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Structure and Learning in Self-Managed Teams: Why "Bureaucratic" Teams Can Be Better Learners

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This paper considers the effect of team structure on a team's engagement in learning and continuous improvement. We begin by noting the uncertain conceptual status of the structure concept in the small groups literature and propose a conceptualization of team structure that is grounded in the long tradition of work on formal structure in the sociology and organization theory literatures. We then consider the thesis that, at least in self-managed teams dealing with stable tasks, greater team structure—i.e., higher levels of specialization, formalization, and hierarchy—can promote learning by encouraging information sharing, reducing conflict frequency, and fostering a climate of psychological safety; that is, we examine a mediated model in which the effect of structure on learning and improvement in teams is mediated by psychological safety, information sharing, and conflict frequency. This model was largely supported in a study of self-managed production teams in a Fortune 100 high-technology firm, although the observed pattern of mediation was more complex than anticipated. Higher structure was also associated with actual productivity improvements in a subsample of these teams. The theory and results of this study advance our understanding of team learning and underscore the importance of team structure in research on team processes and performance.

Key words: learning; group structure; group processes
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Past research has suggested that organizational units tend to get better (i.e., are faster, are more efficient, and make fewer errors) with repeated task experience, i.e., the notion of a "learning curve" (Alchian 1963). The evidence also clearly suggests, however, that similar units within the same organization can differ dramatically in the rate at which they learn, improve, and/or benefit from experience (Argote and Epple 1990). Although much of this research has been conducted at the organization level of analysis, researchers have begun to examine the role of team-level factors in explaining observed differences in rates of improvement across teams engaged in repeated tasks (Pisano et al. 2001, Reagans et al. 2005). The emerging evidence suggests that team-level factors do help to explain heterogeneous learning curves across teams (for a review, see Edmondson et al. 2007).

In a complementary stream of research, scholars have worked to understand differences across teams in the degree to which they are engaged in the group processes that promote learning. This research begins with the assumption that to understand why some teams learn more quickly than others, we must first understand why some teams are more engaged in the activities associated with experiential learning (Kolb 1984), i.e., experimenting, observing and reflecting on successes and failures, etc. Empirical evidence in this research stream suggests that teams do differ in the extent to which they adopt these learning-oriented group processes, that these differences matter for performance, and that certain team-level factors can help to explain these differences (Bresman 2010, Bunderson and Sutcliffe 2003, Edmondson 1999, Gibson and Vermeulen 2003, Van der Vegt and Bunderson 2005).

Given these documented differences in learning rates and learning engagement across teams, a key agenda in both of the above research streams concerns the identification of team-level antecedent factors that can account for observed learning differences. In an attempt to identify these antecedents, researchers have looked to team norms and climate (Edmondson 1999, West and Anderson 1996), team composition (Cummings 2004, Ellis et al. 2003, Gibson and Vermeulen 2003, Van der Vegt and Bunderson 2005), team processes (Drach-Zahavy and Somech 2001, West and Anderson 1996), team identity (Van der Vegt and Bunderson 2005), team stability (Edmondson et al. 2003, Reagans et al. 2005), team context (Zellmer-Bruhn and Gibson 2006), and team leader behavior (Nembhard and Edmondson 2006). Investigations into these various antecedents have yielded important insights into the team-level factors that promote learning. At the same time, there is one category of team characteristics that researchers have generally overlooked in their search for learning antecedents, namely, the structure of a team, i.e., the division of labor into roles and role relations. Team structure is a central element of team functioning, with pervasive implications for team processes and outcomes (Shaw 1976, p. 240). It therefore seems likely that team structure would have important implications for team learning. It is not immediately clear, however, how team structure will affect team learning for at least two reasons. First, although teams researchers often use the term "structure" to refer to aspects of a team, there is no consensus about how to conceptualize structure at the team level. Second, although the relationship between structure and efficiency has been well established in the macro-organizational literature, the relationship between structure and learning has proven less straightforward (see Burns and Stalker 1961, Damanpour 1991).

The time is therefore ripe for an investigation into the structural antecedents of team learning. We lay the groundwork for that investigation by drawing on the deep and extensive literature on structure in the sociology and organization theory literatures to better articulate the key elements of team structure. We then consider specific ways in which team structure might affect a team's engagement in the processes that accelerate experiential learning in self-managed teams that perform repeated tasks. Our goal is to consider not only *whether* team structure is positively or negatively related to team learning but also, and perhaps more importantly, *how* team structure might relate to team learning, i.e., to articulate the intervening mechanisms by which structure might affect a team's propensity to engage (or not engage) in learning. Our theoretical model suggests that team structure can reduce conflict, foster psychological safety, and increase information sharing, which in turn encourages learning and continuous improvement. In other words, we will argue that, contrary to some assumptions about the stifling effects of high structure, more highly structured (i.e., more "bureaucratic") teams can be better learners. We test this theoretical model using multisource data obtained from a sample of self-managed manufacturing teams from a Fortune 100 high-technology firm. This theory and these results advance our understanding of the antecedents of team learning and underscore the importance of team structure in research on team processes and performance.

Theory and Hypotheses

Concepts, Definitions, and Boundary Conditions

Team Structure. Although the term "structure" is commonly used within the literature on groups and teams, there is little consensus about what should be included within that conceptual category. Groups researchers have used the term structure to refer to the composition of a group (see Cummings 2004, Gist et al. 1987, Keck and Tushman 1993, Wageman et al. 2005). The term structure is often used to conceptualize the design of tasks within a group, with particular emphasis on issues of interdependence and autonomy (Langfred 2009, Stewart and Barrick 2000, Tata and Prasad 2004, Wageman et al. 2005). Others have used the term structure to refer to status, roles, and/or norms (Ellis et al. 2003, Gladstein 1984, Levine and Moreland 1990, Wageman et al. 2005). Although all of these various constructs are certainly relevant in the analysis of groups, they are clearly not grounded in a common definition of the term structure.

In contrast, the concept of structure has a very well-developed meaning in the sociology and organization theory literatures. Blau (1974, p. 12) defined structure as "the distributions, along various lines, of people among social positions that influence the role relations among these people." In other words, structure is fundamentally concerned with the division of labor within a social group (Hall 1999)—the horizontal and vertical differentiation of roles and role relations that develops within a social group, deliberately or emergently, to facilitate collaborative work (Drazin 1995, Perrow 1986, Scott 1987). Building on the pioneering work of the Aston group (see Pugh and Hickson 1976), researchers typically apply at least three core elements to describe the structure of an organization: specialization, hierarchy, and formalization. Specialization refers to the horizontal division of labor (e.g., into different roles and role responsibilities), hierarchy refers to the vertical division of labor (e.g., into supervisors and subordinates),[1] and formalization refers to the explicit articulation of procedures, priorities, and regulations that govern relations between and among these differentiated roles.

There is abundant empirical evidence to suggest that these three elements of organizational structure tend to covary, and that attempts to structure activities will tend to involve all three. In fact, past factor analyses of multiple structural dimensions have shown that these three elements load together on one factor, which researchers have referred to simply as "the structuring of activities" (Child 1972, Grinyer and Yasai-Ardekani 1980, Pugh and Hickson 1976, Pugh et al. 1968). Moreover, this factor is distinct from and often negatively correlated with a second factor related to "the concentration of authority," suggesting that a clear structure can lessen the need for centralized oversight (Meyer 1968). Pugh and Hickson (1989) refer to a structure in which structuring of activities is high and concentration of authority is low as a "workflow bureaucracy." To be "bureaucratic," in this sense, is simply to be more highly structured.

It is important to note that there is nothing in these conceptualizations of structure that necessarily limits the relevance of the concept to only large organizations. Collaborative human enterprises of any scale face the same basic problems of dividing and coordinating labor that are at issue in the above literature. As Drazin (1995, p. 137) noted, "To be organized is, by definition, to be differentiated." We would, of course, expect the size of a social group to affect the complexity of its structure, as past research clearly suggests (see the summary in Scott 1987). However, this does not imply that sociological conceptions of structure are irrelevant to small groups or that the structure of small groups is somehow fundamentally different from the structure of large organizations. In fact, past research on structure in organizations has often been conducted in smaller units and workgroups without assuming any qualitative distinction between these smaller units and large organizations (see Fry and Slocum 1984, Van de Ven and Delbecq 1974, Hrebiniak 1974, Comstock and Scott 1977).

Our conceptualization of team structure builds on this theoretical tradition. Specifically, we suggest that a team is more highly structured when it has a more elaborate division of labor both horizontally (specialization) and vertically (hierarchy, e.g., a clear team leader), along with clearer procedures for coordinating and prioritizing work (formalization). In contrast, a team is less structured when member roles and responsibilities are loosely defined, when there is no clear team leader or leaders to coordinate work, and when there are few plans and procedures specifying how work is to be performed. Building from previous research (e.g., Pugh and Hickson 1976), this conceptualization of team structure views specialization, formalization, and hierarchy as related indicators of one underlying construct—the "structuring of activities"—rather than as independent constructs. We are interested in that underlying construct and not in its constitutive indicators separately, in whether a team is more or less structured (i.e., more "bureaucratic" in the Pugh and Hickson (1989) sense) and not in whether a team is more or less formalized, specialized, or hierarchical.

Team Learning. We examine team learning in this paper using the concept of team learning orientation. Extrapolating from theory and research on individual goal orientation (Elliott and Dweck 1988), Bunderson and Sutcliffe (2003) defined team learning orientation in terms of the shared goals that are implicitly pursued by team members within the context of a team. Specifically, teams with a stronger learning orientation pursue goals related to experiential learning, innovation, and competence development. These goals guide member efforts such that "teams with a stronger learning orientation will… pursue a greater number of new ideas related to a wider range of team activities as well as ideas that represent larger digressions from current thinking and practice" (Bunderson and Sutcliffe 2003, p. 553). Empirical research confirms that teams differ in the strength of their learning orientation and that these differences matter for performance (Bunderson and Sutcliffe 2002b, 2003).

The concept of team learning orientation is similar to the concept of team innovative climate (Anderson and West 1998) as well as the concept of team learning behavior (Edmondson 1999) in that all three concepts are concerned with a team's engagement or involvement in goals and activities related to experiential learning as separate from the question of whether a team actually learns and improves. The assumption underlying these research streams is that we must understand whether and how a team engages the process of experiential learning before we can manage that process. Moreover, the question of engagement in learning is separate from the question of how learning-related efforts might or might not translate into actual improvement. Empirical research within each of these streams confirms that engagement in learning-related goals and activities does differ across teams and that these differences help to explain observed differences in performance (Bain et al. 2001, Bresman 2010, Bunderson and Sutcliffe 2003, Edmondson 1999, Van der Vegt and Bunderson 2005, West and Anderson 1996).

Team and Task Boundary Conditions. The present study is explicitly concerned with teams that are able to develop their own structure, i.e., self-managed teams. Past research has suggested that employee involvement in the development of structural controls makes it more likely that those controls will be accepted by employees and result in positive rather than negative employee attitudes and behaviors (see Adler 1992; Adler and Borys 1996, p. 75). It follows that if there are positive consequences of structure for team learning as we are proposing here, we are more likely to observe those consequences in a self-managed team, where team members have the freedom to determine their own structure (Langfred 2009) than in a team where structure was imposed by management. We therefore view self-management as a boundary condition of our theory.

Moreover, we are interested in teams that must collaborate to accomplish an interdependent task. Teams in which tasks can be subdivided without any need for member collaboration do not face the same challenges associated with structuring collaborative work.

Finally, the theory developed in this paper is most appropriate for teams that deal with repeated tasks over time and therefore face the need to learn from past task experience (e.g., manufacturing teams, medical teams, cockpit crews, sports teams, restaurant crews, etc.); that is, we assume that a particular structure is designed (explicitly or emergently) to address a particular set of task requirements that remains reasonably stable over time. As Perrow (1986, p. 4) explained, "Without stable tasks there cannot be a stable division of labor." We would therefore expect that the theory and findings from this paper may be less relevant to teams that perform radically different tasks from one period to the next and therefore have more ad hoc and less stable team structures.

Structure and Learning in Self-Managed Teams

Past research in the macrostructure tradition has been very clear in asserting the benefits of structure for efficiency, predictability, and control. Highly structured, or more "bureaucratic," forms of organizing are generally seen as "the most efficient form of administration known in industrial societies" (Perrow 1986, p. 4; see also Weber 1947). At the same time, scholars have questioned whether a system organized for control and predictability can be effective at encouraging experimentation and fostering novel approaches (Scott 1987). In the words of Thompson (1965, p. 1), "The conditions within bureaucracy are found to be determined by a drive for productivity and control, and inappropriate for creativity." The classic argument, therefore, is that social systems can pursue either efficiency and control through more formalized structures, or they can pursue learning and innovation through more loosely prescribed and autonomous structures (see Burns and Stalker 1961).

The accumulated research evidence suggests that this classic argument may be situationally contingent. For example, Damanpour's (1991) meta-analysis of macro-organizational research on structure and innovation suggested that structure is positively related to innovation in some settings, particularly in manufacturing settings where innovation takes the form of continuously improving stable production processes (see also Adler 1992, Adler et al. 1996). In such settings, structure may actually provide the context for focusing and enabling innovative efforts (see Pierce and Delbecq 1977).

Our goal in this paper is to develop a related argument in the context of teams. Specifically, we will argue that structure can foster the conditions that promote learning and continuous improvement in self-managed teams that perform stable tasks by creating a safe and predictable team environment in which information is more freely shared and the frequency of conflicts is reduced, which encourages a learning focus; that is, we will suggest that higher structure can promote learning and continuous improvement in self-managed teams by affecting three key mediating team processes: information sharing, psychological safety, and conflict frequency.

Team Structure, Information Sharing, and Learning. Past research on information sharing in groups and, more particularly, on the sharing of uniquely held information has identified a number of conditions under which members of a group are more likely to share the information that they possess with other group members. For example, we know that information is more likely to be shared when group members each have an "expert role assignment," i.e., some piece of the group's task for which they are known to have the relevant information and accountability (Stasser et al. 1995, Stewart and Stasser 1995). Clear identification of expert roles facilitates information sharing by making it clear that members possess different information and by clearly indicating where within the group particular types of information can be found (see Liang et al. 1995, Moreland et al. 1996, Moreland 1999, Moreland and Myaskovsky 2000). Furthermore, past research also suggests that a formal leader (i.e., vertical role differentiation) can help to facilitate information sharing by ensuring that different pieces of information are shared and acknowledged during task-related interaction (Larson et al. 1998a, b).

This past research supports the notion that greater structure can foster information sharing in teams by clearly establishing who does what, who is responsible for what, and who reports to whom. This formal division of labor helps team members to parse, route, and source task-related information based on member roles and responsibilities. Greater team structure therefore facilitates information sharing by, first, suggesting a framework for parsing the complex flow of task-related information used by the team into meaningful chunks and, second, by suggesting that certain information chunks should be routed to or obtained from members with the relevant task responsibility. The effect of structure on information sharing within a team, then, is similar to the effect of a transactive memory system (e.g., Liang et al. 1995) in that both assume that the division of labor across members will affect the way a team processes information. Stated formally,

Hypothesis 1. *Team structure will be positively associated with information sharing in teams.*

Critics of structure may respond that greater structure will actually decrease information sharing by fostering tunnel-visioned team members who focus on their narrow responsibilities without considering those of others, perhaps trusting in a team leader to manage cross-role integration. Although we certainly acknowledge this alternative hypothesis, we would suggest that greater structure does not necessarily create either tunnel vision or centralized coordination. In fact, greater differentiation increases the need for the close coordination of differentiated parts, placing a premium on frequent and mindful information exchange (Adler 1992, Lawrence and Lorsch 1967). Moreover, the existence of hierarchy does not necessarily imply the use of centralized coordination, and in fact, greater structure can reduce the need for hierarchical intervention (Meyer 1968).

Past research clearly suggests that information sharing in groups is an important predictor of a group's engagement in learning. Information sharing encourages learning by exposing members to a larger and richer pool of ideas and data (Argote et al. 2001, Kanter 1988). Anderson and West (1998) found that information sharing is an important component of an innovative team climate. Moreover, Drach-Zahavy and Somech (2001) found that information exchange was associated with greater levels of innovation in a study of 48 intact work groups. These arguments and research findings lead to our second hypothesis:

Hypothesis 2. *Information sharing will mediate a positive relationship between structure and learning in teams.*

Team Structure, Psychological Safety, and Learning. Psychological safety has been defined as "a shared belief that the team is safe for interpersonal risk-taking" (Edmondson 1999, p. 354). We suggest that team structure can promote an environment of psychological safety within a self-managed group. Clarity around roles, procedures and priorities, and authority relations makes member relations and interactions more predictable and eliminates uncertainty in those relations, which sets an important foundation for intragroup trust (Edmondson 2004, Sitkin and Roth 1993): Members can interact with greater confidence in the outcome of interactions when they are clear on the roles to be played by each group member, on the rules and procedures governing coordination (along with associated punishments; Perrow 1986), and on how authority is distributed and exercised. In this way, team structure can lower defenses and foster a climate of psychological safety within a group.

In contrast, when there is lack of clarity around roles, procedures, and authority relations, the outcome of interactions among members of a group is much more difficult to predict. Members may disagree on what is and what is not appropriate behavior, whether a particular behavior is or is not role appropriate, and whether they have the authority to take particular actions. That is, the consequences of interpersonal risk taking in a group without clarity on roles, procedures, and authority relations are simply less predictable, and therefore, members are less likely to feel safe taking those risks. These arguments suggest the following hypothesis:

HYPOTHESIS 3. *Team structure will be positively associated with psychological safety in teams.*

At first glance, this hypothesis would seem to contradict research suggesting that psychological safety is less likely in teams where status differences exist (e.g., Edmondson 2002). Because our definition of structure involves vertical as well as horizontal differentiation, this past work would seem to imply that greater structure will reduce psychological safety. However, a careful examination of these past studies makes it clear that hierarchical status does not automatically compromise psychological safety in teams but, rather, that it depends on how hierarchical status is leveraged and, specifically, on whether those with higher status adopt a participative approach (Nembhard and Edmondson 2006). These findings are consistent with past research on structure that shows that the structuring of activities and the concentration of authority are not the same thing (Pugh and Hickson 1976). We suggest that it is centralization rather than structure that compromises safety in teams.

There is abundant evidence to suggest that psychological safety is positively associated with learning-related activities and behaviors in teams. In a sample of manufacturing teams, for example, Edmondson (1999) found that teams reporting higher levels of psychological safety engaged in more learning behaviors (as assessed by both members and observers). Nembhard and Edmondson (2006) found that psychological safety was associated with greater engagement in quality improvement within a sample of intensive care units. Baer and Frese (2003) found that a climate of psychological safety was associated with greater process innovations within a sample of midsized German companies, and Anderson and West (1998) found that "participative safety" is a key element of a group's innovative climate. These arguments support the following hypothesis:

HYPOTHESIS 4. *Psychological safety will mediate a positive relationship between structure and learning in teams.*

Team Structure, Conflict Frequency, and Learning. We would also suggest that team structure can reduce the frequency of conflict in self-managed teams. This expectation is based on two arguments: a territoriality argument and a task coordination argument. Theoretical work by Brown et al. (2005) has acknowledged that it is human nature for individuals working in organizations to become territorial when it comes to particular roles, relationships, and resources within their organization, and to both mark and defend these territorial claims. Brown et al. further suggest that behaviors intended to mark and defend one's territory will increase when (a) individuals believe they are otherwise unable to express their individuality, (b) there is ambiguity about ownership of the territory, and (c) there is concern about territorial infringement. They also suggest that conflict within organizations will tend to decrease when agreed-upon territories have been established.

Team structure establishes clearly defined territories within a team by dividing tasks and allocating responsibility for subtasks and decision making across team members. As a result, there is less ambiguity about territorial ownership and less of a need to fight about territorial boundaries or territorial infringement. Team structure further decreases the likelihood of territorial infringement by establishing priorities and procedures with penalties for infraction. It follows that group members will have less need to engage in territory-claiming or territory-defending conflicts in more highly structured teams.

Team structure can also reduce the frequency of conflicts by enhancing task coordination and reducing ambiguity with regard to roles, procedures, guidelines, and schedules. Structure makes clear to each team member who should be doing what as well as how and when they should do doing it. As a result, disagreements about the timing of exchanges, the scheduling of rotations, the format of information, etc., will simply be less frequent in more highly structured teams and, when they do occur, will take place against a backdrop of agreement about procedure (see Scott 1987, p. 34). Moreover, an agreed-upon hierarchy allows for an arbiter when conflicts become intractable and threaten to drag out. These arguments suggest the following hypothesis:

HYPOTHESIS 5. *Team structure will be negatively associated with conflict frequency in teams.*

We would also argue that conflict frequency will be negatively related to learning in self-managed teams performing repeated tasks. Although it is true that a dialectic between individuals with opposing views can lead to creative new syntheses in task groups (e.g., De Dreu and West 2001, Nemeth and Kwan 1987), frequent conflict redirects attention away from task-related goals (see Jehn and Mannix 2001) and toward conflict management. Furthermore, many of the conflicts that result from ambiguity around roles, relationships, and resources in teams are not the sort of conflicts that yield productive syntheses (Jehn 1995), especially if they are concerned with marking and defending territory. We therefore hypothesize the following:

HYPOTHESIS 6. *Conflict frequency will mediate a positive relationship between structure and learning in teams.*

In sum, we suggest that greater structure will have an overall positive effect on learning in self-managed teams and that this positive relationship can be attributed to increased information sharing, greater psychological safety, and less frequent conflict. The following section describes our efforts to empirically examine these hypotheses.

Method

Sample and Data

Hypotheses were tested using data obtained from self-managed production teams in a Fortune 100 high-technology firm. Each of the teams in this sample was responsible for a specific task within the firm's overall production process. These tasks differed, but all tasks required that team members work together to receive inputs, apply a transformation process to those inputs using highly sophisticated pieces of equipment, and forward outputs to the next station. The efforts of all team members were required to ensure that these tasks flowed smoothly, efficiently, and without errors or malfunctions. Teams were also responsible for the routine maintenance and repair of their equipment.

In performing these tasks, teams were expected to be self-managed by setting their own productivity and safety goals (within some quota range) and by determining how work would be divided and tasks and responsibilities allocated in pursuit of these goals; that is, teams had considerable autonomy to decide how they would structure their collective work efforts to accomplish their objectives. Teams also had considerable autonomy to decide who would act as a team leader or leaders and the extent to which the team would defer to a clear leader or leaders. There was, however, some input from external supervisors on this issue. Specifically, shift supervisors could assign one or more "area coordinators" within each team to help coordinate resources and activities within the team and with other teams and shifts. But we observed a great deal of variance across teams in the role that these coordinators played (if they played any role at all) and in whether the team even had a coordinator. Twenty-five percent of the teams had no coordinator, 25% had one coordinator, and 50% had more than one coordinator with as many as five coordinators on a team. It therefore seems unlikely that the external assignment of area coordinators had a significant impact on the structure of these teams.[2]

There were a total of 44 production teams in this organization representing 11 different production tasks and four different shifts; that is, 11 different production teams worked a given shift, and 11 new production teams came on at the end of that shift to perform the same set of tasks during the next shift and so on for the four shifts.[3] Data were collected in one of each shift's monthly meetings. After a brief description of the study, survey materials were distributed to all employees in attendance. Employees were informed that those who submitted a completed survey would be eligible for a cash prize drawn at random from the pool of shift respondents. Employees who were unable to attend their shift meeting for whatever reason (e.g., some technicians are required to stay on the manufacturing floor during shift meetings for safety reasons) were invited via follow-up announcements to pick up and complete the survey. An additional cash prize per shift was reserved for this group of technicians as an incentive for them to complete the survey.

The population surveyed included 369 individuals from 44 process teams across the four shifts. Usable surveys were received from 231 individuals, for a response rate of 63%. A team was included in this study only if at least two team members responded to the survey so that we could assess interrater reliability. The final sample used in this study therefore included 228 individuals from 40 teams. The mean team size was 8.53 members with a standard deviation (SD) of 2.57. The average within-team response rate was 69%, with an average number of respondents per team of 5.7 members. Respondents had an average of 1.3 years of team tenure ($SD = 0.6$) and 4.4 years of company tenure ($SD = 3.8$), 87.8% were male, 29.8% were ethnic minorities, and 75.9% had an associate's degree or higher.

A second survey was administered to shift supervisors and engineers who are not members of these teams but who are assigned to monitor and supervise their work. Each shift supervisor was assigned to work with several teams in a given shift and was expected to spend at least 50% of their time with teams on the factory floor. Because shift supervisors worked closely together, each supervisor had a good sense of how all of the groups on their shift (not just their assigned group) functioned. In addition, outside engineering managers were assigned to work with particular teams given the highly technical nature of the tasks performed by those teams. These engineering managers also had a very good sense for how their assigned teams functioned. In other words, supervisors and engineers had first-hand and comparative knowledge of these teams and were therefore in a good position to provide comparative team assessments.

Each supervisor was asked to complete a short survey evaluating their assigned teams as well as any other teams on their shift that they felt capable of evaluating, and each engineering manager was asked to complete the same survey to evaluate their assigned teams. We received a total of 81 responses to our observer survey with between 1 and 4 responses per team (mean $= 2.0$, SD $= 0.89$).

Measures

Team structure. Team structure was measured on the team member survey using five items developed for this study. As noted above, our conceptualization of *team structure* proposes that a team is more highly structured when it has a more elaborate division of labor both horizontally (specialization) and vertically (hierarchy), along with clearer procedures for coordinating and prioritizing work (formalization). Specific items were therefore developed to assess specialization, hierarchy, and formalization as follows: "our individual roles are very clear and we don't stray from them" (specialization), "there is a clear leader who directs what we do" (hierarchy), "we follow a very structured work schedule" (formalization), "goals and priorities are clearly communicated" (formalization), and "each team member has their particular area of specialty" (specialization). As noted above, we view specialization, hierarchy, and formalization as part of one structuring of activities factor, consistent with past work (Child 1972, Grinyer and Yasai-Ardekani 1980). We therefore computed *team structure* by first averaging the two specialization and the two formalization items and then computing the average of specialization, hierarchy, and formalization.[4] Cronbach's alpha for this three-item scale was 0.75. Note that *team structure*, as well as all of the scales on the team member survey, was assessed using a seven-point Likert scale ranging from 1 for "very strongly disagree" to 7 for "very strongly agree."

Information Sharing. Information sharing was measured using four items from Bunderson and Sutcliffe (2002a). Specific items included the following: "information is freely shared among members of this team," "when a member of this team gets information that affects the team, they are quick to share it," "members of this team work hard to keep one another up to date on their activities," and "all members of this team are kept 'in the loop' about key issues affecting the team." Cronbach's alpha for this four-item scale was 0.95.

Psychological Safety. Psychological safety was measured using four items from Edmondson (1999). Specific items included the following: "if you make a mistake on this team, it is often held against you," "members of this team are able to bring up problems and tough issues," "it is safe to take risks on this team," and "it is difficult to ask other members of this team for help." Cronbach's alpha for this four-item scale was 0.90.

Conflict Frequency. Conflict frequency was measured using a single item: "there are frequently conflicts and disagreements on this team." We used a single item because of space constraints (Wanous et al. 1997) and given our specific interest in the overall frequency of conflict (Wanous and Hudy 2001, p. 368; Sackett and Larson 1990, p. 468). We did, however, assess the reliability of this single-item scale using the procedures outlined by Wanous and Hudy (2001) and Wanous et al. (1997). Specifically, we administered a survey that included our single-item measure along with Jehn's (1995) multi-item task and relational conflict scale (eight total items) to a sample of undergraduate business students who had worked in groups for the duration of a semester-long organizational behavior course. Surveys were administered in class on the last day of class. We received usable data from 109 individuals working in 30 different groups (about a 73% usable response rate). Using the factor analytic method described by Wanous and colleagues (Wanous and Hudy, 2001; Wanous et al., 1997), the reliability of our single-item scale as a measure of combined task and relational conflict was 0.79.

Team Learning Orientation. Team learning orientation was assessed by combining three items from team members with two items from outside team observers. This combined measurement approach is based on the assumption that, whereas insider assessments provide in-depth insight about what really goes on in a team (even when the supervisor is not around), outsider assessments provide a more objective and comparative assessment while simultaneously mitigating concerns about same-source bias. Thus, whereas either measure alone provides an incomplete and potentially biased picture of the learning that may be going on within a team (Drach-Zahavy and Somech 2001), a combined measure gives us greater confidence that we are measuring something robust.

The three items used to measure *team learning orientation* on the team member survey were adapted for the present sample based initially on the scale used by Bunderson and Sutcliffe (2003), with modifications designed to more directly address issues of continuous learning and skill development around specific (manufacturing) tasks. Thus, each team member was asked to assess the extent to which the climate within their team encouraged all members to "continually look for more efficient ways to accomplish our assigned tasks," "always look for ways to improve quality and productivity," and "learn from one another as we do our individual jobs." Cronbach's alpha for this three-item scale was 0.92. This scale is similar to group learning behavior and group reflexivity scales used by Edmondson (1999), Drach-Zahavy and Somech (2001), and Schippers et al. (2003).

Outside observers were also asked to rate a team's learning orientation by comparing a given team with other teams on several dimensions that included the following: "continually improving work practices" and "helping team members develop their skills and competencies." The response set for these two items ranged from 1 for "far below average" to 7 for "far above average." Observers were asked to respond based on a consideration of the past six months. Reliability for this two-item scale, based on a Spearman Brown split sample approach (Hulin & Cudeck 2001), was 0.88.

The three items from team members were averaged to form a team member assessment of learning orientation, and the two items from outside observers were also averaged to form an observer assessment of team learning orientation. These two measures were then standardized and averaged to create a single measure of *team learning orientation* for each team, a measure that places equal weight on team member and outside observer assessments.[5] The reliability of this two item scale, again based on a Spearman Brown split sample approach, was 0.64. Given that the two items comprising this measure were obtained from different sources and therefore include additional variability in perspective, we saw this reliability as quite strong (see Van de Ven and Ferry 1980, p. 79). We also conducted a second-order confirmatory factor analysis of these items by comparing the observed data with a model in which the three team items loaded on one factor, the two observer items loaded on a second factor, and the two first-order factors loaded on a second-order factor. This measurement model fit the data extremely well ($\chi^2 = 0.92$, $p > 0.50$; root mean square error of approximation = 0.0; goodness-of-fit index (GFI) = 0.99; adjusted GFI = 0.95; standardized root mean square residual = 0.02).

Control Variables. We know from past research that group processes and outcomes can be strongly influenced by the composition of a group (Williams and O'Reilly 1998). Central among the compositional variables that have been shown to influence group processes and outcomes in past research are *group size*, *team tenure*, and *team tenure diversity* (Ancona and Caldwell 1992, Bantel and Jackson 1989, Katz 1982). We therefore controlled for these three variables in all regression models. *Group size* was measured as the number of members on a team and was obtained from team rosters. *Team tenure* was measured as years of experience with the current team and was obtained from team members via the team member survey. *Team tenure diversity* was measured from individual team tenure scores using the coefficient of variation (standard deviation of team tenure scores divided by the mean team tenure).

Aside from the demographic composition of a group, it may be that the composition of a group in terms of less observable member characteristics will also have an effect on team functioning. So, for example, it seems quite possible that the composition of a group in terms of *individual learning orientation* will affect learning-related group processes and outcomes. Past research has demonstrated that individuals with a learning goal orientation are more likely to engage in behaviors that promote skill and knowledge acquisition in achievement situations (e.g., Bell and Kozlowski 2002, VandeWalle et al. 1999). Research also suggests that average goal orientation scores across members of a team can affect group processes related to adaptation (LePine 2005). We therefore controlled for any possible effect of differences in team members' learning goal orientation across the teams in this sample by including a five-item measure of learning goal orientation from VandeWalle (1997) on the team member survey. Cronbach's alpha for this five-item measure was 0.88. *Individual learning orientation* scores were averaged across all team members to create an average learning orientation score for each team, as in LePine (2005).

Confirmatory Factor Analysis. We conducted a confirmatory factor analysis to examine the convergent and discriminant validity of all scales from our team member survey: *team structure* (five items), *information sharing* (four items), *psychological safety* (four items), *conflict frequency* (one item), team member assessments of *team learning orientation* (three items), and *individual learning orientation* (five items). The resulting six-factor and 22-item measurement model yielded a χ^2 of 355.3 with 195 degrees of freedom ($p < 0.01$), a confirmatory fit index of 0.95, and a goodness-of-fit index of 0.88, with all predicted paths significant at $p < 0.01$. These results support the validity of the proposed measurement model.

Data Aggregation. We computed team-level measures of *team structure*, *information sharing*, *psychological safety*, *conflict frequency*, and member assessments of *team learning orientation* by averaging scores from all members of a given team. To confirm that aggregation to the team level was warranted for these data, we examined interrater reliability across team members using the r_{wg} measure proposed by James et al. (1984).

Results suggested that ratings of these team-level constructs were generally similar across team members with median r_{wg} scores of 0.88 for *team structure*, 0.94 for *information sharing*, 0.92 for *psychological safety*, 0.93 for *conflict frequency*, and 0.94 for member assessments of *team learning orientation*.

We also examined the extent to which these constructs were meaningful team-level constructs in this sample by evaluating analysis of variance and intraclass correlation scores (see Bliese 2000). One-way analysis of variance suggested that all of the constructs that were conceptualized as team-level constructs in this paper (*team structure*, *information sharing*, *psychological safety*, *conflict frequency*, and member assessments of *team learning orientation*) varied significantly more across teams than within teams ($p < 0.05$ in all cases). In contrast, the one construct that was conceptualized as an individual-level construct in this study—*individual learning orientation*—did not vary more across teams than within teams ($p = 0.25$). Intraclass correlation (ICC) scores supported these results with ICC(1) scores of 0.20 for *information sharing*, 0.23 for *psychological safety*, 0.27 for *conflict frequency*, 0.07 for *team structure*, and 0.16 for team member assessments of *team learning orientation*. In comparison, the ICC(1) score for *individual learning orientation* was only 0.01.

Because assessments from multiple raters were combined to form observer assessments of *team learning orientation* in cases where more than one observer assessment was received (32 of 40 teams), we also examined interrater reliability (r_{wg} scores) for these observer ratings. The median r_{wg} score for observer assessments of *team learning orientation* across these 32 teams was 0.86.

Results

Table 1 includes means, standard deviations, and intercorrelations for all study variables. Two issues emerged from our analysis of Table 1. First, the pattern of significant correlations between *team structure* and the three team process variables, and between these process variables and *team learning orientation*, were all consistent with what we would expect to find based on our research model. Second, there were strong correlations among the three mediating process variables, raising a possible concern about multicollinearity in models including all three variables. We therefore computed and evaluated variance inflation factors in those regression analyses.

Table 2 summarizes the results of five separate regression models designed to test our hypotheses. Models 1 through 3 in Table 2 examine the relationships between *team structure* and *information sharing* (Model 1), *psychological safety* (Model 2), and *conflict frequency* (Model 3) after controlling for *team size*, *team tenure*, *team tenure heterogeneity*, and *individual learning orientation*. Only one significant relationship was found between the control variables and our process mediators: a positive and significant ($p < 0.01$) relationship between *individual learning orientation* and *psychological safety*. The addition of *team structure* to Models 1 through 3 added significant explanatory power to each model with positive and significant relationships between *team structure* and both *information sharing* and *psychological safety*, and a negative and significant relationship between *team structure* and *conflict frequency* ($p < 0.001$ in all three cases). These results provide strong support for Hypotheses 1, 3, and 5.

Although these results are encouraging, one might question whether observed relationships between *team structure* and our three mediating team process variables were inflated as a result of common method (or, more specifically, common source) variance because these four variables were all obtained from team members (Podsakoff et al. 2003). To address this concern, we conducted a "subgroup split" analysis by randomly dividing the members of each team into two subgroups of comparable size (equal for even-numbered teams, plus or minus one member for odd-numbered teams). We then created subgroup measures of *team structure*, *information sharing*, *psychological safety*, and *conflict frequency* by averaging across subgroup members. Finally, we reran Models 1 through 3 in Table 2 with *information sharing*, *psychological safety*, and *conflict*

Table 1 Descriptive Statistics and Correlations

Variable	Mean	SD	1	2	3	4	5	6	7	8
1. Team size	8.53	2.57								
2. Average team tenure	1.30	0.27	−0.02							
3. Team tenure heterogeneity	0.34	0.22	0.14	−0.13						
4. Individual learning orientation	5.86	0.37	0.06	0.11	0.13					
5. Team structure	4.32	0.51	0.19	−0.11	−0.13	0.07				
6. Information sharing	4.65	0.76	0.17	0.00	−0.08	0.22	0.77**			
7. Psychological safety	4.72	0.72	0.27	0.06	−0.15	0.39*	0.71**	0.83**		
8. Conflict frequency	3.87	1.09	−0.11	0.13	0.08	−0.14	−0.57**	−0.61**	−0.73**	
9. Team learning orientation	0.00	0.86	0.06	−0.14	−0.24	0.14	0.80**	0.80**	0.74**	−0.70**

*$p < 0.05$; **$p < 0.01$.

Table 2 Multiple Regression Results: Team Structure and Team Learning Orientation

	Model				
	1	2	3	4	5
	Information sharing	Psychological safety	Conflict frequency	Team learning orientation	Team learning orientation
Controls					
Team size	0.01	0.14	−0.00	−0.08	−0.08
Team tenure	0.07	0.09	0.08	−0.09	−0.09
Team tenure heterogeneity	0.01	−0.11	0.03	−0.15	−0.15
Individual learning orientation	0.16	0.35**	−0.12	0.12	0.05
Independent variable					
Team structure	0.76***	0.65***	−0.54***	0.77***	0.36*
Mediator					
Information sharing	—	—	—	—	0.40*
Psychological safety	—	—	—	—	−0.05
Conflict frequency	—	—	—	—	−0.27*
R^2	0.62	0.66	0.34	0.68	0.81
Adjusted R^2	0.56	0.60	0.24	0.63	0.76
ΔR^2 (final block)	0.53***	0.39***	0.27***	0.55***	0.13***
F statistic	10.97***	12.91***	3.47*	14.28***	16.02***

Notes. $N = 40$; standardized regression coefficients are reported.
*$p < 0.05$; **$p < 0.01$; ***$p < 0.01$.

frequency as assessed by one-half of a group as the dependent variables and *team structure* as assessed by the other half of the group as the independent variable. This approach mitigates concerns about common method bias because the independent and dependent variables in each model were obtained from different respondents. The observed pattern of significant results using this subgroup split approach was essentially identical to the pattern of results reported above. All of the coefficients that were significant in the prior analysis remained significant in the subgroup split analysis and at the same levels of significance in all cases. These results provide assurance that the significant relationships between team structure and team process described in Table 2 are not unreasonably inflated as a result of common method variance.

Models 4 and 5 in Table 2 examine relationships between *team structure*, *team processes*, and *team learning orientation*. In Model 4, we examined the relationship between *team structure* and *team learning orientation* after controlling for *team size*, *team tenure*, *team tenure heterogeneity*, and *average individual learning orientation*. The relationship was positive and significant ($p < 0.001$). In Model 5, we added *information sharing*, *psychological safety*, and *conflict frequency* to Model 4 to examine the effect of these process mediators on *team learning orientation* beyond the effect of the control variables and *team structure*. The addition of these process mediators explained an additional 13% of the variance in *team learning orientation* ($p < 0.001$) with a positive and significant coefficient for *information sharing* ($p < 0.05$) and a negative and significant coefficient for *conflict frequency* ($p < 0.05$), consistent with Hypotheses 2 and 6. The coefficient for *psychological safety* was not significant, providing no support for Hypothesis 4. None of the variance inflation factors in this model exceeded 7.0, suggesting that multicollinearity was not a significant problem.

The results in Table 2 are consistent with mediation based on the procedures outlined by Baron and Kenny (1986). We also tested mediation directly by examining the indirect effects of *team structure* on *team learning* through the proposed mediators in a multiple mediator model with bootstrapped estimates as recommended by MacKinnon et al. (2002; see also Preacher and Hayes 2008). The results of this analysis, presented in Table 3, suggest that *team structure* affects *team learning* through both *information sharing* and *conflict frequency* ($p < 0.05$ in both cases), but not through *psychological safety*. These results are consistent with Hypotheses 2 and 6 but not 4. After accounting for mediated effects, the direct effect of *team structure* on *team learning* remained significant at $p < 0.05$.

Post Hoc Analyses

The above results suggested no relationship between *psychological safety* and a *team learning orientation* in these teams. Given the robustness of this relationship in past research (Edmondson 1999, Nembhard and Edmondson 2006), we were led to wonder whether the other mediators in the model might actually be accounting for the effect of *psychological safety*, i.e., that the relationship between *psychological safety* and *team learning orientation* was being mediated by *information sharing* and/or *conflict frequency*. Further analyses examining indirect effects with bootstrapped estimates (Preacher

Table 3 Mediation Analysis: Indirect Effect of Team Structure on Team Learning Through Information Sharing, Psychological Safety, and Conflict Frequency

Indirect effects of team structure on team learning through	Product of coefficients			Bias-corrected 95% confidence interval (bootstrap results)	
	Estimate	SE	*T*	Lower	Upper
Information sharing	0.51	0.25	2.04*	0.11	1.12
Psychological safety	−0.06	0.23	−0.26	−0.55	0.37
Conflict frequency	0.25	0.13	1.92*	0.06	0.63
Total	0.70	0.22	3.19**	0.34	1.21

Note. SE, standard error.
*$p < 0.05$; **$p < 0.01$.

and Hayes 2008) strongly supported these post hoc hypotheses. Specifically, the total effect of *psychological safety* on *team learning orientation* was strongly significant ($p < 0.001$), but this effect was fully mediated by *information sharing* ($p < 0.01$) and *conflict frequency* ($p < 0.05$), with no residual direct effect ($p > 0.50$; consistent with full mediation). In other words, these data suggest that *psychological safety* does play a mediating role in the relationship between *team structure* and *team learning* but that this role is played out through the other process mediators.

Although team learning orientation provides a useful indicator of a team's focus on learning and continuous improvement, we were, of course, also interested in whether team structure was associated with actual productivity improvements. Unfortunately, we were not able to collect team-specific productivity data for all of the teams in this sample because of the level at which productivity is measured in this firm. We do, however, have team-specific productivity data for 16 teams, measured as number of units completed during each shift. We measured *productivity improvement* as the slope of these productivity numbers across a three-week period,[6] beginning the week in which survey data were collected, resulting in data for 11 total shifts for eight of the teams and 10 total shifts for the other eight teams. Because the slope of improvement as well as team member survey responses could be influenced by how well a team had been doing, we also computed average levels of productivity beginning two weeks before survey data were collected and continuing for one week (four total shifts). We standardized slopes and averages across teams performing the same task. The partial correlation between *team structure* and *productivity improvement*, controlling for prior productivity, was 0.57 ($p < 0.05$). Given the very small sample size, this result is quite striking and suggests that, in this sample, more structured teams were better learners.

Two additional post hoc analyses bear mention. First, we examined our models using just supervisor or just team member ratings as our dependent measure of team learning. Structure remained a significant predictor of learning with either dependent variable, and the addition of the mediators reduced the significance of the coefficient for *team structure* from $p < 0.001$ to a nonsignificant p value in both cases. However, the full hypothesized pattern of mediation was supported only with the combined measure of *team learning orientation*. Second, we found no evidence for a curvilinear (i.e., quadratic) effect of structure on team learning.

Discussion

The results of this study suggest that, in self-managed teams dealing with stable tasks, structure can promote learning by creating a safe and predictable team environment in which information is more freely shared and the frequency of conflicts is reduced. These findings and the theory upon which they are based make several important contributions to our understanding of teams, team structure, and the conditions that foster team learning and continuous improvement. Specifically, this study (a) proposes a conceptualization of team structure drawn from macro-organization theories, (b) develops and tests a theory relating structure to learning in teams, and (c) considers specific team processes that help to explain that relationship.

Structure and Learning in Teams

Although a "structure" category is often included in comprehensive models of team functioning and effectiveness (e.g., Bettenhausen 1991, Gist et al. 1987, Gladstein 1984, Levine and Moreland 1990), there is little consensus in the groups literature about what that category should include. One key contribution of the present study, then, is to suggest an approach to conceptualizing structure in teams that is grounded in the long and well-developed tradition of research on structure in the sociology and organization theory traditions (Weber 1947, Pugh and Hickson 1976). This approach begins with the assumption that the challenges associated with the structuring of collaborative human work are essentially the same in smaller as in larger groups, at the team level of analysis and at the organization level of analysis. We therefore build on the macro-organizational literature to conceptualize team structure in terms of the division of labor within a team both horizontally (specialization) and vertically (hierarchy) along with articulated procedures for coordinating relations among these differentiated roles (formalization). The present paper develops this conceptualization of team structure, considers its implications for a key process in teams (i.e., learning), and proposes a concise set of items for measuring team structure based on this conceptualization. This study therefore lays the foundation for future work examining the role of a group's structure in exerting, as Shaw (1976, p. 240) predicted, "a pervasive influence upon the behavior of the members of that group."

Moreover, past research on the antecedents of team learning has generally overlooked issues of structure, focusing instead on team process, climate, norms, or composition (see review in Edmondson et al. 2007). This oversight may be due, at least in part, to the uncertain role of structure in the groups literature as just noted. However, the tendency to overlook structure in models of team learning may also be due to the classic assumption that structure and learning are antithetical, that to formally structure activities is to stifle experimentation, learning, and the pursuit of new insights. Although research at the macro-organization level has challenged the universality of this assumption (e.g., Damanpour 1991), this view continues to surface in the teams literature, perhaps because teams are often viewed as the organizational antidote to too much structure (Barker 1993, Wellins et al. 1991). The present study directly challenges this assumption by suggesting that, in self-managed teams that perform stable tasks, structure can create a safe and predictable team environment that fosters a focus on experiential learning and continuous improvement. In addition to illuminating another potential antecedent of learning in teams, therefore, the results of this study provide additional evidence that sweeping generalizations about the "ills of bureaucracy" are too simplistic and fail to separate the consequences of structure from its abuses and misuses (see Perrow 1986, Adler and Borys 1996).

We should note that the relationship between structure and learning in these teams was only partially mediated by the three group process mechanisms that we identified in our theory—information sharing, psychological safety, and conflict frequency. This implies that there may be additional benefits of structure for a team's engagement in learning that we did not capture in our model. What might those benefits be? One possibility is that structure creates a sense of ownership and accountability, both of which have been shown to motivate intentional learning efforts (Pierce et al. 2003, Lerner and Tetlock 1999). Or, it may be that greater structure enables "focused development of new ideas, which can be assessed with greater precision than if team objectives are unclear" (West and Anderson 1996, p. 683). Perhaps greater structure facilitates "operational autonomy" (Bailyn 1985; Perrow 1986, p. 23) by reducing the likelihood of outside interference during task completion, which should increase motivation to learn (Amabile 1988, p. 147), or perhaps greater structure makes it easier for team members to understand and agree on their relationship to one another and to the task, akin to a shared mental model (Mathieu et al. 2000). These possibilities open several avenues for future research on structure and learning.

But before embracing the learning benefits of greater structure too enthusiastically, it is important to note that we are not proposing nor do we anticipate a positive relationship between structure and learning in all teams. This study was explicitly positioned within self-managed teams engaged in repetitive tasks because we reasoned that structure would be most likely to promote learning in that setting. Groups in which structure is imposed from above rather than determined by the group may be more likely to perceive structural controls as coercive rather than enabling (see Adler and Borys 1996), as constraints to be resisted rather than as aids to be exploited. In such cases, leaders, roles, and rules may even compromise psychological safety, stifle information sharing, or enhance conflict. Moreover, teams dealing with highly variable tasks are likely to find that a particular division of labor intended to deal with the coordination requirements of one task becomes inadequate or disruptive when applied to a new and different task. It follows that the benefits of structure in fostering a safe and predictable environment in which information can be freely shared and conflicts avoided may be difficult to realize in imposed structures or with variable tasks. In other words, the generalizability of these results beyond the specific context of self-managed teams and stable tasks should not be automatically assumed. An examination of the task settings in which structure may promote or discourage team learning therefore offers another promising extension of the present research.

Finally, the current study also broadens our understanding of the relationship between psychological safety and team learning. Whereas previous research by Edmondson and colleagues (e.g., Edmondson 1999, Nembhard and Edmondson 2006) has suggested a direct relationship between psychological safety and team learning, that relationship was not supported in our analysis. Given the surprising nature of this finding, we conducted post hoc analyses in which we found that although there is a significant relationship between psychological safety and team learning, this relationship is fully mediated by information sharing and conflict frequency so that it disappears when these other process variables are included in the model. This study therefore provides empirical insight into the intervening mechanisms by which psychological safety encourages team learning.

Study Limitations

There are certain cautions that should be exercised in interpreting and generalizing from this study given the characteristics of this sample, the design of this study, and the pattern of observed findings. For example, we took a number of measures in this study to mitigate concerns about common method bias. Specifically, we reexamined Models 1 through 3 in Table 2 using a split sample approach in which predictor and criterion measures were obtained from different sources. We measured team learning by combining team member and observer ratings (equally weighted) to mitigate concerns about same source variance in testing Models 4 and 5 from Table 2, and we conducted a post hoc analysis with the 16 teams for which actual productivity improvement data were available to examine the relationship between structure and actual improvement. Although these approaches do help to mitigate concerns about common source bias, the use of a completely different method for measuring structure (e.g., observer ratings, written rules, stated roles, etc.) and/or learning (e.g., actual improvement measures for all teams) would strengthen our confidence in these results.

We argued that a measure of team learning orientation that includes both team member and supervisor ratings is more valid than either measure in isolation because team member ratings can suffer from social desirability bias, and supervisor ratings of dimensions of team process or performance can reflect an overall halo rather than in-depth insight into team functioning (which did seem to be the case in our data). It is perhaps not surprising, therefore, that our mediated model was fully supported only with the combined dependent variable. Nevertheless, replication of these results with a behavioral measure of team learning orientation (e.g., actual evidence of trial-and-error learning) would provide greater confidence in the robustness of these results.

The use of a single item to measure conflict frequency is another limitation of this study. Although we employed established techniques to confirm that this single item is a reliable indicator of the broader construct, the use of a single item remains a blunt measure. One direction for future research, then, would be to reconsider the effects of structure on conflict and learning using multi-item measures of conflict that allow for an explicit consideration of different conflict types (e.g., task conflict versus relational conflict). Researchers could then consider the possibility that structure will have different implications for different types of conflict which, in turn, have different implications for learning.

Practical Implications

In an attempt to encourage continuous learning and process improvement within organizations, many teams eschew structural controls as stifling, constraining, and disempowering. In many cases, they do so not because they have necessarily discovered that structure inhibits learning, but rather based on fears about bureaucracy and the stifling effects of structure. The too-frequent result is inefficiency, poorly coordinated efforts, squandered resources, and member frustration. The results of this study suggest that dismissing structure as a matter of course when learning or innovation is the goal overlooks the very real learning benefits that might be gained in certain team settings from structuring activities. As Perrow (1986) has argued, structure and bureaucracy have become scapegoats for a wide variety of organizational problems which, ironically, would likely disappear if organizations and teams simply utilized structure appropriately.

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Endnotes

[1]Note that hierarchy is not the same thing as centralization. In fact, the existence of a clear hierarchy often seems to promote decentralization as suggested by a frequent negative and significant correlation between hierarchy (e.g., vertical span) and centralization in past research (see Child 1972, Grinyer and Yasai-Ardekani 1980, Meyer 1968).

[2]The zero-order correlation between the percentage of area coordinators on a team and our measure of *team structure* was 0.29 (not significant), and teams with one coordinator were not more structured than other teams.

[3]We explicitly considered the effects of data clustering as a result of the nesting of teams within shifts or tasks using random coefficient regression and found no significant clustering effects as a result of nesting (e.g., nonsignificant τ_{00} estimates in unconditional models, replicated patterns of significance for fixed effects; see Cohen et al. 2003).

[4]A principal components factor analysis confirmed that these five items load on a single factor (eigenvalue of 2.4, next highest eigenvalue of 0.81; loadings ranged from 0.66 to 0.74). To confirm that any observed effects of structure are due to the combined structure scale rather than to particular subscales, we also ran all of our regressions with the three subscales entered together as separate predictors in place of the combined structure scale. There was no evidence that any one subscale explains the majority of the variance in any of our dependent variables. Moreover, the combined structure scale explained more variance in every dependent variable than any of the subscales when entered alone. These results point to one underlying construct with three constitutive indicators as hypothesized.

[5]The pattern of significant results changes very little if we use a 60-40 or 40-60 weighting scheme to combine team member and supervisor ratings (although one mediator became significant at $p = 0.06$ rather than $p = 0.04$).

[6]Whereas in some settings productivity improvements may not be evident in just three weeks, these teams can see hundreds of iterations of their task in a given week. Observable improvements over a three-week period are therefore quite possible.

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