984 "A role set analysis of managerial reputation." Organizational Behavior and Human Performance, 34: 64–96.

Tushman, Michael L.
1977 "Special boundary roles in the innovation process." Administrative Science Quarterly, 22: 587–605.
1979 "Work characteristics and subunit communication structure: A contingency analysis." Administrative Science Quarterly, 24: 82–98.

Weick, Karl E.
1979 The Social Psychology of Organizing, 2d ed. Reading, MA: Addison-Wesley.

Zurger, Billie Jo, and Modesto A. Maidique
1990 "A model of new product development: An empirical test." Management Science, 36: 876–888.