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The Teamwork Components Model: An Analysis Using Structural Equation Modeling

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THE TEAMWORK COMPONENTS MODEL:

AN ANALYSIS USING STRUCTURAL EQUATION MODELING

by

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ABSTRACT

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As the world increases in complexity, teams have assumed greater importance in the work place as a method used by organizations to cope with global competition and technological progress. Thus, an understanding of team processes and outcomes has become critical to individuals who study and work in organizations. The purpose of this investigation was to undertake a construct validation study of a model of the processes that underlie teamwork. This investigation was accomplished in two parts. A first study was conducted in order to determine the construct validity of scales that were developed to measure the nine teamwork components: task structure, team leadership, team orientation, communication, monitoring, feedback, backup, coordination, and performance. The Teamwork Components Questionnaire was administered to 150 individuals who were members of various types of teams. Structural equation modeling (i.e., LISREL) provided evidence of the validity of the proposed measurement models, and the results of confirmatory and exploratory factor analyses suggested revisions to further improve the validity of the questionnaire. In a second study, the revised questionnaire was administered to 135 teams, and LISREL was used again to determine the structural relationship among the teamwork components. Additional analyses served to test several specific hypotheses involving task structure and communication as independent variables. Unlike the first study, the second study used aggregated data to reflect the scores of entire teams. Empirical support was found for several of the proposed structural relationships and several of the hypotheses. In general, the most important findings concerned the pervasive effects of communication, considerate leadership, and team orientation on the remaining components. Contrary to what had been predicted, task structure was not found to exert a significant effect on communication. Practical implications of the research were suggested involving the design of training, the sophistication of technology, and the enhancement of the Teamwork Components Questionnaire. Theoretical implications related to the issues of aggregation and the multidimensionality of the constructs. It was concluded that the importance of teamwork cannot be overemphasized in today's increasingly sophisticated society. This research may serve as the first step toward a more comprehensive approach to studying teams.

DEDICATION

This dissertation is dedicated to

my parents, Sol & Beverly Rosenstein

and my grandmother, Mrs. Esther Greenspan

and to the memory of my grandparents

Max Greenspan

and

Nathan & Mollie Rosenstein

who made sacrifices so that I would have opportunity, who have always served as my inspirations, and from whom I learned the value of patience, persistence, and hard work.

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I am also appreciative to my other committee members, Debra Major and Bruce McAfee, for the time that they committed to this project and to Jackie Winston and Mary Boswell for the numerous times that they made my life a little bit easier. This research was truly a team effort, and I will forever be indebted to the kind individuals who willingly gave of their time to participate in this project. Finally, I thank the American Psychological Association and the National Science Foundation for their financial support of this research.

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I. INTRODUCTION

As the world increases in complexity, teams have assumed greater importance in the work place as a method used by organizations to cope with global competition and technological progress. Often, one individual cannot be expected to resolve the problems imposed by modern tasks. Teams are advantageous because of the variety of knowledge and skills that they have to offer (Salas, Dickinson, Converse, & Tannenbaum, 1992). Equally as often, organizational decision-makers believe that a group will produce a higher quality outcome than an individual acting alone (Hackman & Morris, 1975). Work teams or task groups connect the individual and the organization as a whole (Gladstein, 1984). Thus, an understanding of team components and outcomes has become critical to individuals who study and work in organizations.

Teams have been described in diverse ways throughout the literature. For instance, Boguslaw and Porter (1962, p. 388) used the term team to characterize

> a relationship in which people generate and use work procedures to make possible their interactions with machines, machine procedures, and other people in the pursuit of system objectives.

These authors emphasized how teams are created in order to accomplish certain goals. Similarly, Meister (1976, p.232) suggested that teams are distinguished from groups based on one critical difference: "Team behavior is directed by external goals . . . whereas group behavior is much more self-directed."

Klaus and Glaser (1968) also differentiated between teams and groups. Among the notable characteristics of teams, Klaus and Glaser included: organization, formality, rigidity in structure, well-defined positions, and dependence upon coordination. Contrarily, groups were identified by their indefinite structure, lack of designated positions, and reliance upon the independent contributions of individuals.

The definition of team used throughout this research will come from the composite description proposed by Salas et al. (1992), who incorporated the contributions of several authors (e.g., Dyer, 1984; Hall & Rizzo, 1975; Modrick, 1986; Morgan, Glickman, Woodward, Blaiwes, & Salas, 1986; Nieva, Fleishman, & Reick, 1978). Salas and colleagues (p. 4) defined a team as

> a distinguishable set of two or more people who interact, dynamically, interdependently, and adaptively toward a common and valued goal/objective/mission, who have each been assigned specific roles or functions to perform, and who have a limited life-span of membership.

The purpose of the current research was to study a model of teamwork components that indicated the major processes underlying the attempt by team members to accomplish a particular task. Scales were developed to assess the specific teamwork components, and structural equation modeling was employed to study the validity of both the measures and the proposed model of the relationship among the components. The studies were conducted with over 100 teams in corporate field settings, a rare occurrence in team research.

Before presenting the methodology and results of the research, a brief review will be provided of some major theories that specify the components and processes characterizing teams. Next, the Teamwork Components Model, which served as the basis of the research, will be discussed, and specific hypotheses will be derived. Finally, the introduction will culminate in a rationale for the specific purposes of the study. The section that immediately follows reviews some of the major and most well-supported theories of teams. While there have been other conceptualizations of the processes that underlie teamwork, the following theories are among the most widely cited and empirically supported accounts.

Theories of teams

Gersick's time and transition model. Gersick (1988, 1989) formulated a model of group development and change that indicates how a group attempts to accomplish tasks over its life span. Based on an investigation of eight different types of teams, the time and transition model suggests that the progress of groups is a "punctuated equilibrium" in which inertia alternates with radical change. In every type of team studied by Gersick (1988), team members followed an agreed-upon plan toward task accomplishment in a so-called period of inertia, until they arrived at the midpoint in their time schedule. Halfway towards task completion, a major transition occurred as the team decided upon a new plan. Gersick (1989) found additional support for this field-based model using laboratory simulation.

Gersick's (1988, 1989) model emphasizes the dynamic character of team performance and indicates the role of timing in teams' decisions to change or adhere to their task performance plans (Salas et al., 1992).

TEAM model. A combination of the work of Gersick (1988, 1989) and Tuckman (1965), the Team Evolution and Maturation Model (TEAM) suggests how teams evolve through developmental stages before, during, and after task performance. The TEAM model was developed by researchers at Old Dominion University as part of a project for the United States Navy (Morgan et al., 1986).

According to the model, existence of the team is prefaced by a pre-forming stage that represents the environmental forces that lead to the creation of the team. The team is formulated during its first meeting (forming) and progresses through an often unstable period of exploration (storming). The establishment and acceptance of roles (norming) precedes often inefficient performance (performance-I), subsequent re-evaluation and transition (reforming), rechanneling of energy (performance-II), task completion (conforming), and the dispersion of the team (de-forming).

In the initial phase of the project, Morgan and colleagues (1986) proposed that teams originate at different developmental stages, depending upon the experience and expertise of the members, the characteristics of the assigned task, and the environmental circumstances. All teams do not necessarily progress through every stage, and teams spend varying amounts of time in the stages through which they do proceed.

Effective team performance is dependent upon the merging of two tracks. The "operational team skills training" track concerns the comprehension and acquisition of pertinent task-oriented skills by team members. The "generic team skills training" track involves the development of behaviors (i.e., coordination, adaptation, communication, compensatory behavior, performance monitoring, and relaying and receiving feedback) and attitudes necessary for effective team functioning. The activity tracks eventually merge after the occurrence of "intragroup conflict," denoting the convergence of tasks and skills prior to or at the moment of task performance. Inevitably, the tracks diverge again to reflect the dispersion of the team and its members.

An analysis of critical-incident interviews conducted with Navy tactical team members established validity for the TEAM model and also determined that TEAM methodologies enable the discrimination of effective from ineffective teams (Morgan et al., 1986). Subsequent research demonstrated the generalizability of the components in different training environments (Glickman, Zimmer, Montero, Guerette, Campbell, Morgan, & Salas, 1987; McIntyre, Salas, Morgan, & Glickman, 1989; Oser, McCallum, Salas, & Morgan, 1989; Zimmer, Blacksher, Glickman, Montero, & Salas, 1988). This later research also led to a faceted definition that emphasized teamwork as a set of values and behaviors necessary for a team to achieve goals and to adapt to the circumstances that it confronts in the work environment. Team members are viewed as sharing a common frame of reference (team performance and outcomes), such that members monitor the performance of other members out of a concern for the welfare of the entire team. Team members are also viewed as providing feedback to other members on the basis of information derived from their monitoring. Members engage in "closed-loop communication" such that the individual sending information ensures that it is received as intended. Members provide backup for other team members when circumstances make it necessary to do so.

Recently, researchers at Old Dominion University have proposed a model of the processes that underlie team performance, conceptualizing teamwork as being comprised of seven components. These researchers have also developed measures of the teamwork components for the Navy environment (Dickinson, McIntyre, Ruggeberg, Yanushefski, Hamill, & Vick, 1992). This model will be discussed in depth below.

The TEAM model, like the subsequent research on teams at Old Dominion University, is noteworthy for its detailed conceptualization of the processes underlying team performance. Approaching the study of teams from a developmental perspective, this research recognizes the importance of both the technical skills and attitudes of team members.

Task group effectiveness model. Unlike the two developmental perspectives of teams discussed above, Gladstein's (1984) model suggests that both group-level variables (i.e., group composition and group structure) and organizational-level factors (i.e., availability of resources and organizational structure) are antecedents of group effectiveness. Both group and organizational variables exert a direct effect on the group processes, including communication, conflict, and planning of strategy. Moderated by group task demands (e.g., task complexity, environmental uncertainty, and interdependence), group processes result in group effectiveness (i.e., performance and satisfaction). Using a sample of 100 sales teams from the communications industry, Gladstein found support for the proposed model.

This model makes several contributions towards an understanding of team performance. For instance, it underscores the importance of group processes, the moderation of the process-performance relationship by group task demands, and the influence of the organizational and environmental contexts on team performance (Salas et al., 1992).

The remaining models in this section also recognize the important role played by group task demands in the performance of the team.

Team performance model. Nieva and colleagues (1978) based their model of team performance on the conclusions of their review of team research. These authors suggested that team performance is a dependent variable composed of responses apart from the demands imposed by the stimuli that constitute the task. The task behaviors of members and the task functions of the team are the two major components of team performance. While either component may predominate in the determination of team performance, often team performance is mutually determined by these two components in tandem.

Additionally, Nieva et al. (1978) proposed that team performance is a function of four classes of variables: external conditions; the skills, abilities, and personality characteristics of individual members; team characteristics (e.g., size, group cohesiveness, intra- and inter-team cooperation, and communication); and task characteristics and demands. The authors also proposed four categories of team functions, which describe the operations of teams as a whole: team orientation functions (generation and distribution of information to members), team organizational functions (organization and coordination of team effort), team adaptation functions (cooperative behaviors), and team motivational functions (energizing members towards accomplishing team goals).

In a follow-up project, Shiflett, Eisner, Price, and Schemmer (1982) modified the taxonomy proposed by Nieva et al. (1978) based on observations of Army combat and combat support teams. The modification entailed the revision of the functions into five categories, instead of four: team orientation, resource distribution, timing, response coordination, and motivation. Cooper, Shiflett, Korotkin, and Fleishman (1984) applied this revised taxonomy in their development of a prototype team assessment technique for tactical command and control systems.

The research conducted by Nieva and colleagues (1978) emphasizes the multidimensional aspect of team performance and is important for its distinction between the task facing the team and the responses of team members.

Task-oriented models. Some models, such as those proposed by Dickinson (1969), Dieterly (1988), and Naylor and Dickinson (1969), suggest that achievement of the overall team goal is a result of the effective performance of subtasks. The proponents of these models recommend that the performance requirements of the subtasks be examined as a preliminary step toward the development of training programs.

Dickinson (1969) and Naylor and Dickinson (1969) suggested that an examination of performance requirements necessitates an analysis of task structure (i.e., complexity and organization of the subtasks), work structure (i.e., the assignment and allotment of subtasks to team members), and communication structure (i.e., patterns of interaction among team members). This task-oriented model also predicts that when few interdependencies exist among subtasks (low task organization), team members are able to concentrate solely on their assigned subtasks and can accomplish a large number of assignments. Communication and coordination will not usually play key roles in team performance when the task is a simple one, and the training of individual skills is usually sufficient for effective team performance. However, when the subtasks engaged in by the team are highly interdependent (high task organization), coordination and communication become very important. Further, more than one team member must often be assigned to the same subtask. Several studies have found support for the predictions of the task-oriented models (Briggs & Johnston, 1967; Meister, 1976; Naylor & Dickinson, 1969; Wagner, Hibbits, Rosenblatt, & Salas, 1977).

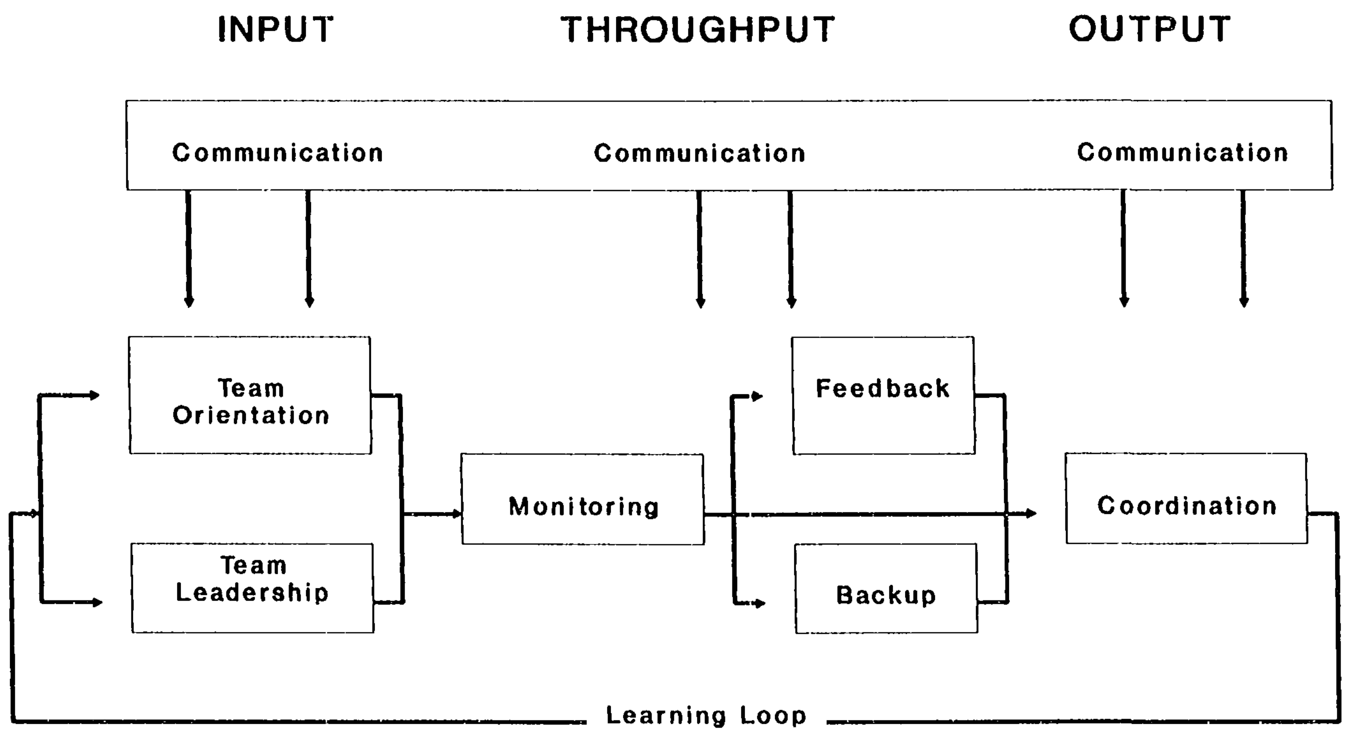
The basic contribution of the task-oriented models to the team literature is their description of task structure and their emphasis on the group task in teamwork.

Team Processes, Team Performance, and Task Demands

The focus of the present research is an integration of the Teamwork Components Model posited by Dickinson and colleagues (1992) and the process-performance propositions formulated by Hackman and Morris (1975). While the former model elaborates upon the processes underlying teamwork, the latter approach emphasizes the importance of task structure and the group interaction process.

Teamwork components model. The research on teamwork has identified several components that emphasize sharing of information and coordination of activities as the antecedents of effective team performance. Figure 1 presents the Teamwork Components Model as specified by Dickinson et al. (1992).

This model (Dickinson et al., 1992) contains seven components:



<u>Figure 1</u>. The Teamwork Components Model

(1) Communication involves the active exchange of information among team members;

(2) Team orientation includes the attitudes of team members toward one another, the team task, and the team leadership (e.g., self-awareness as a team member and group cohesiveness);

(3) Team leadership includes guidance by formal leaders and other members;

(4) Monitoring team performance occurs through the observation and awareness of the activities and performance of members;

(5) Feedback occurs when teams adapt and learn from their performance;

(6) Backup behavior involves assisting other team members to perform their tasks; and

(7) Coordination occurs when team activities are executed in response to the behavior of other members. Successful coordination indicates that other components of teamwork are functioning effectively. Coordination may be regarded as dependent on the remaining components of teamwork.

Dickinson et al. (1992) developed measures of the seven aforementioned components for naval teams functioning in the anti-air warfare environment. Strong content validity was established for the measures.

Process-performance propositions. Conceptualizing a team as a system, Hackman and Morris (1975, p. 50) suggested that input variables (e.g., individual-, group-, and environment-level factors) affect team performance outcomes through the process of interaction. Specifically, the authors stated that "the reason for obtained input-performance relationships always is available . . . in the interaction process itself." This idea is based upon an input-process-output framework originally developed by McGrath (1964) (see Figure 2). One environmental-level factor that exerts a strong influence on the interaction process is the task assigned to the team, as illustrated by task-oriented models and as demonstrated by a variety of studies (e.g., Carter, Haythorn, Meirowitz, & Lanzetta, 1951; Deutsch, 1951; Hare, 1962; Morris, 1966; Talland, 1955).

Hackman and Morris (1975) outlined a three-part explanation to account for the effect of group interaction on group performance. First, they proposed that three summary variables determine group performance: the effort exerted by group members, the task performance strategies used by the members, and the knowledge and skills of members. Second, they suggested that the summary variables are influenced by the group interaction process; additionally, the importance of group interaction depends upon the task assigned to the group. Thus, "the specific roles that group interaction plays in a given situation will depend substantially on the task being performed" (p. 62). Finally, different summary variables, or combinations of these variables, are evoked by different tasks. As Hackman and Morris suggested,

> which . . . summary variables 'will make a

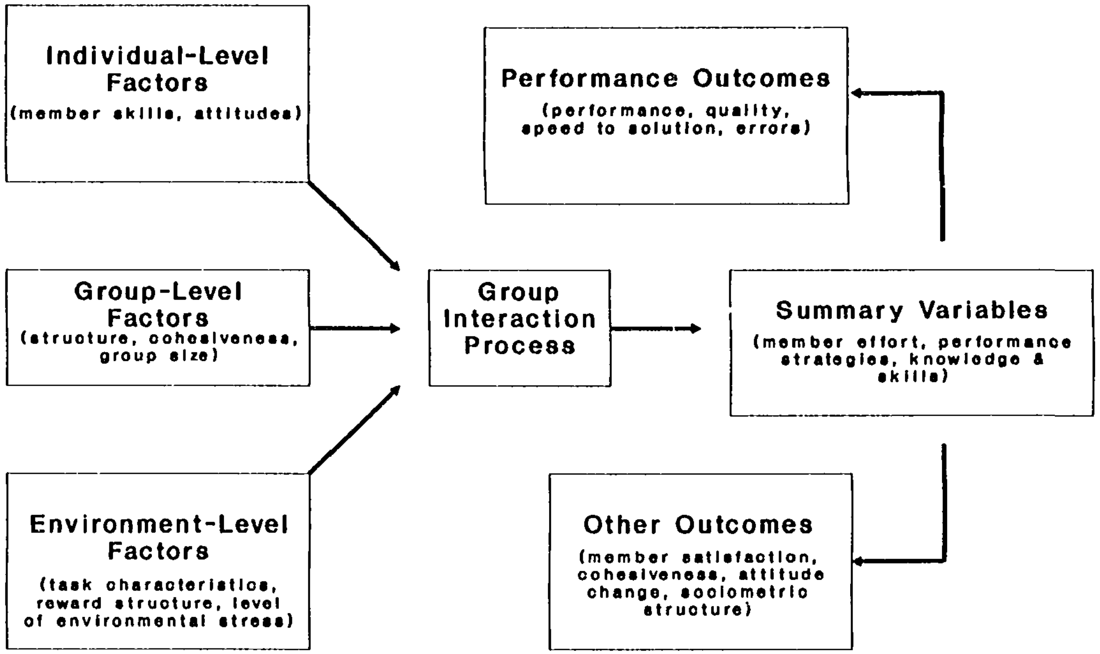


Figure 2. McGrath's (1964) Input-Process-Output Model

> difference' in measured group effectiveness is heavily determined by the type of group task on which the group is working. (p. 63)

For instance, member effort may be paramount in a group tug-of-war game, while collective knowledge may be the most critical factor in a group vocabulary test. Hackman, Brousseau, and Weiss (1976) provided evidence in support of the Hackman-Morris propositions.

However, in 1987, Hackman proposed that the relationship between input, process, and output may not exist according to the traditional perspective as depicted in Part A of Figure 3. Part B demonstrates that input conditions, such as task structure, may directly affect both group interaction and group performance. Alternatively, Part C depicts a third possibility. While task structure may directly influence both group interaction and group performance, a reciprocal relationship may also exist between the latter two variables. Hackman added that currently, there are no data to determine which alternative best depicts the relationships among input, process, and output variables.

Integration. The Teamwork Components Model (Dickinson et al., 1992) can be considered within the larger framework proposed by Hackman and Morris (1975) with a few modifications. First, it is possible to broaden the conceptualization of summary variables to include the core components specified by Dickinson and colleagues. Thus, team performance is determined by team orientation, team leadership, and the other components. Second, group

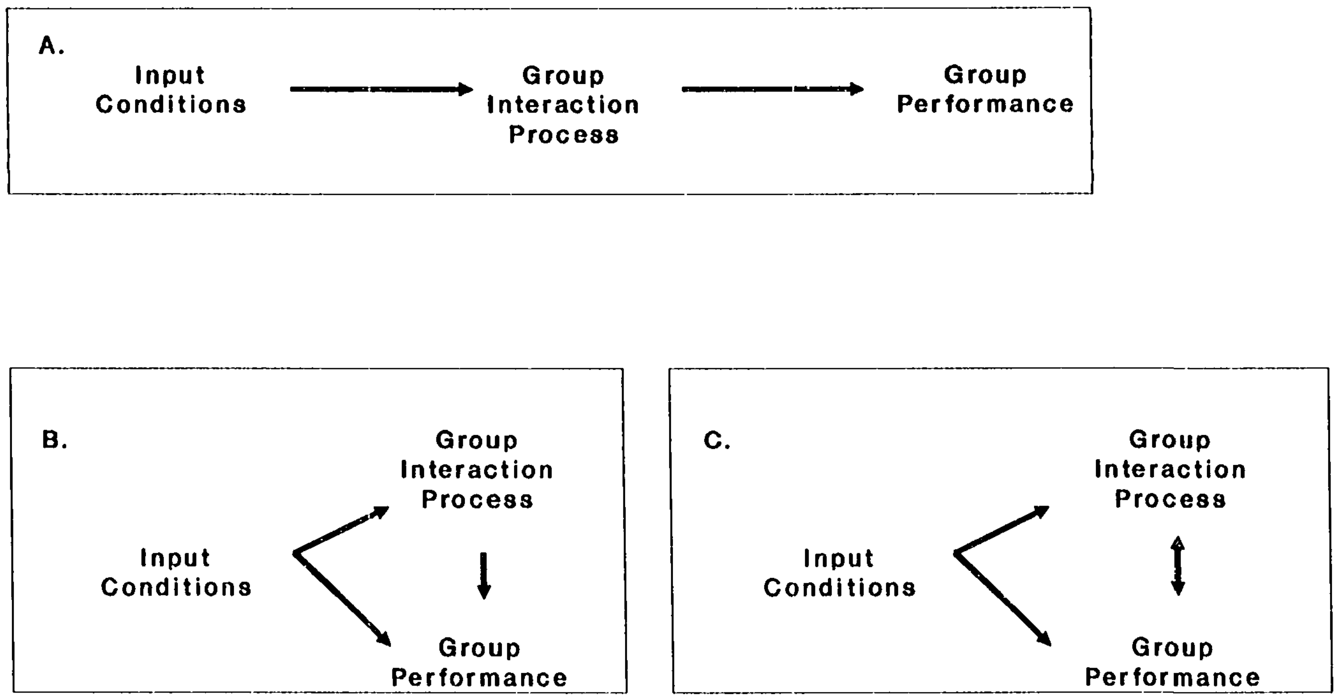


Figure 3. Depictions of the possible relationships between input, process, and output (adapted from Hackman, 1987)

interaction can be operationalized in terms of the communication component. As Shaw (1964, p. 111) stated, "communication lies at the heart of the group interaction process." The role played by communication will be primarily determined by the task situation facing the team. For instance, Naylor and Dickinson (1969) suggested that task structure is one variable that will restrict the type of communication structure that is developed by a team. Third, different tasks may change the priority of different components of teamwork, or combinations of the components. As Hackman and Morris (1975, p. 58) stated,

> . . . it may be unrealistic to work toward achieving a truly general theory of the relationship between group interaction and group performance effectiveness. Instead, it may be necessary to make some a priori distinctions among general classes of tasks and then to delve into process-performance relationships within each class.

The following section elaborates upon the integration between the Teamwork Components Model (Dickinson et al., 1992) and the Hackman-Morris (1975) framework and derives several hypotheses.

Core Components of Teamwork

Dickinson and colleagues (1992) identified the core components of teamwork, as depicted in Figure 1. Essential to teamwork are team members who have positive regard for the team and the task, who have been given guidance and support, and who understand their own assignments as well as the assignments of other members. Team members with these characteristics will be able and willing to monitor the performance of each other, communicate effectively, and provide feedback and backup when necessary. The team that interacts in this manner will exhibit coordinated activity and an interest in collective effectiveness over individual performance.

Communication. Dickinson et al. (1992, p. 48) defined communication as involving

> the exchange of information between two or more team members in the prescribed manner and by using proper terminology. Often the purpose of communication is to clarify or acknowledge the receipt of information.

A critical component of teamwork, communication is the linking mechanism among the other processes involved in team performance.

In support of the reconceptualization of the Hackman-Morris (1975) propositions argued here, Nieva et al. (1978), in their review of the communication literature, found that the relationship between amount of communication and team performance was moderated by the type of task (problem-solving or vigilance-monitoring) and the measure of performance (quantity and quality or time). Specifically, they noticed a general positive relationship between communication and team performance on problem-solving tasks when performance was operationalized as quantity or quality; however, amount of communication was not related to time measures of performance. Contrarily, amount of communication seems to have a negative relationship with performance in vigilance-monitoring studies.

For instance, Williges, Johnston, and Briggs (1966) studied the performance of dyadic teams in a simulated radar situation. They found that verbal communication increased performance only when no other more efficient communication channel was accessible. When both verbal and visual communication were provided, the former exerted no significant effect on coordination.

Nieva et al. (1978) also indicated that task structure may play a role in the communication-performance relationship. For instance, while communication may be necessary for successful team performance in unstructured situations, it may be superfluous when the situation is structured (Federman & Siegal, 1965; Johnston, 1966; Shure, Rogers, Larsen, & Tassone, 1962). Based on this and other evidence, communication will be conceptualized as moderating the relationships between task structure and a variety of the teamwork components discussed below. Within this research, communication will specifically refer to task-related information. Depending upon the teamwork component that is involved, it will be suggested that moderation by communication can occur in terms of: the content of communication, clarity of communication channels, or conduciveness of conditions toward communication. For instance, task structure may impact the relationship between two teamwork components by increasing the importance of maintaining clear channels of communication.

<u>Team orientation</u>. Dickinson et al. (1992, p. 48) define team orientation as

> the attitudes that team members have toward one another and the team task. It reflects acceptance of team norms, level of group cohesiveness, and importance of team membership.

Several authors agree that team orientation is a critical component of teamwork (e.g., Glanzer, Glaser, & Klaus, 1956; Larson & LaFasto, 1989; McIntyre et al., 1989; McIntyre, Glickman, Ruggeberg, Yanushefski, Llewellyn, & Salas, 1990; Morgan et al., 1986; Nieva et al., 1978).

Empirical work has concentrated on several aspects of team orientation. For instance, in a study of 460 management personnel assigned to 4-5 member teams, Fandt (1991) investigated the influence of accountability and interdependent behavior on team consequences. When team members were told that they were accountable for their own or their team's performance, the teams relied more on interdependent behavior, were more successful, and were more satisfied with their members. In another study related to team orientation, Woloschuk (1986) found significant correlations between basketball team members' will to win and the points they scored as well as the margin of their wins.

Cohesiveness is another important facet of team orientation. Nieva et al. (1978) indicated that contradictory results have been found in studies focusing on the relationship between cohesiveness and team performance. These authors concluded that performance effects are probably due to group norms or standards rather than cohesiveness, per se; specifically, group norms probably moderate the relationship between cohesiveness and team performance.

Contradictory results may also be explained by Tziner's (1982) suggestion that there are two forms of cohesiveness: "instrumental" (i.e., task-related) and "interpersonal." Instrumental cohesiveness involves the attainment of team goals, whereas the interpersonal form concerns socio-emotional relations and interaction patterns. Each category of cohesiveness may result in different levels of communication, social interactions, and team performance. Thus, when "instrumental" cohesiveness is high, communication of norms among group members may increase overall team performance; however, when "interpersonal cohesiveness" is high, communication of norms among group members may decrease overall team performance.

A relationship may be conceptualized between cohesiveness and monitoring. For instance, cohesiveness may lead to effective monitoring only when it facilitates the communication of task-related information (i.e., instrumental cohesiveness). Team members will be able to monitor each other more effectively when they understand the level of performance expected of each other according to the accepted group norms. The content of communication may be particularly important when the task is unstructured; specifically, communication of task-related information may increase in importance.

Hypothesis 1: When a team's task is unstructured, the relationship between team orientation (cohesiveness) and monitoring is moderated by communication. When task-related communication is high, the strongest relationship will exist between orientation and monitoring behavior; conversely, when task-related communication is low, monitoring behavior will not be related to team orientation (cohesiveness).

Team leadership. Dickinson et al. (1992, p. 48) defined team leadership as

> providing direction, structure, and support for other team members. It does not necessarily refer to a single individual with formal authority over others. Team leadership can be shown by several team members.

Dyer (1984), Glanzer et al. (1956), and Larson and LaFasto (1989) all point to the importance of the team leadership component. In a study that lends credence to this idea, Henrikson, Jones, Hannaman, Wylie, Shriver, Hamill, and Sulzen (1980) found that teamwork was positively affected when small unit leaders possessed the following skills: management, communication, problem solving, and tactical and technical skills. In terms of communication, two important skills for leaders included conveying information to pertinent individuals and seeking, receiving, and maintaining openness to new information.

The Teamwork Components Model proposed by Dickinson et al. (1992) suggests that team leadership is related to team orientation. In support of this hypothesis, Westre and Weiss (1991) found a significant relationship between the behaviors of a coach and group cohesion of a team. When coaches were perceived as providing high levels of social support, training and instruction, positive feedback, and as using a democratic style, the team members reported a high level of task cohesion. Team members' perceptions of their own and their team's success were significantly related to their perceptions of their coach's behaviors.

Thus, it is hypothesized that high scores on the scales designed to measure the teamwork component of leadership will be accompanied by high scores on the scales designed to measure the component of team orientation. Conversely, low scores on the leadership scale will accompany correspondingly low scores on the team orientation scale.

Hypothesis 2: Team leadership is positively related to team orientation.

Additionally, both communication and task structure may play a role in the relationship between team leadership and monitoring. For instance, several well-known theories predict that task structure is one determinant of the type of leadership (i.e., initiating structure or consideration) required by a particular situation (e.g., Fiedler, 1964, 1967; House & Mitchell, 1974). A leader with an orientation towards initiating structure "defines and structures his or her own role and the roles of subordinates toward attainment of the group's formal goals," whereas a considerate leader "acts in a friendly and supportive manner, shows concern for subordinates, and looks out for their welfare" (Yukl, 1989, p.

75). According to Fiedler, high task structure makes it easier for a leader to direct and monitor the performance of subordinates. Others have found that a highly structured situation does not require as much communication of task-related information as an unstructured situation (cf. Nieva et al., 1978).

Holding all other variables constant, it can be assumed that a supportive, considerate leader would probably be more effective in a structured than an unstructured situation; conversely, a leader with an orientation towards initiating structure would probably be more effective in an unstructured than a structured situation, where task relationships among subordinates require more attention.

Thus, the relationship between team leadership, communication, and monitoring can be described as follows. When the team functions in a highly structured situation, communication of task-related information is not critical to members' ability to monitor each other. The team leader's style (i.e., consideration or initiating structure) will not have great relevance to monitoring behavior. However, when the situation is unstructured and ambiguous, the content of communication will become more important; particularly, the communication of task-related information will become especially critical. In these types of circumstances, leadership that initiates structure will be necessary for effective monitoring behavior to occur.

Hypothesis 3: When a team's task is unstructured, the relationship between team leadership and effective monitoring is moderated by communication.

Hypothesis 3a: Task-related communication will be high when leadership is initiating structure leadership. Under these conditions, the positive relationship between initiating structure leadership and monitoring behavior will be the strongest.

Hypothesis 3b: Task-related communication will be low when leadership is considerate. Under these conditions, the positive relationship between considerate leadership and monitoring behavior will be the weakest.

Monitoring. Dickinson et al. (1992, p. 48) defined monitoring as

> observing the activities and performance of other team members. It implies that team members are individually competent and that they may subsequently provide feedback and backup behavior.

Individuals must possess technical knowledge and the skills necessary to perform their assignments before they can perform successfully as a team (Cooper et al., 1984; Glanzer et al., 1956; Larson & LaFasto, 1989; Wagner et al., 1977).

McIntyre and colleagues (1989, 1990) indicated that communication moderates the relationship between monitoring members' performance and providing feedback to them. This concept can be understood as follows. Wagner et al. (1977) suggested that feedback information may be derived from either an extrinsic or intrinsic source. While a source external to the task system provides extrinsic feedback, intrinsic feedback is an inherent part of the task. Similarly, Ilgen, Fisher, and Taylor (1979) classified sources of feedback into three categories. Feedback may be provided by other individuals, the task environment, or one's self. Monitoring can be a source of extrinsic feedback when members communicate with one another about team-related phenomena that they have observed.

The relationship between monitoring, feedback, and communication may be described as follows. In an unstructured situation, where the task environment is not a major source of extrinsic feedback, the importance of other team members will increase in terms of their provision of direction and/or motivation. In such a situation, an atmosphere promoting the exchange of information is necessary in order for individuals to translate the knowledge that they have acquired through monitoring into appropriate feedback. Thus, an atmosphere conducive to communication will become especially important and may moderate the relationship between monitoring and feedback. When the task environment is structured, feedback can often be derived from the task itself or from one's own internal standards of performance, and information obtained from monitoring may not be as crucial.

Hypothesis 4: When the team's task is unstructured, the relationship between monitoring and feedback behavior is moderated by communication. The positive relationship between feedback and monitoring behavior will be the strongest when there is an atmosphere promoting the exchange and communication of information; conversely, there will be no significant relationship between feedback and monitoring behavior when such an atmosphere is missing.

Additionally, when the task situation is unstructured, team members may be more in need of task-related information and assistance than when the task situation is structured. Since the content of communication (i.e., task-related information) becomes more important in an unstructured situation, the monitoring-backup relationship should be stronger when task structure is low and communication is high. Thus, in an unstructured situation, team members who engage in monitoring behavior will be more likely to provide backup behavior because their assistance will be in greater demand and the high level of communication will facilitate their efforts.

Hypothesis 5: When the task situation is unstructured, the relationship between monitoring and backup behavior is moderated by communication. The positive relationship between monitoring and backup will be the strongest when task-related communication occurs; conversely, when there is little or no task-related communication, there will be little or no relationship between monitoring and backup.

Feedback. Dickinson et al. (1992, p. 48) defined feedback as

> the giving, seeking, and receiving of information among group members. Giving feedback refers to providing information regarding other members'

> performance. Seeking feedback refers to requesting input or guidance regarding performance. Receiving feedback refers to accepting positive and negative information about performance.

Kanarick, Alden, and Daniels (1971) suggested that feedback is the most important aspect of team or individual training. Additionally, Nebeker, Dockstader, and Vickers (1975) demonstrated that feedback enhanced performance regardless of whether it was provided in raw or percentile scores or whether it pertained to the individual, group, or both.

Dyer (1984) proposed that the reinforcement contingencies associated with feedback are more complicated within the team compared to the individual context. Several types of contingencies are relevant to teams: External reinforcement/feedback provided to the team; external reinforcement/feedback provided to both the individual and the team; and immediate feedback provided to individual members or the team as a whole. Because it may be difficult to determine which contingencies exist during a team task performance, it may be more difficult to predict the consequences of feedback for teams than for individuals.

As posited by the Teamwork Components Model of Dickinson et al. (1992), Federman and Siegal (1965) found a positive relationship between information (i.e., feedback in the Teamwork Components Model) and team performance. The Teamwork Components Model posited by Dickinson et al. (1992) also indicates that the feedback-coordination relationship will be moderated by communication. Wagner et al. (1977) commented that in studies of "established" situations, where task structure was high, team coordination appeared to be determined solely by the competency of team members at the start of training (e.g., Klaus & Glaser, 1965; Hall & Rizzo, 1975). However, in emergent situations, successful coordination seemed to be more than the sum of the skills of the individual members (e.g., Johnston, 1966; McRae, 1966).

In unstructured situations which require interdependent behavior, communication may be necessary in order for feedback to result in effective coordination; specifically, clear channels of communication may become a moderator of the feedback-coordination relationship. A football team provides an illustration of this concept. The coach who stands on the sideline will often use special signals to communicate instructions to the quarterback on the field. In executing the plays suggested by the coach, team members will engage in a sequence of actions and feedback resulting in coordinated performance. If the quarterback and other members of the team misinterpret the coach's signals, confusion will result in the disruption of coordinated performance. Under this type of circumstance, a time-out may be necessary in order for the coach and the players to confer on the appropriate strategy. In a highly structured situation, communication may not play such a critical role in the feedback-coordination relationship.

Hypothesis 6: When the task is unstructured, the relationship between feedback and coordination is moderated by

<u>communication. There will be a positive relationship between feedback and coordination when clear channels of communication exist; conversely, when channels of communication are unclear, there will little or no relationship between feedback and coordination</u>.

<u>Backup behavior</u>. Based on the work of others (Denson, 1981; Dyer, 1984; Glanzer et al., 1956; McIntyre et al., 1989, 1990; Morgan et al., 1986; Nieva et al., 1978), Dickinson et al. (1992, p. 48) defined backup behavior as

> assisting the performance of other team members. This implies that members have an understanding of other members' tasks. It also implies that team members are willing and able to provide and seek assistance when needed.

Nieva et al. (1978) recognized the close association between cooperation/coordination and backup by including these two components in the same category labeled the team adaptation function. The authors explained that backup, or "mutual compensatory performance," occurs when team members perform activities that are outside of their normal responsibilities. Such behavior usually occurs in emergency situations. Coordination is encompassed under the subcategory of "mutual compensatory timing" which refers to the inter-task adjustments by team members in completing their subtasks in order to accomplish the overall group task effectively.

The Teamwork Components Model proposed by Dickinson et al. (1992) suggests that the backup-coordination relationship is moderated by communication. Communication may be especially important in an unstructured task situation which necessitates interdependent behavior. For instance, when one team member provides backup for another, this exchange may need to be communicated to the remaining members in order to ensure continued coordinated performance. Such communication is of particular importance if the member providing backup is located in a different area than the individual who usually performs a particular task. Valuable time could be wasted if other team members are not notified of the change; thus, communication may moderate the backup-coordination relationship. However, in a highly structured situation, communication will probably not exert as strong an effect on the backup-coordination relationship.

Hypothesis 7: When the task is unstructured, the relationship between backup and coordination is moderated by communication. In an unstructured task situation requiring interdependent behavior, the positive relationship between backup and coordination will be the strongest when clear channels of communication exist; conversely, when channels of communication are not clear, there will be little or no relationship between backup and coordination.

Coordination. Dickinson et al. (1992, p. 48) defined coordination as

> team members executing their activities in a timely and integrated manner. It implies that the performance of some team members influences the performance of other team members. This may involve an exchange of information that subsequently influences another member's performance.

Thus, effective coordination entails the effective application of other teamwork components, such as communication, monitoring, and backup.

Driskell and Salas (1992, p. 278) conducted an empirical study of collective behavior, or "the tendency to coordinate, evaluate, and utilize task inputs from other group members in an interdependent manner in performing a group task." After identifying collectively oriented team members and their egocentric counterparts, data were collected to study the relationship between collective behavior and team performance. Results revealed that unlike the egocentric teams, collectively oriented teams outperformed the baseline scores of their individual members. Driskell and Salas commented, however, that the effects of collective orientation on performance will probably depend upon the task confronting the team. For instance, they predicted that collective behavior would exert a greater effect on difficult tasks, tasks that necessitate interdependent behavior, and highly uncertain or unpredictable tasks.

Performance. Although it is not one of the seven components of teamwork specified by Dickinson and colleagues (1992), performance is an important aspect of the McGrath (1964) input-process-output model adopted by Hackman and Morris (1975). The measurement of work performance is not clear-cut and is affected by several sources of variance. In a model proposed by Landy and Farr (1983) (see Figure 4), it can be seen that both situational and individual characteristics influence a worker's performance. The

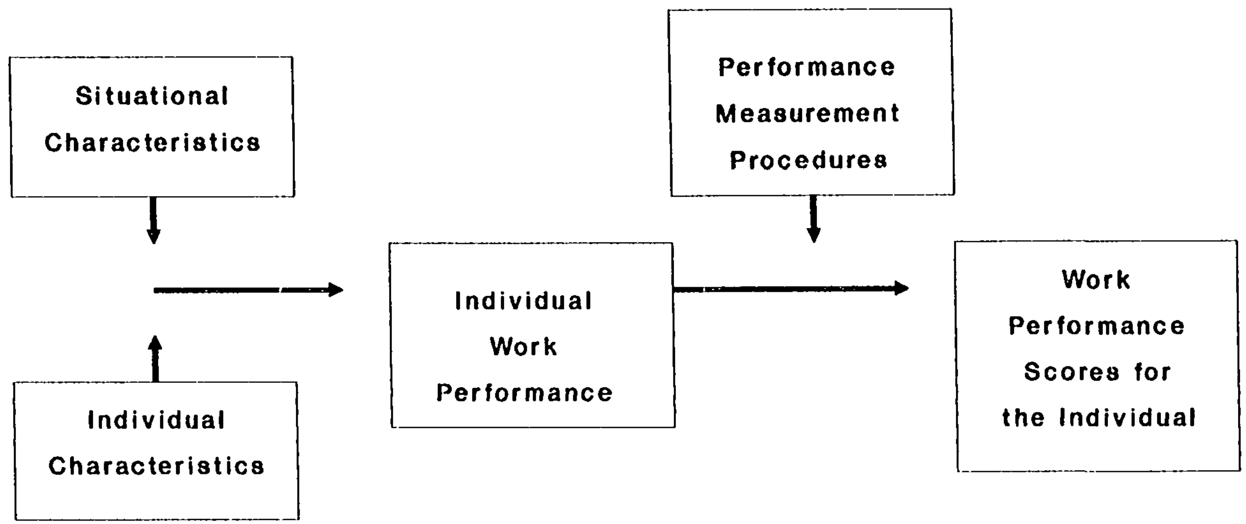


Figure 4. Measuring work performance (adapted from Landy & Farr, 1983, p. 8)

performance measurement procedures may contribute additional error variance in the performance scores that are obtained.

Landy and Farr (1983) suggested that performance data can be categorized into two types: judgmental and nonjudgmental measures. Judgmental measures, such as ratings, require an individual to evaluate the performance of others, whereas nonjudgmental measures "consist of things that can be counted, seen, and compared directly from one employee to another" (p. 27).

Performance can also be understood according to a classification proposed by Smith (1976). Smith's three-dimensional model includes the period in which performance was measured (i.e., immediate or delayed), the specificity or generality of the measure, and the relationship of the measure to organizational goals. The last category was subdivided by Smith into behaviors (i.e., the measurement of work behaviors), results (e.g., absence rates or supervisory ratings), and organizational effectiveness (i.e., whether or not the organization is accomplishing its goals). While behaviors and results are appropriate measures of performance when the level of analysis is the individual, group effectiveness is the focus of concern when research is conducted on the work performance of teams.

Hackman (1987) commented on the complexity of effectiveness criteria for organizational teams. Members of organizational teams usually maintain relationships with each other even after their task has been accomplished. These relationships can be influenced by the team experience and social atmosphere; thus, the performance of teams comprises more than nonjudgmental measures of productivity or quality. Hackman proposed three criteria to measure team effectiveness: team output, the social state of the team (i.e., the desire or capability of team members to work together again in the future), and the influence of the team experience on members (i.e., satisfaction or frustration of their personal needs).

In this commentary, Hackman (1987) described static relationships between the social and technical outcomes of team performance, whereas the Teamwork Components Model recognizes the dynamic nature of these outcomes. Specifically, the social aspect of teamwork is incorporated by the team orientation component which is seen as an input rather than an outcome of the team process (see Figure 1). The model incorporates a learning loop which suggests that social consequences are a byproduct of the processes underlying teamwork and become a defining feature of teamwork over time. Thus, the focus of the current research will be on the technical aspects of performance as the team attempts to accomplish organizationally relevant goals of productivity. Additionally, judgmental measures of team performance will be used.

The following hypothesis is suggested by the Teamwork Components Model.

Hypothesis 8: The relationship between coordination and performance is positive.

Table 1 provides a list of the hypotheses posited in the description above of interrelationships among the core components.

Furthermore, the relationship between task structure, communication, and team performance is an unresolved issue of some contention (see Figure 3). This research will attempt to determine the nature of the relationships among these three factors. Specifically, the Teamwork Components Model will be investigated within the larger framework of task structure with the assumption that the relationship between input, interaction, and team output is represented by part A of Figure 3.

Conceptual Framework

In brief, the present research was an attempt to determine the construct validity of the proposed integration between the Teamwork Components Model proposed by Dickinson et al. (1992) and the process-performance perspective of Hackman and Morris (1975). Empirical testing of the hypotheses was accomplished using structural equation modeling. This research was also an attempt to explore the relationships among task structure, communication, and team performance. The following two sections discuss the phenomena of construct validity and structural equation modeling as well as their relevance to the present topic of interest.

Construct validity. Construct validity, the most important concept in psychometrics (Angoff, 1988), is

> the extent to which a measure 'behaves' the way

Table 1

Summary of Hypotheses

Hypothesis 1: When a team's task is unstructured, the relationship between team orientation (cohesiveness) and monitoring is moderated by communication. When task-related communication is high, the strongest relationship will exist between orientation and monitoring behavior; conversely, when task-related communication is low, monitoring behavior will not be related to team orientation (cohesiveness).

Hypothesis 2: Team leadership is positively related to team orientation.

Hypothesis 3: When a team's task is unstructured, the relationship between team leadership and effective monitoring is moderated by communication.

Hypothesis 3a: Task-related communication will be high when leadership is initiating structure leadership. Under these conditions, the positive relationship between initiating structure leadership and monitoring behavior will be the strongest.

Hypothesis 3b: Task-related communication will be low when leadership is considerate. Under these conditions, the positive relationship between considerate leadership and monitoring behavior will be the weakest.

Hypothesis 4: When the team's task is unstructured, the

Table 1 (continued)

relationship between monitoring and feedback behavior is moderated by communication. The positive relationship between feedback and monitoring behavior will be the strongest when there is an atmosphere promoting the exchange and communication of information; conversely, there will be no significant relationship between feedback and monitoring behavior when such an atmosphere is missing.

Hypothesis 5: When the task situation is unstructured, the relationship between monitoring and backup behavior is moderated by communication. The positive relationship between monitoring and backup will be the strongest when task-related communication occurs; conversely, when there is little or no task-related communication, there will be little or no relationship between monitoring and backup.

Hypothesis 6: When the task is unstructured, the relationship between feedback and coordination is moderated by communication. There will be a positive relationship between feedback and coordination when clear channels of communication exist; conversely, when channels of communication are unclear, there will little or no relationship between feedback and coordination.

Hypothesis 7: When the task is unstructured, the relationship between backup and coordination is moderated by

Table 1 (concluded)

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communication. In an unstructured task situation requiring interdependent behavior, the positive relationship between backup and coordination will be the strongest when clear channels of communication exist; conversely, when channels of communication are not clear, there will be little or no relationship between backup and coordination.

Hypothesis 8: The relationship between coordination and performance is positive.

> that the construct it purports to measure should behave with regard to established measures of other constructs. (DeVellis, 1991, p.46)

Thus, construct validity is established when evidence is provided that a variable measures what it is intended to measure (Cote, Buckley, & Best, 1987). In a seminal article by Cronbach and Meehl (1955), construct validity was referred to as a process. Evidence in support of construct validity necessitates multiple and various types of investigations (both quantitative and qualitative) (Goodwin & Goodwin, 1991).

Goodwin and Goodwin (1991) defined a construct as an unobservable variable which is derived from scientific thought. Another definition, provided by Binning and Barrett (1989, p. 479), stated that psychological constructs are "labels for clusters of covarying behaviors. . . A construct is merely a hypothesis about which behaviors will reliably covary." Binning and Barrett added that construct validation and theory development are synonymous with one another; specifically, both phenomena concern the identification of constructs by developing measures and looking for relationships. Similarly, Lord and Novick (1968) proposed that a construct should be defined on two levels. The first level concerns the operational definition of the construct, while the second level concerns the "syntactic" definition, or set of hypotheses that must be tested in order to provide evidence of construct validity.

Cronbach (1988) contended that today the traditional categorization of validity as content, criterion-related, or construct is passé. Instead, it is more useful to think of construct validity as encompassing the other more specific types. Moreover, Tenopyr (1977) suggested that the attempt to discriminate between content and construct validity has caused confusion among many practitioners and theoreticians. Content validity is determined by demonstrating that the test content is an adequate sample of the category of situations about which conclusions are to be inferred. Construct validity is assessed by determining the psychological qualities measured by a particular test (i.e., by determining the extent to which specific constructs can explain performance on the test).

Content validity usually involves a comparison of test tasks and universe tasks and does not concern the processes involved in accomplishing the tasks. In order to be useful, content-oriented development must always consider the constructs involved. At its best, content validity is one form of evidence for construct validity; however, content validity may be appropriate as a sole source of evidence only for those constructs that are simple and easily measured. Content validity is an inference that a measure can be used to obtain attribute scores for all applicable situations; conversely, construct validity necessitates empirical research that uses one or more measures of an attribute to test and develop a theory (Tenopyr, 1977). Thus, the strong content validity reported by Dickinson et al. (1992) must be considered only preliminary evidence for the construct validity of the Teamwork Components Model.

Goodwin and Goodwin (1991) described the steps in a study designed to test construct validity. First, hypotheses must be formulated, based on an underlying scientific theory. Next, a study should be planned to test these hypotheses. After data have been collected and analyzed, results could lead to several outcomes, such as: a modification of the original theory, alteration of the measurement instrument, and/or the testing of more hypotheses.

Nunnally (1978) outlined four inferences that underlie construct validation:

(1) Measure X and Measure Y are related.

(2) Measure X is an indicator (or an inducer) of Latent Trait X.

(3) Measure Y is an indicator (or an inducer) of Latent Trait Y.

(4) Latent Trait X and Latent Trait Y are causally related.

Absolute proof of the legitimacy of the four inferences would require the empirical demonstration of at least three of them. Such proof is not possible, since only inference 1 can be directly tested empirically. Empirical evidence in support of inference 1, combined with a logical rationale for the validity of two of the remaining three inferences (2, 3, or 4), allows researchers to assume that the remaining inference is valid as well. Thus, Binning and Barrett (1989) suggested that construct validity involves construct-construct links (inference 4), construct-measure links (inferences 2 and 3), and measure-measure links (inference 1). Researchers have traditionally been the most concerned with construct-measure links.

Goodwin and Goodwin (1991) classified construct validation studies into three types: descriptive, experimental, and correlational. Construct validation may require qualitative as well as quantitative investigation; thus, the descriptive approach to validation entails developmental or longitudinal studies. Experimentation is relevant when the hypotheses inferred from the underlying theory seem to suggest a causal relationship. Correlational techniques, which are the most widely used, include predictive and concurrent correlational studies, multiple regression, factor analysis, discriminant function analysis, and multitrait-multimethod analyses. Generalizability (G) theory (Cronbach, Gleser, Nanda, & Rajaratnam, 1972) also yields insights into the estimation of construct validity.

One of the early and popular approaches to studying construct validity was the multitrait-multimethod analysis, developed by Campbell and Fiske (1959). This technique examines the validity of a trait through the use of a construct-method matrix. Evidence of convergent validity is obtained when two or more measures of the same construct are strongly correlated with each other. Evidence of discriminant validity is provided by small correlations among tests measuring different constructs; thus, Campbell and Fiske proposed that tests designed to measure different constructs should not correlate with each other.

Structural equation modeling, a technique that is related to factor analysis, is gaining widespread appeal today for use in construct validation studies (Goodwin & Goodwin, 1991; Muthén, 1988).

Structural equation modeling. Social and behavioral sciences rarely allow for the type of rigorous experimentation that is characteristic of the natural sciences. Instead, causal inferences are usually derived from the statistical evaluation of models and hypotheses (Jöreskog & Sörbom, 1989). One method of statistical evaluation, LISREL (linear structural relations), is a type of structural equation modeling and a valuable technique for theory-building in psychology (Coovert, Penner, & MacCallum, 1990). Structural equation modeling determines the degree of covariation among a set of variables; however, its primary purpose is to test the viability of a model that specifies the relationship among observed (measured) and unobserved (latent) variables. Other popular statistical techniques, such as analysis of variance and regression, consider only measured variables. An important feature of structural equation modeling is its ability to evaluate models in which latent traits serve as mediators in the relationship between other latent traits. Because mediators are a crucial part of most major psychological theories, "it is difficult to overestimate the value of a technique that can test a proposed mediational mechanism" (Coovert et al., 1990, p. 212).

LISREL requires the researcher to obtain several indicators for each latent trait specified by the model. In a viable model, several operationalizations of a latent trait will converge with each other. The results provided by LISREL are likely to be based on valid measures of the constructs involved. Thus, a second major purpose of structural equation modeling is to determine the construct validity of a set of measures.

For every model, LISREL tests two components: the measurement model and the structural model. The measurement model concerns the relationship between the measured variables and the latent traits. The structural model concerns the relationships among the latent traits. Measured variables are always directly related to latent traits, but latent traits may be either directly related with each other or their relationship may be mediated by another latent trait.

The direction of the relationship between variables is also designated by the component models. In a directional relationship, one variable influences the other, but the association is not necessarily cause and effect. No statistical technique can prove causality; rather, at best, structural equation modeling can demonstrate the plausibility of a proposed model (Coovert et al., 1990). However, "causal thinking is consistent with LISREL and structural equations in general" (Hayduk, 1987, p. xv).

Structural equation modeling assumes that within the measurement model, latent traits influence measured variables. Within the structural model, both directional and nondirectional relationships are possible. Dependent latent traits are influenced by other dependent latent traits as well as by independent latent traits. The independent latent traits can be correlated, but no causal relations are allowed among them in the structural model.

Two types of errors are represented separately within structural equation modeling. Disturbance terms are errors that occur in the measured variables because they are imperfect indicators of the latent traits. Errors of measurement and contamination by extraneous variables are examples of this type of error. The second type of error is known as error in equations. Structural equation modeling stipulates that the relationships between the variables are linear. Because linear relationships are infrequently perfect, a residual term will usually result due to an error in estimation.

Synopsis

The purpose of this investigation was to undertake a construct validation study as a natural progression of the work by Dickinson et al. (1992). While some evidence of the content validity of the measures developed by Dickinson et al. has been provided, construct validity is still a very pertinent issue.

This investigation was accomplished in two parts. A first study was conducted in order to determine the construct validity of scales that were developed based upon Dickinson et al. (1992). Evidence of the scales' internal consistency was necessary in order to address the construct validity of the Teamwork Components Model as a whole, within the framework suggested by Hackman and Morris (1975). In a second study, structural equation modeling (i.e., LISREL) was used to determine the relationship among the teamwork components and to derive support for the hypotheses. Figure 5 is a representation of the measurement model of teamwork components, with task structure, orientation, and leadership acting as independent latent traits. In the figure, causal relationships are depicted by arrows, and correlations are depicted by curves.

A secondary goal was to discover the most appropriate representation of the relationship between task structure, communication, and teamwork components.

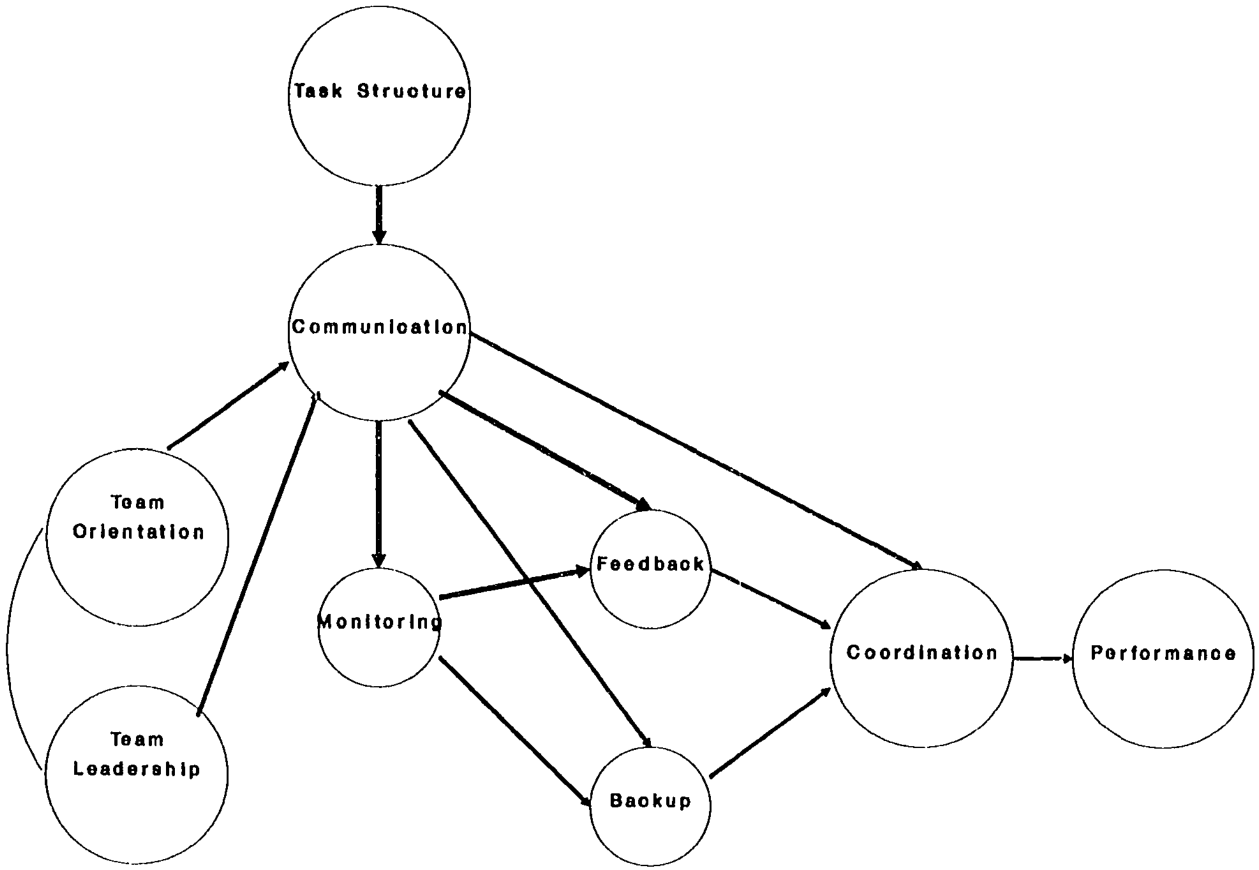

Figure 5. Hypothesized structural teamwork components model

II. METHOD

Study 1: Measurement Model Analysis

The first study was concerned with the proposed relationships between the indicator variables and the factors (i.e., measurement models). Thus, the focus was on the construct validity of the behavioral observation scales for the teamwork components. Validation of the various scales was a necessary step before evaluating the proposed structural model of teamwork components.

Participants

One-hundred fifty participants (131 males, 18 females, and 1 unspecified) were sampled in order to achieve adequate statistical power. MacCallum and Tucker (1991) and MacCallum, Roznowksi, and Necowitz (1992) discussed the important role played by sample size in the generation of solutions in factor analysis and structural equation modeling. Although alternative guidelines may be proposed based on recent perspectives, the present study adopted the approach recommended by Nunnally (1978) of using at least 10 subjects for every hypothesized factor. In the current research, 10 factors were proposed to exist, so at least 100 participants were needed.

Participants were solicited from various types of teams (e.g., athletic, decision-making, and maintenance). Table 2 presents the demographic characteristics of the participants and their teams. Almost all of the team members worked in the public sector, and the three types of teams with the greatest representation in the study were police squad, paramedic team, and utility crew. The individuals had a mean age of about 35, and on average, they had been members of their teams for about 4 years and belonged to teams with 8 members.

Participants in the study belonged to teams that fit the definition used in the current research. A screening instrument was developed in order to ascertain whether or not a particular team qualified for the study. The instrument contained nine questions (see Appendix A) that explored the degree of interdependence among the members, the life span of the team, the importance of team goals, the extent of coordination, and the number of members. It was administered to at least two members of each team. If the answers obtained to at least six of the questions indicated that the particular team qualified for the current research, then its members were asked to participate in the study.

Measures

Participants were administered scales designed to measure the various teamwork components, task structure, and performance.

Teamwork components. Each scale included the definition for the teamwork component and 9 to 22 behavioral items. Participants rated each item according to its frequency of occurrence, using a 5-point scale that ranged from 1 (Almost

Table 2

Demographic Information About Participants in Study 1

Type of Team	Frequency	
Police Squad	48	
Paramedic Team	43	
Utility Crew	41	
Firefighting Team	10	
Athletic Team	8	
Participant Variables	**M**	**SD**
Age	34.97 yrs	8.76
Length of time as team member	3.67 yrs	6.45
Total # members on team	8.23	6.01

Never) to 5 (Almost Always). Negatively worded items were reverse scored. A copy of the scales is provided in Appendix B.

Task structure. Task structure has been measured in several different ways, but its operationalization is usually based upon the four subcategories suggested by Shaw (1963): task decision verifiability; goal path multiplicity; goal clarity; and solution specificity. The present research adapted scales developed by Fiedler, Mahar, and Schmidt (1975) as depicted in Fiedler (1978). A copy of the adapted scales is provided in Appendix B as well.

The task structure scale developed by Fiedler et al. (1975) is subdivided into four categories, with the following headings:

Is the goal clearly stated or known?

Is there only one way to accomplish the task?

Is there only one correct answer or solution?

Is it easy to check whether the job was done right?

Items from the first three categories were modified for use in Study 1. The number of items within each category ranged from two to three. When a category originally contained only two items, a third item was added by the author. Respondents had the option of assigning to each item a rating ranging from 1 (Almost never) to 5 (Almost always).

Performance. Performance was operationalized in terms of team output (i.e., performance quality, speed to solution, or number of errors), using behavioral observation scales specifically designed to measure this component. Members and supervisors were requested to rate their team's performance on 12 different items, using 5-point scales, ranging from 1 (Almost never) to 5 (Almost always). A copy of these scales is also provided in Appendix B.

Procedure

Each of the measurement instruments (i.e., behavioral observation scales of teamwork components, task structure scale, and performance scale) were administered to the participants. The individuals were instructed to recall a team in which they had once been a member. After providing a brief description of this team as well as some biographical information, the participants evaluated their past experience using the modified behavioral observation scales. The participants also completed the performance and task structure scales.

Analytical Strategy

Drasgow and Kanfer (1985) warned that data obtained from polychotomous rating scales are not normally distributed, and Pearson product moment correlation coefficients computed from such scales need to be corrected for underestimation. As a general rule, it is important to have at least three indicators (i.e., subscales) for each factor of a measurement model to be tested with structural equation modeling. Thus, according to the recommendation of Drasgow and Kanfer, the items for each scale were categorized into three subscales as an attempt to deal with the non-normality problem. Furthermore, each subscale contained between three and six items. Averages of the item ratings yielded subscale scores for a particular component. In the case of the teamwork components scales and the task structure scale, development of the subscales necessitated the generation of several items in addition to those contained in the original scales. The performance scale was designed especially for the present research and had not been used previously.

Subscale construction. Using LISREL VII (Jöreskog & Sörbom, 1989), maximum likelihood confirmatory factor analysis was performed utilizing all items within each of the scales. A single factor was specified for each scale (except team leadership), and all items with high loadings (i.e., above .60) on a specific factor were retained. Items that demonstrated a small loading on their factor were eliminated from consideration if at least nine items remained in the scale. If fewer than nine items remained, then items were revised for use in Study 2. Results from exploratory factor analyses were used in conjunction with the results from the confirmatory factor analyses when deciding which items to retain for subscale construction. In many cases, the reason for the small loadings demonstrated by items on their specified factors was due to negative wording or compound phrasing. When needed for a scale, these items were revised accordingly.

Next, a technique, similar to the one used by Mathieu (1991), was employed to form three parallel subscales for each factor (i.e., latent trait) for confirmatory factor analysis of the measurement model. The first subscale included the item with the highest loading on the factor and the item with the lowest loading on the factor. The second subscale included the item with the second highest loading on the factor and the item with the second lowest loading on the factor. The third subscale included the item with the third highest loading on the factor and the item with the third lowest loading on the factor. The remaining items were randomly assigned to the three subscales. If revised items needed to be employed to define a subscale of three items, then these items were assigned randomly to the subscales.

Estimates of goodness-of-fit were calculated for the measurement model that had latent traits for teamwork components, task structure, and performance. Evidence of construct validity was also provided from evaluation of the internal consistency of the scales using estimates of congeneric reliability.

Study 2: Structural Model Analysis

The second study was concerned with the structural model of the teamwork components (i.e., relationships among the latent traits). It is noteworthy that during the time between Study 1 and Study 2, LISREL VIII ((Jöreskog & Sörbom, 1993), had been released. For the purposes of the current investigation, LISREL VII and LISREL VIII would have yielded nearly identical results; however, the more recent version was used for the primary analyses in Study 2.

Participants

Data from 135 work teams (i.e., 541 individuals: 342 males, 177 females, 22 unspecified) were gathered. The size of the teams ranged from 2 to 13 members. The teams chosen for this study functioned in a variety of settings (e.g., police, social work, quality circles). Qualification of the team for participation in the study was determined by using the team screening instrument (see Appendix A).

Table 3 presents various demographic characteristics of the participants. For instance, the five teams with the greatest representation in the study were police, quality circle, firefighting, social work, and national guard/army. The mean age of members was about 38, and on average, the individuals had been members of their teams for 4 years and team size consisted of about 10 members.

Table 3

Demographic Information About Participants in Study 2

Type of Team	Number of Members	Number of Teams
Air National Guard	37	10
Architectural	5	1
Army-Office	8	2
Firefighter	116	28
Graphic Art	3	1
National Guard	13	3
Nursing	13	1
Office-Corporate	6	3
Office-Hospital	3	1
Office-Public Sector	5	1
Police-Aviation, Paramedic	20	10
Police-Decision Making	3	1
Police-Drug Enforcement	59	12
Police-Highway Patrol	48	9
Police-SWAT	8	1
Quality Circle	158	34
Social Work	34	16
Teaching	2	1
Total:	541	135
Participant Variables	*M*	*SD*
Age	37.82 yrs	8.94
Length of time as team member	3.99 yrs	4.92
Total # members on team	9.59	10.26

Measures

Participants were administered the teamwork component scales that had been modified incorporating the findings of Study 1. These modified scales are presented in Appendix C.

Procedure

After a brief orientation, the team members and supervisors were administered the teamwork component scales.

The team members were asked to specify additional information, such as their age, gender, and length of time as a team member.

Analytical Strategy

Dickinson et al. (1992) discussed the importance of obtaining global-level measures of teamwork in order to understand its relationship with global measures of team performance. The aggregation of data from one level to reflect characteristics of a higher level may result in several types of problems (James, 1982; Roberts, Hulin, & Rousseau, 1978; Rousseau, 1985). For example, Rousseau (1985) suggested that aggregation may lead to interpretational difficulties such as misspecification, or the "fallacy of wrong level." For instance, the relationship between participative decision making and employee performance may be misspecified in terms of a relationship between an organizational variable (i.e., organizational structure) and individual-level variables (i.e., performance).

Aggregation may also lead to spurious correlations (i.e., aggregation bias). These spurious correlations can occur when the unit used for aggregation (e.g., organizational level) is correlated with the variables that are being aggregated (e.g., team diversity and team income). For example, a researcher may hypothesize that the diversity in a team's membership is related to the income earned by team members (i.e., the less diverse the team, the more income that is earned). If organizational level is also correlated with team diversity (i.e., the higher the organizational level, the less diverse the team's membership), the researcher may find a negative correlation between team diversity and team income that is not due to aggregation alone. Such a correlation would be spurious.

In order to deal with these aggregation issues, Rousseau (1985) and James (1982) contend that the units of aggregated data should demonstrate small within-unit variance (or high agreement among a unit's raters). By meeting this variance criterion, the aggregated variable can be inferred to have construct validity for the unit-level construct. Another potential advantage of aggregation may be improvement in the reliability of measures; specifically, aggregation may result in the averaging of randomly occurring individual-level errors and biases. Rousseau recommended that researchers determine the extent of agreement among unit members before aggregating data. Within-unit agreement can be ascertained statistically through the calculation of the correlation ratio (η^2) or indices of interrater reliability. While theory should determine the actual units for aggregation, the researcher needs to decide whether a construct meant to refer to one level is also applicable to units at higher levels.

The data collected from the team members were averaged to reflect subscale scores for each team. The ratings obtained with the behavioral observation scales were readily amenable to this manner of aggregation. Interrater reliabilities for each scale were calculated, using the method proposed by

James, Demaree, and Wolf (1984), in order to demonstrate agreement among team members. If the reliability coefficients of at least six of the nine scales were equal to or exceeded .70, then a team's data were retained for further analysis. High levels of interrater reliability were interpreted as evidence of the construct validity of the aggregated scale scores and were considered adequate measures of the team-level constructs.

Using data from the teams that demonstrated high levels of interrater reliability, one-way analyses of variance were conducted in order to determine whether the teams significantly differed from one another in terms of their scores on each component scale. Nine analyses of variance were conducted (i.e., one for each component scale). Thus, aggregation of the data was warranted by high levels of interrater reliability and significant differences among the teams on component scales. All of the analyses for Study 2 were performed on the team-level data which consisted of mean scores for each team on every scale item.

Subscale construction. The original subscales constructed in Study 1 were retained for use in Study 2. However, an additional subscale was constructed for each of the following components so that each component would be represented by a minimum of three subscales: consideration, feedback, backup, performance, and task structure. Each additional subscale, except for the case of task structure, was formed from the remaining unused items for that particular component. In the case of task structure, additional items were randomly chosen from those items written specifically for Study 2. A list of the subscales and their items is provided in Appendix D. Initiating structure was the only component to be represented only by two subscales. An exploratory factor analysis revealed that the additional items developed to tap this component did not load on the initiating structure dimension. Therefore, only six items were available to define two subscales for initiating structure.

Estimates of goodness-of-fit were calculated for the measurement model assessing the independent latent traits and for the model assessing the dependent latent traits. As in Study 1, the congeneric reliabilities of the subscales were also calculated.

Structural model analysis. LISREL VIII (Jöreskog & Sörbom, 1993) was utilized to obtain parameter estimates for the hypothesized structural model. After inspection of the solution for problems of underidentification and improper estimates, the overall chi-square statistic and adjusted goodness-of-fit measures were used to assess how well the resulting solution fit the sample covariance matrix. Ideally, a nonsignificant chi-square and a value of .9 or greater for the adjusted goodness-of-fit index would indicate a good model fit. However, Hayduk (1987, p. 169) commented that when

> N is small, X^2 may have insufficient power to detect substantial differences. My experience suggests that X^2 is instructive for N's ranging from about 50 to 500, but I suspect this range depends on the kinds of models estimated.

For instance, the value of chi-square tends to decrease with each parameter that is estimated. In complex models that necessitate the estimation of many parameters, a sample size of 100 may be too small for chi-square to be an adequate measure of goodness-of-fit.

Additionally, McDonald and Marsh (1990) commented that the needs for parsimony and goodness-of-fit often conflict with one another. Although the chi-square statistic is frequently used to test the goodness-of-fit of a particular model, it is subject to a sample size effect (i.e., the magnitude of chi-square increases with sample size). In fact, Marsh, Balla, and McDonald (1988) found that using chi-square as an indicator of goodness-of-fit could lead individuals conducting the same research with different sample sizes to select different models. McDonald and Marsh (1990) demonstrated that among the goodness-of-fit indices based on a comparison with a null or alternative model, only the Tucker-Lewis Index (Tucker & Lewis, 1973) and the McDonald-Marsh Relative Noncentrality Index (RNI) were unbiased by sample size. Both the Tucker-Lewis Index and the Relative Noncentrality Index range from zero to unity, and the higher the value, the better the fit of the model (Goffin & Jackson, 1993).

Another relative noncentrality index, RNI2, represents the multiplication of the RNI by the parsimony ratio and takes into account model parsimony (Mulaik, James, Van Alstine, Bennett, Lind, & Stilwell, 1989). Mulaik and colleagues admonished that the goodness-of-fit of a model should always be considered together with the parsimony of the model. Specifically, good fit may occur for two reasons: (1) parameters of the model are correctly constrained by hypotheses and (2) as more parameters are estimated, the goodness-of-fit is improved. When two models fit the same data equally as well, Mulaik and colleagues suggested that the model with the higher parsimony ratio should be preferred "because it has been subjected to more potentially disconfirming tests" (p. 439). Thus, in addition to the chi-square index, the Tucker-Lewis Index, the Relative Noncentrality Index, and RNI2 were calculated as indications of the goodness-of-fit of the model.

Parameter estimation of the measurement and structural models was undertaken with the goal of achieving goodness-of-fit estimates of .90 or higher. Modification indices for unspecified parameters were also examined. These indices were provided as output from the LISREL VIII (Jöreskog & Sörbom, 1993) program. Basically, large modification indices indicate parameters to estimate in order to improve the fit of the model. Thus, respecification of the model is indicated when the modification indices are large. Ideally, the hypothesized model should fit the data, and few or no modifications should be warranted.

<u>Testing the hypotheses</u>. Hypotheses 2 and 8, which posited correlations between two variables, were tested by examining the LISREL output specifying the correlations

between Etas (dependent latent traits) and Ksis (independent latent traits). The remaining hypotheses specified interactions among variables under different levels of communication and task structure and were tested using another method. Specifically, the median values were found for communication and task structure. "Low" communication and "low" task structure occurred at values below the median; conversely, "high" communication and "high" task structure occurred at values equal to or greater than the median. Next, the correlations among the variables specified in the various hypotheses were computed under the following four situations: low communication, low task structure; low communication, high task structure; high communication, high task structure; high communication, low task structure.

Jones (1968) presented a technique for analyzing correlations as dependent variables. Using this technique it was possible to determine the main and interaction sources of variation for the correlations. The data in the current study were analyzed using Jones' suggestions and modifications proposed by Snedecor (1962) in his discussion of the analysis of variance with unequal sample sizes.

III. RESULTS

Study 1: Measurement Model Analysis

The data from Study 1 were utilized in two ways. First, subscales were constructed based on the results of the confirmatory factor analyses. Exploratory factor analyses were consulted in order to gain additional information about a poor fit to the confirmatory model when it occurred. In some cases, to be described below, information from both types of factor analyses was used for item revisions and additions. Second, the measurement model was analyzed using information on the retained items. The first subsection below presents the results of the subscale construction, and the second subsection discusses the findings regarding the measurement model.

Component Scale Analysis

Appendix E presents the standardized output for the confirmatory factor analyses for each questionnaire scale. Appendix F presents the results of the associated exploratory factor analyses. For each questionnaire scale, one factor was specified for each of the components except team leadership, which was conceptualized as being comprised of two factors.

Both the confirmatory and exploratory factor analyses were consulted when the subscales for each component were constructed. Items were considered for inclusion in the subscales if they loaded around .60 or higher on their factor in the confirmatory factor analysis and if a subsequent exploratory factor analysis revealed that they were representative of the theoretical conceptualization for their particular team component.

The exploratory factor analyses indicated that items that were reverse-scored and/or negatively worded demonstrated small loadings on their respective factors. Because these items also tended to demonstrate small loadings on their factors in the confirmatory factor analyses, they were eliminated from consideration for inclusion in the subscales. Other items that demonstrated small loadings were worded in compound phrases. These items were rewritten for inclusion in the subscales when there were less than three existing items that met the pre-specified criteria.

Appendix G indicates the original items retained in each component subscale, revised items, and additional items. In the subsections below, the content of each scale will be briefly described (please refer to Appendix E and Appendix F for item information). Appendix C presents the revised questionnaire that was administered in Study 2.

Team orientation. Original items 4 and 22 were dropped in the revised questionnaire because they loaded less than .60 on the team orientation factor. All of the remaining original items were retained.

Team leadership. Two confirmatory factor analyses were conducted for team leadership. In the first analysis, all items were included; however, in the second analysis, all reverse-coded and negatively worded items were eliminated (i.e., items 1, 2, 3, 7, and 16). Negative factor loadings and the negative correlation between the two factors disappeared in the second analysis. The results of this second confirmatory factor analysis were used in the subscale construction for team leadership. As demonstrated by an intercorrelation of .65 between the factors, as well as an extensive amount of previous research in the area (cf. Fleishman & Harris, 1962; Halpin & Winer, 1957), team leadership can be conceptualized as involving two distinct but correlated factors: consideration (Factor 1) and initiating structure (Factor 2).

Original items 1, 7, and 8 were dropped from the revised questionnaire because they demonstrated a loading less than .60. Also, the exploratory factor analysis indicated that these three items represented the independent latent trait of initiating structure although they had been intended to represent consideration. Items 2, 3, and 4 were rewritten to remove compound phrasing, and item 16 was revised to remove negative wording. One new item was added to the team leadership scale in the revised questionnaire.

Communication. The revised questionnaire did not include original items 9, 13, 14, 15, and 16. The exploratory factor analysis indicated that these items seemed to be measuring an aspect of communication that was different from the content tapped by the remaining items. Specifically, the retained items appeared to be measuring an aspect of communication involving clarification and completeness of information; conversely, the items that were removed seemed to involve the facilitation of information exchange.

Monitoring. Original items 7, 8, and 9 were dropped from the revised version of the scale, but all remaining items were retained.

Feedback. Original items 3, 5, and 9 were dropped from the revised scale due to small and negative loadings. Items 3 and 5 appeared to reflect the giving of feedback. Original items 2 and 4 were rewritten to remove negative phrasing. Item 6 was retained even though its loading was somewhat less than .60.

Backup. The revised questionnaire did not include original items 7, 8, and 9 due to small loadings on the backup factor. Original item 5 was rewritten to remove compound phrasing, and item 6 was revised to remove negative phrasing.

Coordination. Original items 2, 10, and 12 were eliminated from the revised scale. Items 10 and 12 demonstrated small loadings on the coordination factor, and item 2 seemed to be tapping a different aspect of coordination, according to the exploratory factor analysis.

Performance. Original items 9, 10, 11, and 12 were eliminated due to small loadings on the performance factor, and item 8 was revised to remove negative wording. Additionally, a new item was added to the revised scale. Items 9, 10, and 11 reflected unfavorable aspects of performance, whereas item 12 could have been interpreted in either a positive or negative direction.

Task structure. In the case of task structure, poor reliability characterized most of the original task structure items. For instance, except for item 3, the squared multiple correlation for the remaining items ranged from .01 to .46. When the two items with the smallest loadings on the task structure dimension (and the smallest squared multiple correlations) were dropped (i.e., items 6 and 9), there were enough items left for two subscales only. Appendix F shows that items 6 and 9 loaded on a different dimension than the remaining items when the exploratory factor analysis was performed.

All of the items were retained for use in Study 2; specifically, original items 7 and 9 were reworded in a simpler manner, and 11 new items were added to the revised scale. Some of these items were adapted from Fiedler (1978) and other new items were written solely for this component.

On the basis of the confirmatory and exploratory factor analyses for each component, sufficient items were available for forming subscales for all components. These subscales allowed evaluation of the measurement models for the dependent and independent latent traits. In sum, there were three subscales for team orientation, communication, monitoring, and feedback; and there were two subscales for consideration, initiating structure, task structure, backup, coordination and performance.

Measurement Models

The measurement model for the independent factors (or latent traits) included the three indicators for team orientation, the four indicators for team leadership, and the two indicators for task structure. Four independent factors were specified: team orientation, consideration, initiating structure, and task structure. The results are provided in Appendix H.

For this measurement model, it is clear that the factor loadings are high, and they all demonstrate significant T-values (i.e., greater than or equal in magnitude to 2.0). Except for the first subscale of initiating structure, values of Theta Delta, which indicate the amount of measurement error variance in the model, are small. As indicated in the Phi matrix, the correlations among the independent factors do not exceed .64, suggesting a separate status for each of these latent traits. The squared multiple correlations indicate adequate to strong accounting for subscale variance by the factors and their intercorrelations. Finally, the goodness-of-fit indices indicate that the overall model fits the data well.

Appendix I presents the results of the measurement model for the dependent factors. In this case, 15 indicators were specified along with the following 6 dependent factors: communication, monitoring, feedback, backup, coordination, and performance.

As can be seen in Appendix I, the factor loadings for this measurement model are very high, and in no instance are they lower than .81. T-values for the factor loadings are all significant, and Theta Delta values are small. The Phi matrix containing the correlations between the dependent latent traits has values ranging between .59 and .84. There are high squared multiple correlations and high values for goodness-of-fit indices.

The subscales and scales used in Study 1 and Study 2 were considered to be congeneric because it was assumed that they had different true scores and different error variances. The use of intraclass correlations to estimate reliability may be problematic, especially in instances where measures are not tau equivalent or parallel (Werts, Linn, & Jöreskog, 1974). Therefore, the formula proposed by Werts and colleagues was used to calculate the congeneric reliabilities for the subscales using Lambda X and Theta Delta values for the individual items in each scale.

Table 4 presents the congeneric reliabilities of subscales as well as the entire scales. These reliabilities are influenced by the presence of poor items which are reflected in Lambda X and Theta Delta values. These reliabilities can be considered conservative estimates and were expected to improve in Study 2 for the revised questionnaire. As can be seen in the table, when task structure is not considered, the subscale reliabilities range from .48 to .69. Reliabilities for the task structure subscales are much lower, ranging from .37 to .40.

Table 4

Study 1: Congeneric Reliabilities of Subscales

Subscale	Congeneric Reliability
Team Orientation 1:	.54
Team Orientation 2:	.53
Team Orientation 3:	.55
Consideration 1:	.60
Consideration 2:	.52
Initiating Structure 1:	.49
Initiating Structure 2:	.48
Communication 1:	.58
Communication 2:	.60
Communication 3:	.60
Monitoring 1:	.49
Monitoring 2:	.49
Monitoring 3:	.52
Feedback 1:	.53
Feedback 2:	.48
Backup 1:	.59
Backup 2:	.55
Coordination 1:	.66
Coordination 2:	.69
Coordination 3:	.59
Performance 1;	.60
Performance 2:	.58
Task Structure 1:	.40
Task Structure 2:	.37

Note. The congeneric reliabilities for entire scales are as follows: Team Orientation (.54), Consideration (.56), Initiating Structure (.48), Communication (.60), Monitoring (.50), Feedback (.51), Backup (.57), Coordination (.64), Performance (.59), and Task Structure (.39).

Study 2: Structural Model Analysis

As in Study 1, confirmatory factor analyses were performed preliminary to the analyses of the measurement and structural models. Unique to Study 2, analyses were based on the aggregation of individual-level to team-level data. The subsections below discuss the aggregation of data, the confirmatory factor analyses, the results of the measurement model analyses, the findings of the structural model analysis, and the testing of the hypotheses.

Aggregation

Interrater reliability, indicated by small within-group variance, signifies that the members of a team demonstrate enough agreement among each other as to provide evidence for data aggregation to the team level. The interrater reliability of 28 teams failed to meet the reliability criterion imposed using the method developed by James et al. (1984). Data for these teams were not included in subsequent analyses. Appendix J presents the reliability coefficients of all teams on the nine scales.

Individual differences between teams on the component scales are also important indicators for aggregation. Such differences indicate that each team can be considered a separate, self-contained unit for the purposes of statistical analyses. Analyses of variance demonstrated significant between-team differences (i.e., $p < .01$) on the nine teamwork components scales for all of the teams that remained in the data set. Appendix K provides the results of the analyses used to test for between-team differences on the component scales.

Component Factor Analyses

Appendix L includes the standardized output for the confirmatory factor analyses of the questionnaire scales. As in Study 1, all scales were conceptualized as having one factor, except for team leadership, for which two factors were specified (i.e., consideration and initiating structure). In sum, 29 subscales were formed, with all components represented by three subscales, except for initiating structure which was represented by two subscales.

Measurement Models

The measurement model for the independent factors (or latent traits) included three indicators each for team orientation, consideration, and task structure, and two indicators for initiating structure. The results are provided in Appendix M. Modification indices for Theta Delta suggested that correlated measurement error was negatively affecting the fit of the data to the model. Appendix N presents the results for the measurement model after correlated measurement error had been removed.

For this measurement model, the factor loadings are .70 or higher, except for the second subscale for task structure (i.e., .34), and they all demonstrate significant *T*-values (i.e., greater than or equal in magnitude to 2.0). In general the amount of measurement error in the model is small, as indicated by the low values of Theta Delta. The highest values of Theta Delta occur for the first initiating structure subscale (i.e., .51) and the second subscale for task structure (i.e., .88). The Phi matrix demonstrates high correlations between team orientation and consideration (i.e., r = .84), team orientation and initiating structure (i.e., r = .76), and consideration and initiating structure (i.e., r =

.81). The squared multiple correlations indicate that the factors and their intercorrelations strongly account for subscale variance. The lowest values for the squared multiple correlations occur for the first subscale for initiating structure (i.e., R^2 = .49) and the second subscale for task structure (i.e., R^2 = .12). Finally, the goodness-of-fit indices indicate that the overall model fits the data very well.

Appendix O presents the results of the measurement model for the dependent factors. In this case, 18 indicators were specified along with the following 6 dependent latent traits: communication, monitoring, feedback, backup, coordination, and performance. The modification indices for Theta Delta suggested that fit would improve if parameters reflecting correlated measurement error were not fixed to zero and were freed to be estimated. Appendix P presents the results for the measurement model after correlated measurement error was estimated.

As can be seen in Appendix P, the factor loadings for this measurement model are .76 or higher (except for the value of .38 for the first monitoring subscale), T-values for the factor loadings are all significant, and Theta Delta values do not exceed .42 (except for the value of .86 for the first monitoring subscale). The Phi matrix, containing the correlations between the dependent factors, has values ranging between .62 (i.e., the relationship between monitoring and performance) and .97 (i.e., the relationship between backup and coordination). There are high squared multiple correlations (except for the first monitoring subscale) and generally high values for goodness-of-fit indices.

As in Study 1, the scales used in Study 2 were considered to be congeneric, with the assumption that they had different true score and different measurement error variances. The formula proposed by Werts and colleagues (1974) was used to calculate the congeneric reliabilities for the subscales using Lambda X and Theta Delta values for the individual items in each scale. Table 5 below presents these results as well as the congeneric reliabilities of entire scales. As can be seen in the table, the subscale reliabilities range from .31 to .93. The lowest reliabilities occur for the subscales representing initiating structure and task structure.

Structural Model

Appendix Q presents the results of the structural model analysis. Modification indices for Theta Epsilon and Theta Delta indicated the presence of correlated measurement error, suggesting that the fit of the model would improve if covariances between these errors were estimated. Appendix R provides the results of the modified structural model, after Theta Epsilon and Theta Delta parameters with values greater than 7.882 had been relaxed. Additionally, the Psi value for coordination was set at .01 to insure the proper fit of the model. According to Jöreskog and Sörbom (1993), modification indices with such values are considered large. As expected from the measurement model analysis, Lambda Y reveals high

Table 5

Study 2: Congeneric Reliabilities of Subscales

Subscale	Congeneric Reliability
Team Orientation 1:	.67
Team Orientation 2:	.68
Team Orientation 3:	.71
Consideration 1:	.81
Consideration 2:	.72
Consideration 3:	.83
Initiating Structure 1:	.38
Initiating Structure 2:	.60
Communication 1:	.92
Communication 2:	.88
Communication 3:	.93
Monitoring 1:	.69
Monitoring 2:	.77
Monitoring 3:	.75
Feedback 1:	.83
Feedback 2:	.75
Feedback 3:	.84
Backup 1:	.82
Backup 2:	.88
Backup 3:	.79
Coordination 1:	.71
Coordination 2:	.90
Coordination 3:	.83
Performance 1:	.83
Performance 2:	.84
Performance 3:	.89
Task Structure 1:	.43
Task Structure 2:	.31
Task Structure 3:	.54

Note. The congeneric reliabilities for entire scales are as follows: Team Orientation (.69), Consideration (.79), Initiating Structure (.43), Communication (.91), Monitoring (.73), Feedback (.81), Backup (.83), Coordination (.81), Performance (.85), and Task Structure (.39).

factor loadings of indicators on the dependent latent traits, ranging from .76 to .98. The only exception is the value of .35 for the first subscale of monitoring. Lambda X also indicates high factor loadings of indicators on the independent latent traits with a minimum value of .58 (i.e., the second subscale for task structure).

The Beta matrix indicates the relationships among the dependent latent traits, and the significant loadings range from .78 to 1.83. Small _T_-values indicate that the Betas representing the following relationships are not significant: communication-coordination, monitoring-feedback, monitoring-backup, and feedback-coordination. The matrix of the standardized indirect effects among Etas shows that indirect relationships are nonsignificant except for those between communication and feedback, communication and coordination, communication and performance, and backup and performance.

The Gamma matrix demonstrates the relationship between the independent and dependent latent traits. Such relationships were hypothesized between communication and four independent variables (i.e., team orientation, consideration, initiating structure, and task structure). The _T_-values indicate that only two of these relationships attained statistical significance: orientation-communication and consideration-communication. The matrix of standardized indirect effects among Ksis and Etas shows moderately sized relationships between orientation and every other variable except for communication (i.e., ranging from .33 to .42). Consideration also displays moderately sized indirect relationships with every variable except for communication (i.e., ranging from .35 to .45).

The Psi matrix indicates the amount of variance that is not accounted for by the measurement and structural models. The values in the Psi matrix are small, ranging from .01 to .25, except for a value of .40 for monitoring. Likewise, measurement error variances are small. Theta Epsilon and Theta Delta values range between .06 and .32, except for the values of the first two subscales for monitoring, the second subscale of backup, the first subscale of initiating structure, and the second subscale for task structure. In general, squared multiple correlations are high, ranging between .13 and .96. Chi-square and the goodness-of-fit indices suggest that the model fits the data moderately well.

Summary: Validity of the Structural Model

After adjusting for correlated measurement errors as suggested by the modification indices, the fit of the proposed structural model improved substantially. According to the modified model, only seven of the hypothesized thirteen structural relationships are significant as demonstrated by the *T*-values for the elements of Beta and Gamma. Figure 6 presents the structural model and the estimates of the parameters as determined by LISREL VIII (Jöreskog & Sörbom, 1993). More specific questions regarding the model can be resolved by testing the hypotheses.

Hypotheses

Appendix S presents the results of the analyses testing the six hypotheses examining correlations for the task structure and communication subgroups. A detailed discussion

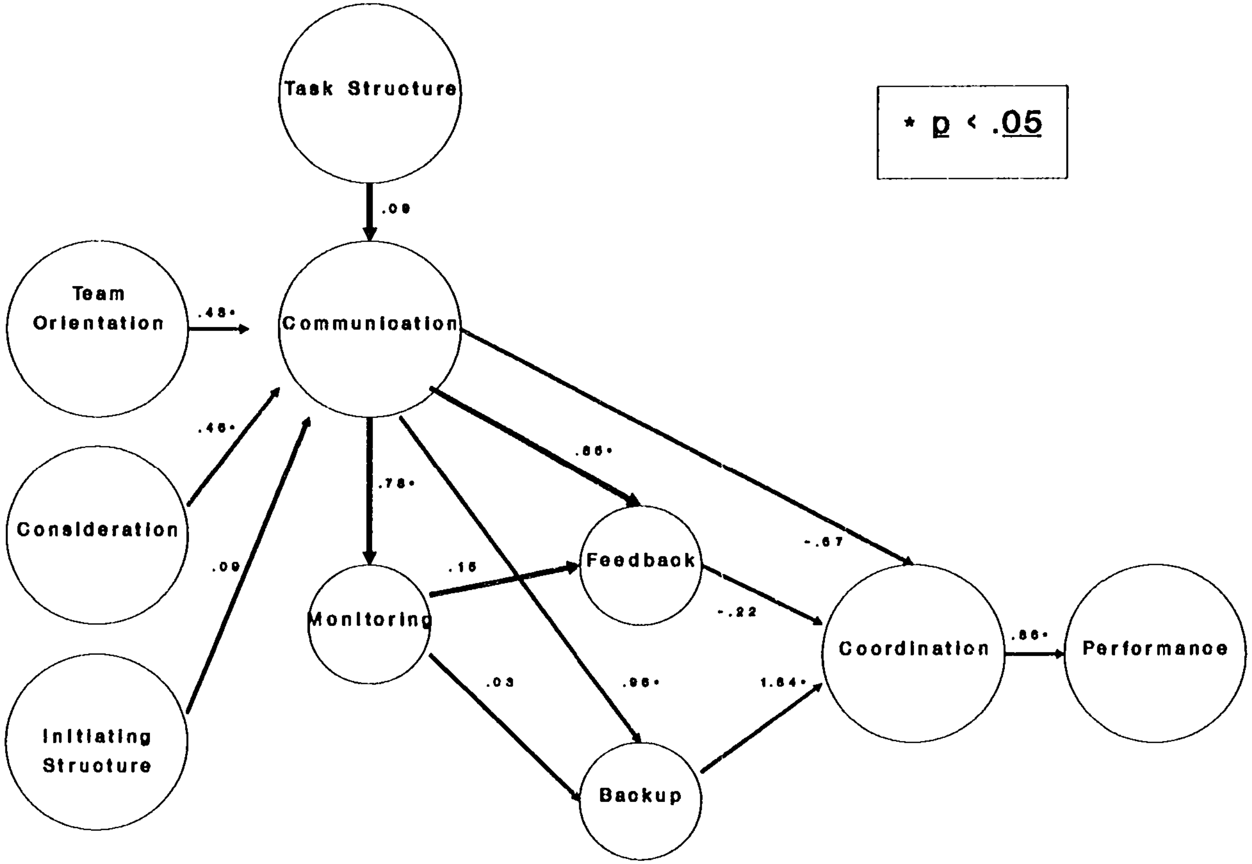

Figure 5. Hypothesized structural teamwork components model

of each hypothesis is presented in the following sections.

Hypothesis 1. The first hypothesis suggests an interaction between task structure and communication in which the correlation between orientation and monitoring is highest when task structure is low and communication is high. The results include a significant interaction confirming this hypothesis; namely, the correlation between orientation and monitoring was .77 when task structure was low and communication was high compared to the remaining correlations of .03, .41, and .46.

Hypothesis 2. Support for the hypothesized positive correlation between leadership and orientation is provided by the matrix of the correlations between Etas and Ksis provided in the output for the structural model (see Appendix R). As hypothesized, both consideration (r = .85) and initiating structure (r = .76) are positively correlated with orientation.

Hypothesis 3. This hypothesis suggests two interactions: (a) the correlation between monitoring and initiating structure should be highest when task structure is low and communication is high; and (b) the correlation between monitoring and consideration should be the lowest when task structure is low and communication is low. The results provide support for Hypothesis 3a. Specifically, the correlation between monitoring and initiating structure is highest (i.e., r = .70) when task structure is low and communication is high. However, hypothesis 3b was not confirmed. Although a significant interaction was found, its direction was not as hypothesized. Rather, the correlation between monitoring and consideration was found to be lowest when communication is low and task structure is high.

Hypothesis 4. An interaction is hypothesized between task structure and communication in which the correlation between monitoring and feedback is highest when task structure is low and communication is high. The analyses indicate that a significant interaction does not exist; rather, the significant main effect suggests that the correlation between monitoring and feedback tends to be high when communication is high, regardless of the level of task structure.

Hypothesis 5. The fifth hypothesis proposed an interaction between task structure and communication in which the correlation between monitoring and backup is highest when task structure is low and communication is high. While the direction of the interaction is as hypothesized, this effect did not achieve statistical significance. The significant main effect for communication suggests that the correlation between monitoring and backup is highest when communication is high, regardless of the level of task structure.

Hypothesis 6. This hypothesis suggests the existence of an interaction between task structure and communication in which the correlation between feedback and coordination is highest when task structure is low and communication is high. The analyses did not find a significant interaction; however, a significant main effect for task structure indicates that the correlation between feedback and coordination is highest when task structure is low, regardless of the level of communication.

Hypothesis 7. An interaction is hypothesized to exist between task structure and communication in which the correlation between backup and coordination is highest when task structure is low and communication is high. While a significant interaction does exist, the direction is not as proposed; specifically, the correlation between backup and coordination is highest when task structure and communication are both low and when task structure and communication are both high. Smaller values of this correlation are found when task structure is low and communication is high and when task structure is high and communication is low.

Hypothesis 8. Support for the proposed positive correlation between coordination and performance is provided by the matrix of the correlations between Etas and Ksis provided in the output for the structural model. As presented in Appendix R, the correlation between these two variables is .86.

IV. DISCUSSION

In the sections to follow the general findings of Study 1 and Study 2 will be addressed, and implications for theory and practice will be outlined. Additionally, suggestions will be made for future research throughout the discussion.

General Findings

The current research tested a complex model of teamwork components in order to explore the relationships among the processes that underlie teamwork. Few models of this type have been studied empirically, partly due to the difficulties of obtaining the necessary sample sizes, making the current effort unique. The research encompassed two studies, and the sections below discuss the findings that pertain to the analyses of the measurement models, structural model, and specific hypotheses.

Measurement models. The purpose of Study 1 was to develop the Teamwork Components Questionnaire and to explore its construct validity by analyzing the measurement model. Although construct validity cannot be established through a single study, one of the purposes of this research was to begin the construct validation effort. In general, evidence of the questionnaire's validity was provided by the high factor loadings, small Theta Delta values, high squared multiple correlations, high goodness-of-fit values, and high congeneric reliabilities for the subscales. The lowest congeneric reliabilities were found for the scales of task structure, initiating structure, and monitoring. The scales for task structure and initiating structure continued to show poor congeneric reliability in Study 2. The measurement model also indicated the smallest loadings for the relevant subscales on these three components.

The measurement model for Study 1 did not include three subscales for every component, as is generally recommended. The failure to use at least three subscales for each component may have affected the reliability of the findings for Study 1, especially those pertaining to initiating structure and task structure. Also, if more original items had been generated for task structure and initiating structure, the subscales for these components may have been better developed for use in Study 2 and subsequently demonstrated higher loadings and higher levels of reliability.

Interestingly, in the measurement models for Study 1, (especially for the latent dependent traits), the Phi matrix indicated substantial intercorrelations of several factors (i.e., greater than .70). These high intercorrelations may be explained by the fact that the focus of analysis was a process model. By necessity, the constructs in any process model should be highly correlated with one another, even though it may logical to consider them as distinct phenomena. For instance, both age and years of experience are antecedents of expertise. While age and years of experience are often highly correlated, they are clearly two distinct variables and should not be confused with one another.

Structural model. The purpose of Study 2 was to test the proposed structural model and several hypotheses concerning the effects of communication and task structure on the correlations between other components. The scores for the subscales were aggregated at the team level, and evidence of an adequate level of interrater reliability for each team was provided before the analyses were undertaken. As in Study 1, analysis of the measurement model indicated a high degree of reliability for the subscales, with the lowest degree of reliability evident for initiating structure and task structure. Again, enough appropriate items were found only for two initiating structure subscales. The number of subscales for initiating structure may have affected the size and significance of the relationships found between this component and other latent traits. Gerbing and Anderson (1985) warned that when a latent trait is only defined by two indicators, one should be cautious in interpreting the estimates for the associated structural parameters.

It was expected that in Study 2, the reliabilities of the subscales would improve because of the aggregation of scores at the team level. This improvement was found for every subscale except initiating structure and task structure. The congeneric reliability for initiating structure was about the same in Study 1 (i.e., .48) and in Study 2 (i.e., .43), a very unusual result considering that the same items were used for the two subscales in both studies. The congeneric reliability for task structure was .39 in both studies despite the use of different items and the aggregation of data in Study 2. This finding seems to indicate that task structure is a complex factor and is deserving of further research.

The validity of any structural model is partially based on the corresponding measurement models. The structural model in Study 2 achieved a moderate level of goodness-of-fit, after adjustments for correlated measurement error, indicated by high values of Theta Epsilon and Theta Delta. The structural model indicated that seven of the proposed relationships were significant, with moderate to high Beta and Gamma values: communication-monitoring, communication-feedback, communication-backup, backup-coordination, coordination-performance, orientation-communication, and consideration-communication. The following hypothesized relationships were not found to be significant: monitoring-feedback, monitoring-backup, communication-coordination, feedback-coordination, initiating structure-communication, and task structure-communication.

It had originally been proposed that monitoring of behavior by team members serves as an antecedent to the feedback that they provide to each other. Likewise, in the original model, monitoring was postulated to result in backup; specifically, it was believed that team members who watched each other would be likely to step in for one another when the situation warranted. Although these relationships were not significant, the Beta between communication and feedback was .85, and the Beta between communication and backup was .96. One possible explanation for these significant relationships may be that the active communication of task-related information among team members, rather than passive monitoring, makes them more able and/or willing to provide feedback and to step in for one another when needed.

Analysis of the structural model also failed to find statistical significance for the proposed relationship between communication and coordination, although there was a significant indirect relationship between these two variables. Unlike feedback, backup alone had a significant direct effect on coordination, indicating that providing assistance to team members in need is fundamental for the smooth functioning of the team. Additionally, orientation and consideration exerted significant indirect effects on coordination. An atmosphere conducive to the promotion of relationships among members, positive attitudes, encouragement, and support seems to be fundamental to the smooth functioning of the team.

Originally, it had been proposed that initiating structure would result in the communication of task-related information; however, the factor with the strongest relationship to communication was consideration (i.e., Gamma = .46). The poor reliability of initiating structure (and the use of two subscales as indicators) may have hindered the attempt to find a relationship between this construct and communication. Alternatively, it is possible that a leader who demonstrates initiating structure may do most of the communication of task-related information himself/herself. This type of leader is one who prefers structure and may prefer to be in control. On the contrary, a considerate leader, through the use of supportive behaviors, may prompt other team members to resolve problems on their own and share their insights and other task-related information with one another. Communication of such information will occur by all team members rather than by the leader alone.

Finally, the proposed task structure-communication relationship was also found to be nonsignificant, as indicated by the small T-value for the relevant element of Gamma. This finding comes as a surprise since task structure was conceived as being a very important influence on communication (cf. Naylor & Dickinson, 1969; Nieva et al., 1978). Again, the reason for this nonsignificant Gamma may be the generally low level of reliability found for the task structure subscales. Alternatively, communication may be affected more by interpersonal factors among members of a particular team than by external factors. Additional evidence for the important role played by interpersonal factors is provided by the matrices specifying the indirect relationships.

The matrices of standardized indirect relationships in Appendix R reveal the pervasive effect of communication on feedback and performance. Overall, communication seems to be the dependent latent trait that exerts the greatest degree of influence over other dependent factors in the model, indicating that team members should concentrate on developing their communication skills if they seek to improve their effectiveness.

Among the independent latent traits, orientation and consideration both exert moderately strong and indirect influences on all of the dependent factors via communication, which they influence directly. Orientation and consideration appear to be much more crucial to a team's success than task structure. Interpersonal factors appear to be the key to team effectiveness.

A third possible explanation for the failure to find a significant influence of task structure on communication is provided by Gladstein (1984) who found that group processes (i.e., communication) exert an effect on performance that is moderated by group task demands (e.g., task complexity). In other words, it may be more appropriate to conceive of communication as influencing task structure than vice versa.

Hypotheses. Four of the nine hypotheses examined in Study 2 were confirmed (i.e., hypotheses 1, 2, 3a, and 8). Evidence was found for Hypothesis 2 which confirmed the fact that both initiating structure and consideration are positively correlated with orientation. Likewise, support was found for Hypothesis 8 which suggested that coordination is positively correlated with performance.

The remaining hypotheses were tested after the data had been categorized into communication and task structure subgroups. Several correlations between factors were proposed to be the highest when task structure was low and communication was high. Evidence was found to support Hypotheses 1 and 3a which respectively suggested that the correlation between orientation and monitoring and the correlation between initiating structure and monitoring are highest under such conditions.

Support was not found for Hypothesis 3b which suggested that the correlation between monitoring and consideration is the lowest when task structure is low and communication is low. In fact, this correlation was found to be the lowest when task structure was high and communication was low. As mentioned previously, it seems as though the considerate leader stimulates communication among team members. When task structure is high, there is probably less of a need for communication of task-related information among team members, and the consideration strategy may be less appropriate than initiating structure. Consideration is probably superfluous when task structure is high and will not stimulate team members to monitor one another because their responsibilities are already so clearly defined.

Hypothesis 4 suggested that when task structure is low and communication is high, the correlation between monitoring and feedback should be the highest. Instead of the predicted interaction, a main effect was found in which the correlation between monitoring and feedback was high whenever communication is high, regardless of the level of task structure. Effective communication probably enhances the tendency of information extracted from monitoring to be translated into external feedback that is provided among team members.

Like Hypothesis 4, Hypothesis 5 suggested that the correlation between monitoring and backup would be the highest when task structure is low and communication is high. While a significant interaction was not found, the significant main effect suggested that the correlation is highest when communication is high, regardless of the level of task structure. Again, when communication is high, team members will probably find it easier to provide backup for each other when they identify the existence of a problem through their monitoring behaviors.

Hypothesis 6 suggested that the correlation between feedback and coordination would be highest when task structure is low and communication is high. Although the suggested interaction was not found, a significant main effect indicated that the correlation between feedback and coordination is highest when task structure is low, regardless of the level of communication. A high level of task structure may inherently provide information about performance making external feedback among team members unnecessary (Ilgen et al., 1979). When task structure is low, a high degree of external feedback is necessary for a high degree of coordination.

Finally, according to Hypothesis 7, the correlation between backup and coordination should be the highest when task structure is low and communication is high. Contrary to the hypothesis, a significant crossover interaction was found in which the correlation between backup and coordination is highest when both task structure and communication are low and when both task structure and communication are high. The most difficult condition for team members to perform under occurs when both task structure and communication are low. In this situation, feedback is not inherent to the task, nor are members proficient in task-related knowledge. Here, mistakes may be the most likely, and backup behaviors will become very necessary for effective coordination. On the contrary, the best condition for team members to perform under occurs when both task structure and communication are high. In this situation, feedback from the task and from other team members is readily available, making effective backup very likely. Effective backup will tend to result in effective coordination.

Process-performance propositions. One of the purposes of this research was to examine Hackman's (1987) three proposed relationships between input (i.e., task structure), process (i.e., communication), and output (i.e., performance). These relationships were explained in depth in the Introduction section and are summarized in Figure 3. In all of these alternatives, task structure serves as the independent variable affecting communication and/or performance. Evidence was not obtained to confirm task structure as a direct influence on communication; additionally, the results did not indicate that task structure exerts an indirect effect on communication. While the matrix of standardized indirect effects of the Ksis on the Etas provided in Appendix R clearly shows no significant indirect influence of task structure on performance, the modification index for the Gamma matrix suggests that task structure be reconceptualized as exerting a direct influence on performance. It is not known whether this relationship would be significant since the structural model was not modified in this manner. However, it appears as though none of the proposed relationships presented in Figure 3 can be confirmed. As mentioned above, Gladstein's (1984) finding that communication directly influences task structure may be a more viable proposal for future research.

Practical Implications and Directions for Future Research

The development of productive work teams is an issue in organizations of all kinds. Seventy-six percent of all organizations in the United States report that they use teams ("The Teaming," 1993). As society advances technologically, teams will be increasingly relied upon to resolve complex issues and problems. Although many instruments have been developed to measure group processes, most have been accepted without adequate empirical validation. The current research points to some of the important relationships that influence the effectiveness of work teams and will hopefully serve as the first step in an ongoing effort at construct validation. Although it is primarily theoretical in nature, several practical implications can be derived from the results of the studies conducted here pertaining to the design of training, the sophistication of technology, and the enhancement of the Teamwork Components Questionnaire.

The purpose of most teamwork is preparation for decision making (Sisco, 1993). Many organizations design training programs for team members to enhance their decision-making skills and to help them develop in such other areas as conflict resolution, problem solving, situation awareness, team building, and listening (Bovier, 1993, Geber, 1992, Sisco, 1993). The current research identifies the specific behaviors inherent in these skills, the relationships among these behaviors, and the overall importance of each behavior to the general performance of the team. Many organizations are learning through experience about the important role that these behaviors play in the performance of teams and the reduction of human error (Bovier, 1993). Although the current research provides scientific support for much of this anecdotal evidence, organizations have also learned that the use of teams does not necessarily guarantee success and improvement in the bottom line (Zemke, 1993). The empirical results of the current research suggest a systematic approach for tailoring training programs aimed at developing the behaviors of team members that appear to be the most crucial to overall performance. Suggestions may also be derived for designing training programs that attempt to teach team members how to diagnose and possibly avoid common performance-related problems. Orientation, leadership strategy, and communication should all play key roles in these training programs.

Another practical implication of the current research involves the interaction between technology and teamwork. In recent decades several technological advances, such as computer networking (e.g., Local Area Networks) and telecommunications, have incorporated the concept of teamwork, encouraging collaboration among individuals who may or may not be familiar with one another. Direct improvement of these technologies may ensue from progress that has been made in the understanding of teams. For instance, technologies often strive to reduce human error by being "user friendly." The matrices in Appendix R indicate that communication, orientation, and consideration exert the most pervasive influences on team members. In addition to an improved human-machine interface, technologies that link individuals should also ensure that channels and methods of communication between users are clear and accessible. While the present research studied verbal communication, other forms may be equally as helpful or even more so (cf. Williges et al., 1966). Designs that enhance the opportunities for individuals to send and receive task-relevant information and that facilitate an atmosphere conducive to collaboration are crucial components of effective technologies. New systems, procedures, and techniques may result from a better understanding of how team members work together. It is hoped that the application of the knowledge contributed by the current research will help in that direction.

Long-term practical implications of the current research can also be envisioned. For example, the teamwork component scales have the potential of being used as the cornerstone of a more comprehensive instrument that eventually may attempt to explain the impact of other variables (e.g., group size, personalities of members, technology) on teams and their performance. The scales could also be administered to teams throughout their life spans in order to determine how the relationships among the components change with the duration that the members are together. The knowledge acquired from such a developed instrument could conceivably result in making assignments more appropriate to a particular team so that members will be more productive and effectual at different stages in the team's life span.

Efforts at application of the current findings would be aided by other kinds of research as well. The present research studied individuals and teams from a variety of work settings; therefore, the resultant model of structural relationships is a very general one. Although a screening instrument was used as the criterion for inclusion in the current research, hopefully ensuring a certain level of homogeneity among teams, it is likely that causality among the constructs will change when specific types of teams are studied. Social work teams, nursing teams, police teams, and firefighting teams, for example, differ from one another in terms of their goals, environments, and the conditions for their existence.

Theoretical Implications and Directions for Future Research

Theoretically, the current research is singular in two major ways: Few empirical studies have used aggregated measures to study teams, and little scientific work has focused on developing instruments to measure the multidimensional constructs that comprise teamwork. Attention is paid to these two issues in the sections that follow.

Aggregation. In Study 2, team means were used rather than the scores of individuals. The principle of aggregation states that combining many measurements will tend to average out error and yield a better estimate of the true score of a parameter in the population (Ossenkopp & Mazmanian, 1985). However, a comparison of measurement models for individual- and team-level data indicated that team-level data did not consistently show a better fit. For instance, the measurement models for Study 1 (i.e., individual-level data) showed better fits to the data than the initial measurement models for Study 2 (i.e., team-level data), even though the congeneric reliability of the scales improved in the second study.

One possible reason for the poor goodness-of-fit indices for the structural model in Study 2 seemed to be correlated measurement error. One type, "Within-occasion (construct) between-variable correlated error" (Reddy, 1992, p. 552), occurs when the responses to items are influenced by other, temporally related items. For instance, contiguous subscales (e.g., communication and monitoring) and subscales measuring the same component may show correlated measurement error because subjects may develop a particular response pattern that is carried over from one subscale to another. Correlated measurement error may cause the value of chi-square to greatly exceed the value of the true model. However, in models with both correlated measurement error and poor reliability, chi-square tends to improve. Reddy found that while within-construct correlated measurement error does not influence estimates of structural parameters, measurement parameters tend to be inflated. Interestingly, in Study 2, the modification indices for the structural model indicated that the measurement parameters needed the most improvement.

LISREL may be used to adjust for correlated measurement errors and to see whether the fit of the model improves. When such a technique was attempted with Study 2, the goodness-of-fit indices for the measurement models showed substantial improvement (except for a slight decrease in RNI2, a measure of model parsimony). All goodness-of-fit indices improved when LISREL was used to adjust for correlated measurement error found in the structural model. It seems as though correlated measurement error played an important role in the problem with fit.

Alternatively, the Phi matrix may yield some insights into the problem with fit. In general, the Phi matrices in the measurement models for both studies showed higher intercorrelations among the components in Study 2 than in Study 1. Ossenkopp and Mazmanian (1985) and Tachibana (1985) also found larger intercorrelations among aggregated scores for psychobiological variables that they had hypothesized to be related to one another. They suggested that since aggregation usually enhances the estimation of a variable's true population parameters, the estimation of variables that are not related should not be inflated by aggregation.

The higher intercorrelations may indicate that subscales designed for one component may tap a greater portion of intercorrelated components when data have been aggregated. For instance, in Study 1, the correlation between backup and feedback was .74, and in Study 2 the correlation was .91. The subscales for backup may tap more of the component of feedback in Study 2 than they did in Study 1; thus, the subscales for backup may be serving as indicators of both backup and feedback after the data have been aggregated. Large correlations among constructs will result in poorer goodness-of-fit indices for the resultant measurement models because it will appear as though scales designed to tap one construct tap a substantial portion of correlated constructs. This explanation suggests that structural models of aggregated phenomena should optimally consist of indicators that have been developed using aggregated data. When the validation studies of indicators have been based on individual-level data, use of these same indicators to measure aggregated phenomena may negatively affect the goodness-of-fit of the associated structural model.

Another potential explanation for the problem with fit involves the influence of model complexity on the goodness-of-fit indices. The structural model used for the present research was a complex one, including 10 latent traits. Anderson and Gerbing (1984) found that the Goodness-of-Fit Index (GFI), Adjusted Goodness-of-Fit Index (AGIF), and Root-Mean-Squared Residual (RMR), all commonly displayed in LISREL output, are influenced by sample size, the number of indicators per latent trait, and the number of latent traits.

In the current research, it appears as though correlated measurement error, artifacts of aggregation (i.e., large correlations among constructs), and model complexity jointly affected the goodness-of-fit indices for the structural model. Studies employing complex structural models and large sample sizes are susceptible to all three types of problems mentioned above.

Researchers should also be aware that aggregation usually increases the power of a study. The aggregation of data results in a smaller sample size, which is associated with a reduction in power; however, the concurrent reduction in measurement error also tends to decrease the observed score variance. Statistical power is a function of observed score variance; specifically, power increases as observed score variance decreases. Thus, aggregation is associated with an increase in reliability and power, although the relationship between these two phenomena is complex (Humphreys, 1993).

<u>Multidimensionality of constructs</u>. Another important issue to be raised about the current research is the multidimensionality of most of the constructs. For instance,

team orientation is comprised of several factors such as cohesiveness and various attitudes of the team members. The current research used very general conceptualizations for many of the constructs. For other constructs, such as communication, very specific conceptualizations were used. Replications of the current research could use various instruments to measure the facets of the constructs and to examine the subsequent effects on structural relationships. Task structure especially appears to be a very complex construct, with many dimensions in addition to the one studied in this research (i.e., "structured-unstructured"). Further investigation is needed to specify the dimensions of task structure and the relationship of this construct with other variables. Although Study 2 found that the proposed relationship between task structure and communication was not very large, the strength of the relationship is likely to change when different dimensions of task structure are examined.

Conclusion

As the twenty-first century nears, the work place faces growing pressures to improve its efficiency and the quality of its outputs in order to meet the challenges imposed by globalization and technological sophistication. Teams have become the core of many organizations that strive to meet these challenges. This research tested a model that demonstrated many of the crucial processes underlying teamwork and the relationships among them. It also resulted in the design of an instrument that may serve as the first step in the development of a more comprehensive approach to studying teams. The implications derived from this research suggest that the importance of teamwork as the wave of the future cannot be overemphasized.

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Appendix A.

The Team Screening Questionnaire

	Yes	No
(1) Does your team include two or more people?		
(2) Do team members need to interact with each other in order to accomplish the team task?		
(3) Do all team members share a common and valued goal or mission?		
(4) Does each team member have a each specific role or function?		
(5) Is team membership temporary? Do team members have a limited term of membership?		
(6) Do team members engage in the frequent exchange of information or resources?		
(7) Do team members have to time or coordinate their activities so that they can work together?		
(8) Are team members constantly adjusting to the demands or requirements of their task or goal?		
(9) Do team members depend upon each other? (a) Do team members need to communicate with each other or (b) Do team members need to anticipate the actions of each other?		

Appendix B.

Study 1: Teamwork Components Rating Scales

Almost Never		Sometimes		Almost Always
1	2	3	4	5

Write "N/A" if a behavior does not apply

Team Orientation: Team Orientation refers to the attitudes that team members have toward one another and the team task. It reflects an acceptance of team norms, level of group cohesiveness, and importance of team membership.

Team Members:

	Willingly participate in all relevant aspects of the team.
	Cooperate fully with one another.
	Pull together and place team goals ahead of their personal goals and interests.
	Prevent any interpersonal conflicts that may exist from interfering with team functioning.
	Display a high degree of pride in their duties and the team.
	Display a high degree of trust among one another.
	Display an awareness that they are part of a team and that teamwork is important.
	Assign high priority to team goals.
	Display willingness to rely on other team members.
	Get along with other team members.
	Enjoy working with other team members.
	Feel that team experience is personally satisfying.
	Feel proud of personal contributions to team output.
	Regard other team members in a positive way.

Almost Never		Sometimes		Almost Always
1	2	3	4	5

Write "N/A" if a behavior does not apply

Team Orientation: Team Orientation refers to the attitudes that team members have toward one another and the team task. It reflects an acceptance of team norms, level of group cohesiveness, and importance of team membership.

Team Members:

	Feel close to other team members.
	Do helpful things for other members of the team.
	Unify with other members in pursuit of team goals.
	Feel that accomplishment of team goals is important.
	Agree with other members about importance of team goals.
	Are able to work with other members to achieve optimal performance.
	Find it easy to accomplish tasks in the company of other team members.
	Agree that completion of the team task is more important than socializing with each other.

Almost Never		Sometimes		Almost Always
1	2	3	4	5

Write "N/A" if a behavior does not apply

Team Leadership: Team Leadership involves providing direction, structure, and support for other team members. It does not necessarily refer to a single individual with formal authority over others. Team leadership can be shown by several team members.

Team Members:

	Allow other members constantly to ask questions regarding their performance during an assignment.
	Leave work without announcing their intentions or assigning someone to take over for them.
	Assign only the most experienced members to perform even during routine duties.
	Encourage members to take on extra duties, and after demonstrating proficiency, to retain the duties.
	Encourage other team members to make decisions on their own.
	Work with other members to develop communication methods and areas of responsibility.
	Withhold useful information from other team members, believing that they should learn from mistakes.
	Interject only when problems arise and allow other team members to function independently.
	Explain to other team members exactly what is needed from them during an assignment.
	Review the situation quickly when the team becomes overwhelmed and take action.

Almost Never		Sometimes		Almost Always
1	2	3	4	5

Write "N/A" if a behavior does not apply

Team Leadership: Team Leadership involves providing direction, structure, and support for other team members. It does not necessarily refer to a single individual with formal authority over others. Team leadership can be shown by several team members.

Team Members:

	Ensure that other members are working up to capacity.
	Ask other members to follow standard procedures.
	Stress the importance of meeting deadlines.
	Strive to maintain definite performance standards.
	Give consideration to the needs of other members, especially subordinates.
	Fail to provide needed support for new members, and leave them to fend for themselves.
	Provide encouragement when other members attempt to meet new challenges.
	Are willing to listen to problems/complaints of other members.
	Show concern for the welfare of other team members, especially subordinates.
	Strive to create a friendly team environment.

Almost Never		Sometimes		Almost Always
1	2	3	4	5

Write "N/A" if a behavior does not apply

Communication: Communication involves the exchange of information between two or more team members in the prescribed manner and by using proper terminology. Often the purpose of communication is to clarify or acknowledge the receipt of information.

Team Members:

	Clarify intentions to other team members.
	Clarify procedures in advance of assignments.
	Pass complete information as prescribed.
	Acknowledge and repeat messages to ensure understanding.
	Communicate with proper terminology and procedures.
	Verify information prior to making a report.
	Ask for clarification of performance status when necessary.
	Follow proper communication procedures in passing and receiving information.
	Acknowledge requests of other members.
	Ensure that members who receive information understand it as it was intended to be understood.
	Communicate information related to the task.
	Discuss task-related problems with others.
	Share materials related to the task with other members.
	Understand terminology used by other team members.

Almost Never		Sometimes		Almost Always
1	2	3	4	5

Write "N/A" if a behavior does not apply

Communication: Communication involves the exchange of information between two or more team members in the prescribed manner and by using proper terminology. Often the purpose of communication is to clarify or acknowledge the receipt of information.

Team Members:

	Recognize the team members who are the most knowledgeable about certain aspects of the task.
	Understand special codes used by team members.

Almost Never		Sometimes		Almost Always
1	2	3	4	5

Write "N/A" if a behavior does not apply

Monitoring: Monitoring refers to observing the activities and performance of other team members. It implies that team members are individually competent and that they may subsequently provide feedback and backup behavior.

Team Members:

	Are aware of other team members' performance.
	Are concerned with the performance of the team members with whom they interact closely.
	Make sure other team members are performing appropriately.
	Recognize when a team member makes a mistake.
	Recognize when a team member performs correctly.
	Notice the behavior of others.
	Keep track of other team members' work activities.
	Observe the performance of other team members.
	Review the work of other team members.
	Discover errors in the performance of another team member.
	Watch other team members to ensure that they are performing according to guidelines.
	Notice which members are performing their tasks especially well.

Almost Never		Sometimes		Almost Always
1	2	3	4	5

Write "N/A" if a behavior does not apply

Feedback: Feedback involves the giving, seeking, and receiving of information among members. Giving feedback refers to providing information regarding other members' performance. Seeking feedback refers to requesting input or guidance regarding performance. Receiving feedback refers to accepting positive and negative information regarding performance.

Team Members:

	Respond to other members' requests for performance information.
	Provide unneeded suggestions that ultimately confuse other members.
	Go over procedures with other members after an assignment, explaining each step and identifying mistakes.
	Provide nonconstructive, sarcastic comments when an assignment does not go as planned.
	Inform other members that they are doing great, rather than giving specific and constructive advice.
	Ask for advice on proper procedures.
	Accept time-saving suggestions offered by other team members.
	Explain terminology to a member who does not understand its meaning.
	Are yelled at for mistakes in their performance, but do not in turn yell at other team members.
	Ask the supervisor for input on their performance and what needs to be worked on.

Almost Never		Sometimes		Almost Always
1	2	3	4	5

Write "N/A" if a behavior does not apply

Feedback: Feedback involves the giving, seeking, and receiving of information among members. Giving feedback refers to providing information regarding other members' performance. Seeking feedback refers to requesting input or guidance regarding performance. Receiving feedback refers to accepting positive and negative information regarding performance.

Team Members:

	Are corrected on a few mistakes and incorporate the suggestions into their products.
	Use information provided by other members to improve behavior.

Almost Never		Sometimes		Almost Always
1	2	3	4	5

Write "N/A" if a behavior does not apply

Backup Behavior: Backup Behavior involves assisting the performance of other team members. This implies that members have an understanding of other members' tasks. It also implies that members are willing and able to provide and seek assistance when needed.

Team Members:

	Fill in for another member who is unable to perform a task.
	Seek opportunities to aid other team members.
	Help another member correct a mistake.
	Provide assistance to those who need it when specifically asked.
	Ask for help when needed rather than struggle.
	Provide assistance to others having difficulty even when not asked.
	Neglect their own duties in the process of helping.
	Fail to provide assistance to a member even when the member asks.
	Ensure that the person who is assisted is aware of what was done.
	Step in for another team member who is overburdened.
	Take control of situation when other team members do not know how to perform.
	Solve a problem posed by another team member.

Almost Never		Sometimes		Almost Always
1	2	3	4	5

Write "N/A" if a behavior does not apply

Coordination: Coordination refers to team members executing their activities in a timely and integrated manner. It implies that the performance of some team members influences the performance of other team members. This may involve an exchange of information that subsequently influences another member's performance.

Team Members:

	Complete individual tasks without error, in a timely manner.
	Pass performance-relevant data from one to another in a timely manner.
	Pass performance-relevant data from one to another in an efficient manner.
	Are familiar with the relevant parts of other members' jobs.
	Facilitate the performance of each other.
	Carry out individual tasks in synchrony.
	Cause each other to work effectively.
	Avoid distractions during critical assignments.
	Carry out individual tasks effectively thereby leading to coordinated team performance.
	Slow down the rate of performance of other members so that accomplishment of the team goal is delayed.
	Work together with other members to accomplish team goals.
	Interfere with the performance of other team members.

Almost Never		Sometimes		Almost Always
1	2	3	4	5

Write "N/A" if a behavior does not apply

Performance: Performance concerns the accomplishment of the activities and tasks required of the team. This team performance occurs with a consideration of the goals and expectations of team members, the supervisor, and the larger organization.

Team Members:

	Accomplish team goals.
	Meet or exceed expectations of the team.
	Meet performance goals in a timely manner.
	Regard team output as adequate or acceptable.
	Achieve team goals with few or no errors.
	Produce team output that meets standards of the organization.
	Regard accomplishments of the team to be above average.
	Feel that the team as a whole did not perform effectively.
	Consider the number of team errors to be unacceptably high.
	Take too long to accomplish team objectives.
	Can think of many ways in which to improve output produced by the team.
	Consider team performance to be the best that the team could do.

Almost Never		Sometimes		Almost Always
1	2	3	4	5

Write "N/A" if a behavior does not apply

Task Structure: Task structure concerns the degree to which the team is provided with detailed instructions and clear-cut goals. The major aspects of task structure include the clarity of the goal, the team's strategy for accomplishing the task, the nature of the task solution, and the manner in which team members can determine whether or not they have obtained the correct solution to their task.

For Team Members:

	Is there a detailed picture or description available of the finished product/service expected of the team?
	Is there a knowledgeable person available to advise the team members about how the job should be done?
	Is it clear from the instructions given what outcome is expected?
	Is there a step-by-step process which should be followed in order to successfully accomplish the task?
	Can the task be subdivided into separate or distinct parts or steps?
	Is there one best way for performing this task?
	Is it obvious when a correct solution has been found for the task or when the task has been completed?
	Is there one best solution or outcome for the task as indicated by a book, manual, or job description?
	Does it appear as though the task can be accomplished in only one way?

Appendix C.

Study 2: Teamwork Components Rating Scales

Almost Never		Sometimes		Almost Always
1	2	3	4	5

Write "N/A" if a behavior does not apply

Team Orientation: Team Orientation refers to the attitudes that team members have toward one another and the team task. It reflects an acceptance of team norms, level of group cohesiveness, and importance of team membership.

Team Members:

	Willingly participate in all relevant aspects of the team.
	Cooperate fully with one another.
	Pull together and place team goals ahead of their personal goals and interests.
	Display a high degree of pride in their duties and the team.
	Display a high degree of trust among one another.
	Display an awareness that they are part of a team and that teamwork is important.
	Assign high priority to team goals.
	Display willingness to rely on other team members.
	Get along with other team members.
	Enjoy working with other team members.
	Feel that team experience is personally satisfying.
	Feel proud of personal contributions to team output.
	Regard other team members in a positive way.
	Feel close to other team members.
	Do helpful things for other members of the team.

Almost Never		Sometimes		Almost Always
1	2	3	4	5

Write "N/A" if a behavior does not apply

Team Orientation: Team Orientation refers to the attitudes that team members have toward one another and the team task. It reflects an acceptance of team norms, level of group cohesiveness, and importance of team membership.

Team Members:

	Unify with other members in pursuit of team goals.
	Feel that accomplishment of team goals is important.
	Agree with other members about importance of team goals.
	Are able to work with other members to achieve optimal performance.
	Find it easy to accomplish tasks in the company of other team members.

Almost Never		Sometimes		Almost Always
1	2	3	4	5

Write "N/A" if a behavior does not apply

Team Leadership: Team Leadership involves providing direction, structure, and support for other team members. It does not necessarily refer to a single individual with formal authority over others. Team leadership can be shown by several team members.

Team Members:

	Encourage other members to make decisions on their own.
	Work with other members to develop communication methods and areas of responsibility.
	Explain to other team members exactly what is needed from them during an assignment.
	Review the situation quickly when the team becomes overwhelmed and take action.
	Ensure that other members are working up to capacity.
	Ask other members to follow standard procedures.
	Stress the importance of meeting deadlines.
	Strive to maintain definite performance standards.
	Give consideration to the needs of other members, especially subordinates.
	Provide encouragement when other members attempt to meet new challenges.
	Are willing to listen to problems/complaints of other members.
	Show concern for the welfare of other team members, especially subordinates.

Almost Never		Sometimes		Almost Always
1	2	3	4	5

Write "N/A" if a behavior does not apply

Team Leadership: Team Leadership involves providing direction, structure, and support for other team members. It does not necessarily refer to a single individual with formal authority over others. Team leadership can be shown by several team members.

Team Members:

	Strive to create a friendly team environment.
	Provide needed support for new members.
	Listen to the concerns of other team members.
	Assign experienced members to perform critical tasks.
	Assign extra work only to the more capable members.
	Find someone to fill in for them when leaving work.

Almost Never		Sometimes		Almost Always
1	2	3	4	5

Write "N/A" if a behavior does not apply

Communication: Communication involves the exchange of information between two or more team members in the prescribed manner and by using proper terminology. Often the purpose of communication is to clarify or acknowledge the receipt of information.

Team Members:

	Clarify intentions to other team members.
	Clarify procedures in advance of assignments.
	Pass complete information as prescribed.
	Acknowledge and repeat messages to ensure understanding.
	Communicate with proper terminology and procedures.
	Verify information prior to making a report.
	Ask for clarification of performance status when necessary.
	Follow proper communication procedures in passing and receiving information.
	Ensure that members who receive information understand it as it was intended to be understood.
	Communicate information related to the task.
	Discuss task-related problems with others.

Almost Never		Sometimes		Almost Always
1	2	3	4	5

Write "N/A" if a behavior does not apply

Monitoring: Monitoring refers to observing the activities and performance of other team members. It implies that team members are individually competent and that they may subsequently provide feedback and backup behavior.

Team Members:

	Are aware of other team members' performance.
	Are concerned with the performance of the team members with whom they interact closely.
	Make sure other team members are performing appropriately.
	Recognize when a team member makes a mistake.
	Recognize when a team member performs correctly.
	Notice the behavior of others.
	Discover errors in the performance of another team member.
	Watch other team members to ensure that they are performing according to guidelines.
	Notice which members are performing their tasks especially well.

Almost Never		Sometimes		Almost Always
1	2	3	4	5

Write "N/A" if a behavior does not apply

Feedback: Feedback involves the giving, seeking, and receiving of information among members. Giving feedback refers to providing information regarding other members' performance. Seeking feedback refers to requesting input or guidance regarding performance. Receiving feedback refers to accepting positive and negative information regarding performance.

Team Members:

	Respond to other members' requests for performance information.
	Accept time-saving suggestions offered by other team members.
	Explain terminology to a member who does not understand its meaning.
	Ask the supervisor for input regarding their performance and what needs to be worked on.
	Are corrected on a few mistakes, and incorporate the suggestions into their procedures.
	Use information provided by other members to improve behavior.
	Ask for advice on proper procedures.
	Provide helpful suggestions to other members.
	Provide insightful comments when an assignment does not go as planned.

Almost Never		Sometimes		Almost Always
1	2	3	4	5

Write "N/A" if a behavior does not apply

Backup Behavior: Backup Behavior involves assisting the performance of other team members. This implies that members have an understanding of other members' tasks. It also implies that members are willing and able to provide and seek assistance when needed.

Team Members:

	Fill in for another member who is unable to perform a task.
	Seek opportunities to aid other team members.
	Help another member correct a mistake.
	Provide assistance to those who need it when specifically asked.
	Step in for another team member who is overburdened.
	Take control of situation when other team members do not know how to perform.
	Solve a problem posed by another team member.
	Ask for help when needed.
	Maintain their own duties in the process of helping others.

Almost Never		Sometimes		Almost Always
1	2	3	4	5

Write "N/A" if a behavior does not apply

Coordination: Coordination refers to team members executing their activities in a timely and integrated manner. It implies that the performance of some team members influences the performance of other team members. This may involve an exchange of information that subsequently influences another member's performance.

Team Members:

	Complete individual tasks without error, in a timely manner.
	Pass performance-relevant data from one to another in an efficient manner.
	Are familiar with the relevant parts of other members' jobs.
	Facilitate the performance of each other.
	Carry out individual tasks in synchrony.
	Cause each other to work effectively.
	Avoid distractions during critical assignments.
	Carry out individual tasks effectively thereby leading to coordinated team performance.
	Work together with other members to accomplish team goals.

Almost Never		Sometimes		Almost Always
1	2	3	4	5

Write "N/A" if a behavior does not apply

Performance: Performance concerns the accomplishment of the activities and tasks required of the team. This team performance occurs with a consideration of the goals and expectations of team members, the supervisor, and the larger organization.

Team Members:

	Accomplish team goals.
	Meet or exceed expectations of the team.
	Meet performance goals in a timely manner.
	Regard team output as adequate or acceptable.
	Achieve team goals with few or no errors.
	Produce team output that meets standards of the organization.
	Regard accomplishments of the team to be above average.
	Feel that the team as a whole performed at an acceptable level.
	Met team objectives in an efficient manner.

Almost Never		Sometimes		Almost Always
1	2	3	4	5

Write "N/A" if a behavior does not apply

Task Structure: Task structure concerns the degree to which the team is provided with detailed instructions and clear-cut goals. The major aspects of task structure include the clarity of the goal, the team's strategy for accomplishing the task, the nature of the task solution, and the manner in which team members can determine whether or not they have obtained the correct solution to their task.

For Team Members:

	Is there a detailed picture or description available of the finished product/service expected of the team?
	Is there a knowledgeable person available to advise the team members about how the job should be done?
	Is it clear from the instructions given what outcome is expected?
	Is there a step-by-step process which should be followed in order to successfully accomplish the task?
	Can the task be subdivided into separate or distinct parts or steps?
	Is there one best way for performing this task?
	Is it obvious when the task has been completed?
	Is there one best solution or outcome for the task as indicated by a book, manual, or job description?
	Can the task be accomplished in only one way?

Almost Never		Sometimes		Almost Always
1	2	3	4	5

Write "N/A" if a behavior does not apply

Task Structure: Task structure concerns the degree to which the team is provided with detailed instructions and clear-cut goals. The major aspects of task structure include the clarity of the goal, the team's strategy for accomplishing the task, the nature of the task solution, and the manner in which team members can determine whether or not they have obtained the correct solution to their task.

For Team Members:

	Do team members understand the standards that the team product must meet in order to be considered acceptable?
	Is the team output or product evaluated using a numerical rating scale?
	Can the team find out how well the task has been accomplished in enough time to improve future performance?
	Do team members understand the goal of their task?
	Do team members have a clear picture of the end-result expected for their task?
	Are there detailed guidelines for accomplishing the task?
	Are there exact instructions for team members to follow when performing the task?
	Is it easy to recognize when a task is completed?
	Do team members prefer to solve most tasks in one particular way?

Almost Never		Sometimes		Almost Always
1	2	3	4	5

Write "N/A" if a behavior does not apply

Task Structure: Task structure concerns the degree to which the team is provided with detailed instructions and clear-cut goals. The major aspects of task structure include the clarity of the goal, the team's strategy for accomplishing the task, the nature of the task solution, and the manner in which team members can determine whether or not they have obtained the correct solution to their task.

For Team Members:

	Is it easy to find out how well the team performed the task?
	Do team members understand when a task has been performed well?

Appendix D.

Items Used for Analyses in Study 2

Team Orientation

(1) Subscale 1: Items 16, 4, 17, 2, 12
(2) Subscale 2: Items 6, 1, 3, 15
(3) Subscale 3: Items 13, 14, 7, 11

Leadership: Consideration

(1) Subscale 1: Items 12, 2, 11
(2) Subscale 2: Items 13, 1, 9
(3) Subscale 3*: Items 10, 14, 15

Leadership: Initiating Structure

(1) Subscale 1: Items 3, 6, 5
(2) Subscale 2: Items 8, 7, 4

Communication

(1) Subscale 1: Items 10, 4, 1, 2
(2) Subscale 2: Items 8, 6, 5, 11
(3) Subscale 3: Items 3, 7, 9

Monitoring

(1) Subscale 1: Items 8, 4, 6
(2) Subscale 2: Items 5, 7, 1
(3) Subscale 3: Items 9, 2, 3

Feedback

(1) Subscale 1: Items 3, 6, 5
(2) Subscale 2: Items 1, 4, 2
(3) Subscale 3*: Items 7, 8, 9

Backup

(1) Subscale 1: Items 1, 7, 3
(2) Subscale 2: Items 2, 6, 5
(3) Subscale 3*: Items 4, 8, 9

Coordination

(1) Subscale 1: Items 4, 7, 3
(2) Subscale 2: Items 8, 9, 6
(3) Subscale 3: Items 5, 1, 2

Performance

(1) Subscale 1: Items 3, 4, 1
(2) Subscale 2: Items 7, 5, 2
(3) Subscale 3*: Items 6, 8, 9

<u>Task Structure</u>

(1) Subscale 1:	Items 3, 2, 5, 7
(2) Subscale 2:	Items 4, 1, 8
(3) Subscale 3*:	Items 14, 19, 17

* New scale

Appendix E.

Study 1: Confirmatory Factor Analyses of the Nine Components

Table E.1

Team Orientation: Maximum Likelihood Factor Loadings, Theta Deltas, and Squared Multiple Correlations

	Factor Loadings	Theta Delta	R^2
ITEM1	.65	.58	.42
ITEM2	.71	.50	.50
ITEM3	.72	.48	.52
ITEM4	.56	.69	.31
ITEM5	.63	.60	.40
ITEM6	.69	.53	.48
ITEM7	.82	.32	.68
ITEM8	.76	.42	.58
ITEM9	.68	.54	.46
ITEM10	.67	.55	.45
ITEM11	.74	.45	.55
ITEM12	.70	.51	.49
ITEM13	.73	.47	.54
ITEM14	.80	.37	.63
ITEM15	.69	.53	.47
ITEM16	.72	.48	.52
ITEM17	.83	.32	.68
ITEM18	.77	.41	.59
ITEM19	.74	.45	.55
ITEM20	.72	.48	.52
ITEM21	.76	.42	.58
ITEM22	.54	.71	.29

Note. N = 147. Estimates of goodness-of-fit are: Chi-square (df = 209, $p < .01$) = 1229.23, goodness-of-fit index = .60, adjusted goodness-of-fit index = .51, root mean square residual = .09, Tucker-Lewis Index = .69, RNI = .67, RNI2= .73. All T-values are greater than 2.0.

Table E.2

Team Leadership: Maximum Likelihood Factor Loadings, Theta Deltas, Squared Multiple Correlation (All Items Included)

	CN Factor Loadings	IS Factor Loadings	Theta Delta	R^2
ITEM1	.31	.00	.91	.09
ITEM2	.00	.13	.98	.02
ITEM3	.00	.32	.90	.10
ITEM4	.00	.44	.81	.20
ITEM5	-.50	.00	.76	.25
ITEM6	-.65	.00	.58	.42
ITEM7	-.49	.00	.76	.24
ITEM8	.04	.00	.99	.00
ITEM9	.00	.75	.45	.55
ITEM10	.00	.71	.50	.51
ITEM11	.00	.71	.50	.50
ITEM12	.00	.64	.59	.41
ITEM13	.00	.64	.59	.41
ITEM14	.00	.72	.48	.52
ITEM15	-.79	.00	.37	.63
ITEM16	-.52	.00	.73	.27
ITEM17	-.82	.00	.34	.67
ITEM18	-.78	.00	.39	.61
ITEM19	-.87	.00	.24	.76
ITEM20	-.83	.00	.32	.68

Note. *N* = 112. Abbreviations are: CN = Consideration and IS = Initiating Structure. The Phi correlation between Factor 1 and Factor 2 was -.66. Estimates of goodness-of-fit are: Chi-square (df = 169, $p < .01$) = 830.87, goodness-of-fit index = .65, adjusted goodness-of-fit index = .56, root mean square residual = .12, Tucker-Lewis Index = .60, RNI = .56, RNI2 = .62. All *T*-values are greater than 2.0.

Table E.3

Team Leadership: Maximum Likelihood Factor Loadings, Theta Deltas,and Squared Multiple Correlations (Items 1, 2, 3, 7, 16 Eliminated)

	CN Factor Loadings	IS Factor Loadings	Theta Delta	R^2
ITEM4	.00	.46	.79	.22
ITEM5	.52	.00	.73	.27
ITEM6	.65	.00	.58	.42
ITEM8	.01	.00	1.00	.00
ITEM9	.00	.75	.44	.56
ITEM10	.00	.70	.50	.50
ITEM11	.00	.70	.51	.45
ITEM12	.00	.64	.59	.41
ITEM13	.00	.64	.59	.41
ITEM14	.00	.73	.47	.53
ITEM15	.79	.00	.38	.62
ITEM17	.82	.00	.34	.67
ITEM18	.79	.00	.37	.63
ITEM19	.87	.00	.24	.76
ITEM20	.82	.00	.32	.68

Note. N = 112. Abbreviations are: CN = Consideration and IS = Initiating Structure. The Phi correlation between Factor 1 and Factor 2 was .65. Estimates of goodness-of-fit are: Chi-square (df = 89, p < .01) = 379.13, goodness-of-fit index = .79, adjusted goodness-of-fit index = .72, root mean square residual = .09, Tucker-Lewis Index = .76, RNI = .85, RNI2 = .53. All T-values are greater than 2.0.

Table E.4

Communication: Maximum Likelihood Factor Loadings, Theta Deltas, and Squared Multiple Correlations

	Factor Loadings	Theta Delta	R^2
ITEM1	.79	.38	.62
ITEM2	.75	.44	.56
ITEM3	.80	.36	.64
ITEM4	.63	.61	.39
ITEM5	.75	.44	.56
ITEM6	.73	.47	.54
ITEM7	.73	.46	.54
ITEM8	.83	.31	.69
ITEM9	.77	.40	.60
ITEM10	.80	.37	.63
ITEM11	.87	.24	.76
ITEM12	.79	.38	.62
ITEM13	.75	.44	.56
ITEM14	.64	.59	.41
ITEM15	.73	.46	.54
ITEM16	.62	.61	.39

Note. N = 129. Estimates of goodness-of-fit are: Chi-square (df = 104, p < .01) = 497.59, goodness-of-fit index = .72, adjusted goodness-of-fit index = .63, root mean square residual = .07, Tucker-Lewis Index = .83, RNI = .81, RNI2 = .92. All T-values are greater than 2.0.

Table E.5

Monitoring: Maximum Likelihood Factor Loadings, Theta Deltas, and Squared Multiple Correlations

	Factor Loadings	Theta Delta	R^2
ITEM1	.71	.50	.50
ITEM2	.66	.56	.44
ITEM3	.73	.47	.53
ITEM4	.60	.65	.36
ITEM5	.75	.44	.56
ITEM6	.67	.55	.45
ITEM7	.77	.41	.59
ITEM8	.82	.34	.67
ITEM9	.75	.43	.57
ITEM10	.64	.59	.41
ITEM11	.79	.37	.63
ITEM12	.78	.39	.61

Note. *N* = 129. Estimates of goodness-of-fit are: Chi-square (*df* = 54, *p* < .01) = 272.45, goodness-of-fit index = .76, adjusted goodness-of-fit index = .65, root mean square residual = .08, Tucker-Lewis Index = .86, RNI = .93, RNI2 = .97. All *T*-values are greater than 2.0.

Table E.6

Feedback: Maximum Likelihood Factor Loadings, Theta Deltas, and Squared Multiple Correlations

	Factor Loadings	Theta Delta	R^2
ITEM1	.73	.47	.53
ITEM2	.34	.89	.11
ITEM3	-.56	.69	.31
ITEM4	.32	.90	.09
ITEM5	-.08	.99	.01
ITEM6	.54	.71	.30
ITEM7	.72	.49	.51
ITEM8	.76	.43	.58
ITEM9	-.05	.99	.00
ITEM10	.63	.61	.39
ITEM11	.72	.48	.52
ITEM12	.71	.50	.50

Note. N = 140. Estimates of goodness-of-fit are: Chi-square (df = 54, $p < .01$) = 301.36, goodness-of-fit index = .72, adjusted goodness-of-fit index = .60, root mean square residual = .14, Tucker-Lewis Index = .72, RNI = .68, RNI2 = .79. All T-values are greater than 2.0.

Table E.7

Backup: Maximum Likelihood Factor Loadings, Theta Deltas, and Squared Multiple Correlations

	Lambda Loadings	Theta Delta	R^2
ITEM1	.83	.31	.69
ITEM2	.89	.21	.79
ITEM3	.87	.25	.75
ITEM4	.84	.29	.71
ITEM5	.50	.75	.25
ITEM6	.62	.62	.38
ITEM7	.12	.99	.01
ITEM8	.48	.77	.23
ITEM9	.19	.96	.04
ITEM10	.74	.45	.55
ITEM11	.67	.56	.44
ITEM12	.57	.68	.33

Note. N = 138. Estimates of goodness-of-fit are: Chi-square (df = 54, $p < .01$) = 261.04, goodness-of-fit index = .79, adjusted goodness-of-fit index = .69, root mean square residual = .08, Tucker-Lewis Index = .84, RNI = .82, RNI2 = .95. All T-values are greater than 2.0.

Table E.8

Coordination: Maximum Likelihood Factor Loadings, Theta Deltas, and Squared Multiple Correlations

	Factor Loadings	Theta Delta	R^2
ITEM1	.72	.49	.51
ITEM2	.79	.38	.62
ITEM3	.75	.44	.56
ITEM4	.83	.31	.69
ITEM5	.89	.21	.79
ITEM6	.83	.31	.69
ITEM7	.83	.30	.70
ITEM8	.70	.52	.48
ITEM9	.88	.23	.77
ITEM10	.47	.78	.22
ITEM11	.78	.40	.60
ITEM12	.35	.88	.12

Note. N = 136. Estimates of goodness-of-fit are: Chi-square (df = 54, $p < .01$) = 461.40, goodness-of-fit index = .70, adjusted goodness-of-fit index = .56, root mean square residual = .09, Tucker-Lewis Index = .79, RNI = .76, RNI2 = .88. All T-values are greater than 2.0.

Table E.9

Performance: Maximum Likelihood Factor Loadings, Theta Deltas, and Squared Multiple Correlations

	Factor Loadings	Theta Delta	R^2
ITEM1	.79	.38	.62
ITEM2	.77	.42	.59
ITEM3	.87	.25	.75
ITEM4	.65	.58	.42
ITEM5	.69	.52	.48
ITEM6	.81	.35	.65
ITEM7	.82	.33	.67
ITEM8	.36	.87	.13
ITEM9	.44	.81	.19
ITEM10	.55	.70	.31
ITEM11	-.25	.94	.06
ITEM12	.31	.91	.09

Note. *N* = 142. Estimates of goodness-of-fit are: Chi-square (*df* = 54, *p* < .01) = 406.07, goodness-of-fit index = .68, adjusted goodness-of-fit index = .54, root mean square residual = .13, Tucker-Lewis Index = .74, RNI = .69, RNI2 = .81. All *T*-values are greater than 2.0.

Table E.10

Task Structure: Maximum Likelihood Factor Loadings, Theta Deltas, and Squared Multiple Correlations

	Factor Loadings	Theta Delta	R^2
ITEM1	.64	.59	.41
ITEM2	.67	.55	.45
ITEM3	.80	.37	.64
ITEM4	.68	.54	.46
ITEM5	.56	.69	.31
ITEM6	.37	.87	.14
ITEM7	.47	.78	.22
ITEM8	.48	.77	.23
ITEM9	.09	.99	.01

Note. N = 124. Estimates of goodness-of-fit are: chi-square (df = 27, $p < .01$) = 114.28, goodness-of-fit index = .86, adjusted goodness-of-fit index = .76, root mean square residual = .10, Tucker-Lewis Index = .84, RNI = .81, RNI2 = .99. All T-values are greater than 2.0.

Appendix F.

Study 1: Exploratory Factor Analyses of the Nine Components

Table F.1

Pattern and Factor Correlation Matrix for Team Orientation

Pattern Matrix

	FACTOR1	FACTOR2	FACTOR3	FACTOR4
ITEM3	.84			
ITEM2	.65		-.35	
ITEM4	.60			
ITEM5	.56			
ITEM1	.51			
ITEM22	.50			
ITEM7	.49			
ITEM18	.48			
ITEM8	.42			.36
ITEM17	.36			
ITEM20		-1.07		
ITEM21		-.45		.35
ITEM19		-.31		
ITEM9		-.30		
ITEM10			-.78	
ITEM11			-.62	
ITEM6			-.40	
ITEM16				.73
ITEM15				.68
ITEM12				.62
ITEM13	.35			.53
ITEM14				.43

Factor Correlation Matrix

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4
FACTOR 1	1.00			
FACTOR 2	-.55	1.00		
FACTOR 3	-.25	.33	1.00	
FACTOR 4	.56	-.51	-.31	1.00

Note. *N* = 147. Only pattern coefficients greater than .29 are displayed.

Table F.2

Pattern and Factor Correlation Matrix for Team Leadership

Pattern Matrix

	FACTOR1	FACTOR2	FACTOR3	FACTOR4
ITEM18	.84			
ITEM19	.84			
ITEM17	.74			
ITEM15	.68			
ITEM20	.68			
ITEM5	.55			
ITEM6	.46			
ITEM2		-.70		
ITEM3		-.56		
ITEM4		.39		
ITEM1		-.36		
ITEM11			.81	
ITEM9			.73	
ITEM12			.66	
ITEM10			.59	
ITEM13			.52	
ITEM14			.44	
ITEM16	.31	-.34		-.53
ITEM8				.53
ITEM7		-.33		-.38

Factor Correlation Matrix

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR
FACTOR 1	1.00			
FACTOR 2	.03	1.00		
FACTOR 3	.50	.05	1.00	
FACTOR 4	-.19	.16	-.06	1.00

Note. N = 112. Only pattern coefficients greater than .29 are displayed.

Table F.3

Pattern and Factor Correlation Matrix for Communication

Pattern Matrix

	FACTOR 1	FACTOR 2
ITEM2	.83	
ITEM3	.81	
ITEM1	.74	
ITEM5	.72	
ITEM4	.69	
ITEM8	.65	
ITEM7	.59	
ITEM10	.54	
ITEM6	.51	
ITEM11	.45	.43
ITEM12	.43	.37
ITEM16		.79
ITEM15		.70
ITEM9		.62
ITEM14		.61
ITEM13		.48

Factor Correlation Matrix

	FACTOR 1	FACTOR 2
FACTOR 1	1.00	
FACTOR 2	.71	1.00

Note. N = 129. Only pattern coefficients greater than .29 are displayed.

Table F.4

Pattern and Factor Correlation Matrix for Monitoring

Pattern Matrix

	FACTOR 1	FACTOR 2
ITEM1	.80	
ITEM2	.75	
ITEM5	.65	
ITEM3	.65	
ITEM6	.60	
ITEM4	.44	
ITEM9		-.87
ITEM7		-.85
ITEM10		-.62
ITEM8		-.62
ITEM11		-.55
ITEM12	.30	-.49

Factor Correlation Matrix

	FACTOR 1	FACTOR 2
FACTOR 1	1.00	
FACTOR 2	-.69	1.00

Note. N = 140. Only pattern coefficients greater than .29 are displayed.

Table F.5

Pattern and Factor Correlation Matrix for Feedback

Pattern Matrix

	FACTOR 1	FACTOR 2	FACTOR 3
ITEM12	.90		
ITEM10	.61		
ITEM3	-.49		
ITEM11	.48		.32
ITEM1	.37		.35
ITEM4		.72	
ITEM2		.70	
ITEM9		-.58	
ITEM5		.52	
ITEM7			.82
ITEM8			.69
ITEM6			.56

Factor Correlation Matrix

	FACTOR 1	FACTOR 2	FACTOR 3
FACTOR 1	1.00		
FACTOR 2	.03	1.00	
FACTOR 3	.60	.10	1.00

Note. N = 125. Only pattern coefficients greater than .29 are displayed.

Table F.6

Pattern and Factor Correlation Matrix for Backup

Pattern Matrix

	FACTOR 1	FACTOR 2	FACTOR 3
ITEM3	.85		
ITEM2	.82		
ITEM1	.75		
ITEM11	.63		-.34
ITEM12	.63		
ITEM10	.59		
ITEM4	.53		.33
ITEM5		.64	
ITEM9		.38	
ITEM6		.38	
ITEM8			
ITEM7			

Factor Correlation Matrix

	FACTOR 1	FACTOR 2	FACTOR 3
FACTOR 1	1.00		
FACTOR 2	.43	1.00	
FACTOR 3	.20	.06	1.00

Note. N = 138. Only pattern coefficients greater than .29 are displayed.

Table F.7

Pattern and Factor Correlation Matrix for Coordination

Pattern Matrix

	FACTOR 1	FACTOR 2
ITEM6	.79	
ITEM7	.71	
ITEM8	.67	
ITEM9	.64	
ITEM4	.63	
ITEM5	.61	-.33
ITEM11	.43	-.32
ITEM10	.42	
ITEM12	.32	
ITEM2		-1.00
ITEM3		-.76
ITEM1		-.58

Factor Correlation Matrix

	FACTOR 1	FACTOR 2
FACTOR 1	1.00	
FACTOR 2	.59	1.00

Note. *N* = 136. Only pattern coefficients greater than .29 are displayed.

Table F.8

Pattern and Factor Correlation Matrix for Performance

Pattern Matrix

	FACTOR 1	FACTOR 2	FACTOR 3
ITEM2	.84		
ITEM1	.83		
ITEM7	.68		
ITEM3	.63		
ITEM6	.56		.40
ITEM5	.56		.30
ITEM4	.43		
ITEM9		.85	
ITEM10		.69	
ITEM8		.61	
ITEM12			.33
ITEM11			

Factor Correlation Matrix

	FACTOR 1	FACTOR 2	FACTOR 3
FACTOR 1	1.00		
FACTOR 2	.41	1.00	
FACTOR 3	.11	.09	1.00

Note. *N* = 142. Only pattern coefficients greater than .29 are displayed.

Table F.9

Pattern and Factor Correlation Matrix for Task Structure

Pattern Matrix

	FACTOR 1	FACTOR 2
ITEM3	.78	
ITEM2	.61	
ITEM1	.59	
ITEM4	.58	
ITEM5	.46	
ITEM8	.37	
ITEM7	.36	
ITEM9		.75
ITEM6		.61

Factor Correlation Matrix

	FACTOR 1	FACTOR 2
FACTOR 1	1.00	
FACTOR 2	.26	1.00

Note. *N* = 124. Only pattern coefficients greater than .29 are displayed.

Appendix G.

Items Used For Analyses in Study 1 and Their Modifications for Study 2

Team Orientation

(1) Subscale 1: Items 17, 5, 18, 2, 13
(2) Subscale 2: Items 7, 1, 3, 16
(3) Subscale 3: Items 14, 15, 8, 12

- New Scale
  Also retained: Items 6, 9, 10, 11, 19, 20, 21
  Removed: Items 4, 22

Team Leadership: Consideration

(1) Subscale 1: Items 19, 6, 18
(2) Subscale 2: Items 20, 5, 15

- New Scale
  Rewrote:
  Item 16 (Provide needed support for new members)

  Added:
  Listen to the concerns of other team members.

Team Leadership: Initiating Structure

(1) Subscale 1: Items 9, 12, 11
(2) Subscale 2: Items 14, 13, 10

- New Scale
  Removed: Items 1, 7, 8
  Rewrote:
  Item 2 (Find someone to fill in for them when leaving work.)
  Item 3 (Assign experienced members to perform critical tasks.)
  Item 4 (Assign extra work only to the more capable members.)

Communication

(1) Subscale 1: Items 11, 4, 1, 2
(2) Subscale 2: Items 8, 6, 5, 12
(3) Subscale 3: Items 3, 7, 10

- New Scale
  Removed: Items 9, 13, 14, 15, 16

Monitoring

(1) Subscale 1: Items 11, 4, 6
(2) Subscale 2: Items 5, 10, 1
(3) Subscale 3: Items 12, 2, 3

- New Scale
  Removed: Item 7, 8, 9

Feedback

(1) Subscale 1: Items 8, 12, 11
(2) Subscale 2: Items 1, 10, 7

- New Scale
  Also retained: Item 6
  Removed: Items 3, 5, 9
  Rewrote:
  Item 2 (Provide helpful suggestions to other members)
  Item 4 (Provide insightful comments when an assignment does not go as planned.)

Backup

(1) Subscale 1: Items 1, 12, 3
(2) Subscale 2: Items 2, 11, 10

- New Scale
  Also retained: Item 4
  Removed: Items 6, 7, 8, 9
  Rewrote:
  Item 5 (Ask for help when needed.)
  Item 7 (Maintain their own duties in the process of helping others.)

Coordination

(1) Subscale 1: Items 5, 8 , 4
(2) Subscale 2: Items 9, 11, 7
(3) Subscale 3: Items 6, 1, 3

- New Scale
  Removed: Items 2, 10, 12

Performance

(1) Subscale 1: Items 3, 4, 1
(2) Subscale 2: Items 7, 5, 2

- New Scale
  Also retained: Item 6
  Removed: Items 9, 10, 11, 12
  Rewrote:
  Item 8 (Feel that the team as a whole performed at an acceptable level.)

  Added:
  Met team objectives in an efficient manner.

Task Structure

(1) Subscale 1: Items 3, 2, 5, 7
(2) Subscale 2: Items 4, 1, 8

- New Scale
  Also retained: Items 6, 9
  Rewrote:
  Item 7 (Is it obvious when the task has been completed?)
  Item 9 (Can the task be accomplished only in one way?)

  Added:
  Additional items adapted from Fiedler (1978):

  (a) Do team members understand the standards that the team product must meet in order to considered acceptable?
  (b) Is the team product or output evaluated using a numerical rating scale?
  (c) Can the team find out how well the task has been accomplished in enough time to improve future performance?

  Additional new items:
  (a) Do team members understand the goal of their task?
  (b) Do team members have a clear picture of the end-result expected for their task?
  (c) Are there detailed guidelines for accomplishing the task?
  (d) Are there exact instructions for team members to follow when performing the task?
  (e) Is it easy for team members to recognize when the task has been completed?
  (f) Do team members prefer to solve most tasks in one particular way?
  (g) Is it easy to find out how well the team performed the task?
  (h) Do team members understand when a task has been performed well?

Appendix H.

Study 1: Results of the Measurement Model Analysis for the Independent Latent Traits

Table H.1

Measurement Model Analysis for Independent Latent Factors

	Lambda X Factor Loadings					
	TO	CN	IS	TS	Theta Delta	R^2
TO1	.91	.00	.00	.00	.16	.84
TO2	.93	.00	.00	.00	.13	.87
TO3	.87	.00	.00	.00	.25	.75
CN1	.00	.82	.00	.00	.32	.68
CN2	.00	.85	.00	.00	.28	.72
IS1	.00	.00	.73	.00	.47	.53
IS2	.00	.00	.94	.00	.11	.89
TS1	.00	.00	.00	.95	.09	.91
TS2	.00	.00	.00	.66	.56	.44

Factor Correlations (Phi)

	TO	CN	IS	TS
TO	1.00			
CN	.55	1.00		
IS	.64	.61	1.00	
TS	.60	.59	.50	1.00

Note. N = 100. Abbreviations: TO = Team Orientation, CN = Consideration, IS = Initiating Structure, and TS = Task Structure. Total coefficient of determination for the model is .99. Estimates of goodness-of-fit are: Chi-square (df = 21, $p < .01$) = 46.04, goodness-of-fit index = .91, adjusted goodness-of-fit index = .80, root mean square residual = .05, Tucker Lewis Index = .99, RNI = .99, RNI2 = 1.13. All T-values are 2.0 or greater, except for the following T-values for Theta Delta: IS2 = 1.12, TS1 = .72.

Appendix I.

Study 1: Results of the Measurement Model Analysis for the Dependent Latent Traits

Table I.1

Measurement Model Analysis for Dependent Latent Factors

	Lambda X Factor Loadings							
	COM	MON	FDB	BKP	COO	PER	Theta Delta	R^2
COM1	.89	.00	.00	.00	.00	.00	.20	.80
COM2	.93	.00	.00	.00	.00	.00	.13	.87
COM3	.89	.00	.00	.00	.00	.00	.22	.78
MON1	.00	.81	.00	.00	.00	.00	.36	.64
MON2	.00	.86	.00	.00	.00	.00	.27	.73
MON3	.00	.90	.00	.00	.00	.00	.19	.81
FDB1	.00	.00	.88	.00	.00	.00	.22	.78
FDB2	.00	.00	.92	.00	.00	.00	.15	.85
BKP1	.00	.00	.00	.95	.00	.00	.09	.91
BKP2	.00	.00	.00	.87	.00	.00	.25	.75
COO1	.00	.00	.00	.00	.91	.00	.17	.83
COO2	.00	.00	.00	.00	.94	.00	.12	.88
COO3	.00	.00	.00	.00	.89	.00	.21	.79
PER1	.00	.00	.00	.00	.00	.87	.24	.76
PER2	.00	.00	.00	.00	.00	.93	.13	.87

Factor Correlations (Phi)

	COM	MON	FDB	BKP	COO	PER
COM	1.00					
MON	.61	1.00				
FDB	.64	.76	1.00			
BKP	.65	.80	.74	1.00		
COO	.69	.77	.59	.80	1.00	
PER	.60	.62	.62	.79	.84	1.00

Note. N = 100. The following abbreviations are used in the appendix: COM (Communication), MON (Monitoring), FDB (Feedback), BKP (Backup), COO (Coordination), and PER (Performance). Total coefficient of determination for the model is 1.00. Estimates of goodness-of-fit are: Chi-square (df = 75, $p < .01$) = 180.88, goodness-of-fit index = .82, adjusted goodness-of-fit index = .71, root mean square residual = .04, Tucker Lewis Index = 1.00, RNI = 1.00, RNI2 = 1.09. All T-values are 2.0 or greater.

Appendix J.

Interrater Reliabilities for Teams

TEAM	TO	TL	COMM	MONIT	FDBK	BKUP	COORD	PERF	TASK
1	7.10	.18	.27	-2.67	2.83	-.10	2.44	-.22	-2.85
2	.92	.92	.97	.82	.88	.87	.90	.58	.93
3	.95	.91	.91	.94	.89	.92	.96	.97	.88
4	.99	.52	.92	.43	.96	.97	.98	.99	.86
5	.94	.92	.93	.90	.94	.90	.95	.97	.88
6	.95	.95	.94	.90	.95	.94	.95	.97	.92
7	.83	.84	.94	.74	.87	.83	.86	.90	.80
8	.85	.91	.93	.87	.94	.90	.89	.88	.91
9	.95	.75	.87	.58	.87	.92	.95	.95	.90
10	-1.42	3.77	14.40	4.61	-4.20	-.76	-63.60	-1.50	.01
11	.92	.95	.91	.82	.87	.90	.95	.96	.90
13	.96	.90	.96	.96	.93	.97	.97	.97	.93
14	.97	.94	.97	.97	.89	.98	.97	.97	.91
15	.96	.91	.92	.80	.91	.94	.95	.83	.58
16	.98	.96	.95	.97	.96	.98	.98	.98	.95
17	.88	.95	.94	.95	.98	.98	.93	.92	.93
18	.95	.93	.99	.94	.96	.95	.97	.98	.88
19	1.00	.99	1.00	.96	1.00	1.00	1.00	1.00	1.00
20	.96	.95	.96	.96	.97	.96	.99	.98	.93

TEAM	TO	TL	COMM	MONIT	FDBK	BKUP	COORD	PERF	TASK
21	.76	.95	.94	.96	.95	.92	.95	.95	.85
22	.98	.95	.88	.94	.93	.98	.98	.97	.91
23	.99	.97	.98	.98	.98	.98	.98	.98	.91
24	.92	.93	.93	.97	.95	.96	.97	.97	.92
25	.95	.81	.94	.89	.96	.97	.88	.96	.73
26	.88	.92	.94	.93	.71	.78	.64	.82	1.00
27	.95	.92	.87	.84	.89	.95	.95	.99	.88
28	.94	.88	.90	.97	.90	.91	.96	.96	.91
29	.93	.82	.86	.80	.74	.47	.62	.76	.53
30	.96	.94	.95	.95	.98	.95	.97	.95	.96
31	.88	.82	.89	.89	.92	.96	.87	.85	.81
32	.81	.81	.80	.72	.61	.65	.54	.83	.70
33	.86	.81	.89	.71	.94	.93	.93	.69	.86
34	.33	.38	.60	.84	.40	.56	1.00	.71	1.00
35	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
36	.93	.89	.95	.94	.93	.90	.93	.92	.94
37	.35	.29	.69	.76	.86	.40	.33	.89	.90
38	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
39	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

TEAM	TO	TL	COMM	MONIT	FDBK	BKUP	COORD	PERF	TASK
40	.87	.80	.40	.47	.71	.43	.53	.74	.05
41	.87	.80	.91	.89	.82	.82	.91	.97	.90
42	.83	.51	.70	.80	.71	.71	.72	.57	.67
43	.94	.91	.96	.87	.89	.95	.94	.95	.80
44	.97	.96	.97	.96	.95	.95	.95	.95	.91
45	.99	.85	.99	.97	1.00	.97	1.00	.98	.94
46	.95	.89	.53	.94	1.00	1.00	.99	1.00	.50
47	.45	.03	.86	.78	.50	.33	.29	.50	.42
48	.82	.71	.98	-18.75	.31	-3.56	.89	.92	.73
49	.93	.86	.91	.61	.88	.38	.88	.91	.74
50	.91	.90	.88	.83	.95	.91	.87	.85	.38
51	.93	-.40	.83	.78	.86	.62	.89	.88	.84
52	.83	1.00	.76	.91	.86	.82	.94	.99	.46
53	.89	.62	.94	.80	.86	.50	.84	.96	.80
54	.95	.88	.91	.56	.74	.89	.89	.94	.61
55	.73	.24	.74	.20	.53	.71	.86	.88	-5.27
56	.52	.70	.81	.64	.40	.94	.76	.86	.86
57	.87	.74	.86	.96	.74	.71	.88	.94	.60
58	.81	.57	.86	.74	.80	-.67	.89	.96	.77

TEAM	TO	TL	COMM	MONIT	FDBK	BKUP	COORD	PERF	TASK
59	.87	.50	.96	.53	.97	.47	.96	.99	.52
60	.78	.67	.72	.93	.62	.89	.91	.86	.86
61	.87	.85	.93	.95	.90	.95	.90	.96	.74
62	.98	.92	.96	.85	.86	.95	.96	1.00	.84
63	.77	.80	.85	.82	.78	.82	.81	.73	.81
64	.92	.95	.99	.96	.95	.95	.96	.93	.75
65	.81	.76	.80	.66	.27	.44	.75	.74	.51
66	.94	.69	.91	.83	.65	.91	.88	.94	.60
67	.91	.92	.91	.93	.88	.86	.86	.91	.79
68	.94	.96	.93	.81	.92	.85	.90	.85	-1.86
69	.92	.86	.95	.88	.85	.92	.93	.95	.82
70	.90	.88	.86	.84	.53	.69	.94	.88	.81
71	.96	.86	.93	.94	.89	.98	.95	.97	.85
72	.94	.94	.96	1.00	.97	.96	.86	.80	.81
73	.94	.83	.93	.87	.96	.91	.67	.76	.77
74	.90	.87	.87	.95	.93	.83	.84	.25	.87
75	.96	.94	.93	.93	.38	.92	.93	.96	.83
76	.90	.83	.90	.91	.91	.89	.94	.99	.86
77	.96	1.00	1.00	1.00	.91	.50	.97	.97	.49

TEAM	TO	TL	COMM	MONIT	FDBK	BKUP	COORD	PERF	TASK
78	.93	.78	.93	.90	.96	.89	.95	.92	.85
79	0	0	0	0	0	0	0	0	0
80	.92	.94	.94	.95	.94	.93	.96	.93	.89
81	.91	.84	.92	.88	.94	.94	.95	.96	.42
82	.97	.98	.98	.97	.98	.92	.99	.99	.95
83	.96	.84	.92	.84	.90	.92	.96	.93	.91
84	.91	.61	.96	.91	.91	.89	.92	.93	.90
85	.97	.96	.97	.97	.95	.94	.95	.96	.92
86	.93	.91	.96	.92	.93	.94	.94	.98	.90
87	.90	.86	.93	.93	.94	.93	.91	.94	.85
88	.95	.95	.85	.89	.91	.95	.93	.92	.84
89	.87	.91	.93	.71	.93	.83	.86	.80	.79
90	.89	.78	.89	.89	.89	.94	.93	.97	.71
91	.92	.95	.93	.88	.86	.94	.91	.95	.91
92	.97	.84	.69	.90	.61	.99	.96	.95	.85
93	.82	.42	.74	.83	.61	.75	.73	.60	.67
94	.96	.95	.98	.94	.91	.93	.96	.98	.92
95	.96	.82	.92	.77	.92	.96	.97	.98	.89
96	.93	.95	.90	.90	.90	.94	.95	.94	.42

TEAM	TO	TL	COMM	MONIT	FDBK	BKUP	COORD	PERF	TASK
97	.85	.77	.86	.77	-.17	.59	.87	.89	.67
98	.93	.80	.90	.86	.74	.93	.98	.99	.72
99	.95	.90	.95	.94	.95	.89	.97	.96	.92
100	.94	.88	.75	.90	.90	.91	.90	.85	.74
101	.99	.95	.98	.93	.93	.91	.99	.97	.47
102	1.00	-7.78	.98	.98	.97	.99	.99	1.00	.77
103	.97	.98	.97	.97	.96	.93	.98	1.00	.92
104	.70	.85	.74	.84	.54	.92	.78	.76	.45
105	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
106	.94	.29	.58	.78	4.88	-2.80	9.20	4.57	1.00
107	.73	.99	1.00	.99	1.00	.99	1.00	1.00	1.00
108	.92	.90	.97	.92	.95	.94	.39	.97	.86
109	.91	.90	.95	.95	.89	.96	.91	.94	.48
110	.97	.77	.92	.89	.82	.90	.85	.96	.69
111	.76	.98	.99	.92	.98	.98	.98	.96	.22
112	.78	.82	.91	.93	.52	.95	.89	.88	.80
113	.90	.85	.90	1.89	.58	-2.97	-.28	.88	2.80
114	.97	.92	.81	.89	.63	.92	.66	.45	.63
115	.95	.84	.94	1.26	.98	.99	.98	.99	1.12

TEAM	TO	TL	COMM	MONIT	FDBK	BKUP	COORD	PERF	TASK
116	.99	.92	.98	.99	1.00	.99	1.00	1.00	.99
117	.74	.97	.98	.74	.78	.93	.91	.69	.79
118	.71	.40	.56	.84	.33	-4.00	0	.86	.07
119	.83	-.15	.96	.62	-.32	.82	.47	.91	.18
120	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
121	1.00	.99	1.00	.99	.94	.99	1.00	1.00	1.00
122	.90	1.35	.94	.88	.83	.94	.96	.95	.93
123	.97	.87	.96	1.10	1.33	.93	1.28	.98	6.70
124	1.74	1.23	1.15	1.08	1.07	1.09	1.07	1.07	1.06
125	.93	.86	.93	.64	.91	.96	.62	.64	.82
126	.99	-.48	0	-.18	.88	.84	.94	.89	-2.10
127	.70	.36	.74	-.25	.43	.64	-.48	.50	8.67
128	.93	.43	.90	-.67	.62	.94	.93	.96	-.42
129	.99	.81	.98	-.11	.33	.94	.97	.97	.46
130	.94	.90	.10	.89	.96	.94	.93	-.69	.89
131	.99	.97	1.00	.99	.98	.99	.99	1.00	.99
132	.94	1.54	.98	.99	.97	.93	.99	.97	.98
133	.99	.96	.99	.99	.97	.94	.96	.97	.98
134	1.00	.98	.99	.99	.99	.99	1.00	.99	.99

TEAM	TO	TL	COMM	MONIT	FDBK	BKUP	COORD	PERF	TASK
135	.99	.94	.98	.97	.97	.99	.95	.99	.98
136	.97	1.07	10.00	.96	.90	.98	.98	.96	.96

Note. Abbreviations are: TO (Team Orientation), TL (Team Leadership), COMM (Communication), MONIT (Monitoring), FDBK (Feedback), BKUP (Backup), COORD (Coordination), PERF (Performance), and TASK (Task Structure). No team was assigned the number 12. The following 28 teams were dropped because they did not achieve a reliability of .70 or higher on at least 7 scales: Team 1, 10, 29, 34, 37, 40, 46, 47, 48, 55, 56, 59, 65, 79, 93, 97, 106, 113, 114, 118, 119, 123, 124, 125, 126, 127, 128, and 129.

Appendix K.

Study 2: Between-Team Differences on the Component Scales

Orientation

Source	df	Mean Squares	F
BG	132	1.167	4.05*
WG	374	.288	

Leadership

Source	df	Mean Squares	F
BG	124	.967	2.44*
WG	264	.396	

Communication

Source	df	Mean Squares	F
BG	129	1.252	3.75*
WG	349	.334	

Monitoring

Source	df	Mean Squares	F
BG	125	.721	2.07*
WG	348	.349	

Feedback

Source	df	Mean Squares	F
BG	124	1.030	2.39*
WG	320	.431	

Backup

Source	df	Mean Squares	F
BG	127	1.096	2.86*
WG	346	.383	

Coordination

Source	df	Mean Squares	F
BG	126	1.143	3.35*
WG	349	.341	

Performance

Source	df	Mean Squares	F
BG	131	.994	2.77*
WG	374	.359	

Task Structure

Source	df	Mean Squares	F
BG	121	.764	2.29*
WG	259	.334	

Note. Abbreviations are: BG = Between groups and WG = Within groups.
*$p < .01$.

Appendix L.

Study 2: Confirmatory Factor Analyses of the Nine Components

Table L.1

Team Orientation: Maximum Likelihood Factor Loadings for Lambda X, Theta Deltas, and Squared Multiple Correlations

	Factor Loadings	Theta Delta	R^2
ITEM1	.81	.35	.65
ITEM2	.72	.48	.52
ITEM3	.74	.45	.55
ITEM4	.80	.37	.63
ITEM5	.87	.25	.75
ITEM6	.89	.21	.79
ITEM7	.83	.31	.69
ITEM8	.85	.28	.72
ITEM9	.69	.52	.48
ITEM10	.85	.29	.71
ITEM11	.88	.23	.77
ITEM12	.83	.31	.69
ITEM13	.85	.28	.72
ITEM14	.81	.34	.66
ITEM15	.84	.29	.71
ITEM16	.92	.15	.85
ITEM17	.81	.34	.66
ITEM18	.83	.30	.70
ITEM19	.90	.19	.81
ITEM20	.81	.35	.65

Note. N = 107. Estimates of goodness-of-fit are: Chi-square (df = 170, $p < .01$) = 688.93, goodness-of-fit index = .58, adjusted goodness-of-fit index = .48, root mean square residual = .07, Tucker-Lewis Index = .78, RNI = .75, RNI2= .68. All T-values are greater than 2.0.

Table L.2

Team Leadership: Maximum Likelihood Factor Loadings for Lambda X, Theta Deltas,and Squared Multiple Correlations

	CN Factor Loadings	IS Factor Loadings	Theta Delta	R^2
ITEM1	.70	.00	.52	.48
ITEM2	.85	.00	.28	.72
ITEM3	.00	.76	.42	.58
ITEM4	.00	.78	.39	.61
ITEM5	.00	.51	.74	.26
ITEM6	.00	.54	.71	.29
ITEM7	.00	.70	.50	.50
ITEM8	.00	.84	.30	.70
ITEM9	.91	.00	.18	.82
ITEM10	.92	.00	.15	.85
ITEM11	.91	.00	.17	.83
ITEM12	.94	.00	.12	.88
ITEM13	.92	.00	.15	.85
ITEM14	.92	.00	.16	.84
ITEM15	.89	.00	.21	.79
ITEM16	.00	.71	.50	.50
ITEM17	.00	.40	.84	.16
ITEM18	.00	.48	.77	.23

Note. N = 102. Abbreviations are: CN = Consideration, IS = Initiating Structure. The Phi correlation between Factor 1 and Factor 2 was .81. Estimates of goodness-of-fit are: Chi-square (df = 134, p < .01) = 376.31, goodness-of-fit index = .73, adjusted goodness-of-fit index = .66, root mean square residual = .08, Tucker-Lewis Index = .84, RNI = .80, RNI2 = .70. All T-values are greater than 2.0.

Table L.3

Communication: Maximum Likelihood Factor Loadings for Lambda X, Theta Deltas, and Squared Multiple Correlations

	Factor Loadings	Theta Delta	R^2
ITEM1	.96	.08	.92
ITEM2	.94	.12	.88
ITEM3	.96	.07	.93
ITEM4	.94	.12	.88
ITEM5	.92	.16	.84
ITEM6	.96	.07	.93
ITEM7	.95	.10	.90
ITEM8	.98	.04	.96
ITEM9	.98	.03	.97
ITEM10	.99	.01	.99
ITEM11	.88	.22	.78

Note. N = 104. Estimates of goodness-of-fit are: Chi-square (df = 44, $p < .34$) = 47.28, goodness-of-fit index = .1.00, adjusted goodness-of-fit index = .99, root mean square residual = .16, Tucker-Lewis Index = .1.00, RNI = .99, RNI2= .80. Only T-values for Lambda X are greater than 2.0.

Table L.4

Monitoring: Maximum Likelihood Factor Loadings for Lambda X, Theta Deltas, and Squared Multiple Correlations

	Factor Loadings	Theta Delta	R^2
ITEM1	.86	.25	.75
ITEM2	.84	.29	.71
ITEM3	.85	.28	.72
ITEM4	.88	.23	.77
ITEM5	.94	.12	.88
ITEM6	.82	.33	.67
ITEM7	.82	.33	.67
ITEM8	.79	.37	.63
ITEM9	.89	.21	.79

Note. N = 103. Estimates of goodness-of-fit are: Chi-square (df = 27, $p < .01$) = 104.03, goodness-of-fit index = .94, adjusted goodness-of-fit index = .91, root mean square residual = .34, Tucker-Lewis Index = .92, RNI = .93, RNI2= .69. All T-values are for Lambda X are greater than 2.0, and so are the following T-values for Theta Delta: ITEM6, ITEM7, and ITEM8.

Table L.5

Feedback: Maximum Likelihood Factor Loadings for Lambda X, Theta Deltas, and Squared Multiple Correlations

	Factor Loadings	Theta Delta	R^2
ITEM1	.81	.34	.66
ITEM2	.93	.14	.86
ITEM3	.90	.19	.81
ITEM4	.86	.27	.73
ITEM5	.88	.23	.77
ITEM6	.95	.10	.90
ITEM7	.88	.22	.78
ITEM8	.94	.12	.88
ITEM9	.93	.14	.86

Note. *N* = 103. Estimates of goodness-of-fit are: Chi-square (*df* = 27, *p* < .01) = 47.72, goodness-of-fit index = .98, adjusted goodness-of-fit index = .96, root mean square residual = .20, Tucker-Lewis Index = .98, RNI = .97, RNI2= .73. All *T*-values for Lambda X are greater than 2.0 and so is the Theta Delta *T*-value for ITEM1.

Table L.6

Backup: Maximum Likelihood Factor Loadings for Lambda X, Theta Deltas, and Squared Multiple Correlations

	Factor Loadings	Theta Delta	R^2
ITEM1	.87	.24	.76
ITEM2	.95	.10	.90
ITEM3	.95	.09	.91
ITEM4	.88	.23	.77
ITEM5	.92	.15	.85
ITEM6	.94	.12	.88
ITEM7	.90	.20	.80
ITEM8	.90	.18	.82
ITEM9	.89	.21	.79

Note. *N* = 104. Estimates of goodness-of-fit are: Chi-square (*df* = 27, $p < .01$) = 47.30, goodness-of-fit index = .98, adjusted goodness-of-fit index = .97, root mean square residual = .19, Tucker-Lewis Index = .98, RNI = .97, RNI2= .73 Only *T*-values for Lambda X are greater than 2.0.

Table L.7

Coordination: Maximum Likelihood Factor Loadings for Lambda X, Theta Deltas, and Squared Multiple Correlations

	Factor Loadings	Theta Delta	R^2
ITEM1	.86	.25	.75
ITEM2	.92	.16	.84
ITEM3	.71	.50	.50
ITEM4	.88	.22	.78
ITEM5	.94	.11	.89
ITEM6	.97	.06	.94
ITEM7	.92	.16	.84
ITEM8	.97	.06	.94
ITEM9	.91	.18	.82

Note. *N* = 104. Estimates of goodness-of-fit are: Chi-square (*df* = 27, *p* < .12) = 35.65, goodness-of-fit index = .99, adjusted goodness-of-fit index = .98, root mean square residual = .13, Tucker-Lewis Index = .98, RNI = .99, RNI2= .59. All *T*-values for Lambda X are greater than 2.0, and so is the Theta Delta *T*-value for ITEM3.

Table L.8

Performance: Maximum Likelihood Factor Loadings for Lambda X, Theta Deltas, and Squared Multiple Correlations

	Factor Loadings	Theta Delta	R^2
ITEM1	.92	.15	.85
ITEM2	.92	.15	.85
ITEM3	.91	.17	.83
ITEM4	.91	.18	.82
ITEM5	.92	.15	.85
ITEM6	.93	.14	.86
ITEM7	.90	.19	.81
ITEM8	.94	.12	.88
ITEM9	.96	.08	.92

Note. N = 107. Estimates of goodness-of-fit are: Chi-square (df = 27, $p < .13$) = 35.23, goodness-of-fit index = .99, adjusted goodness-of-fit index = .98, root mean square residual = .13, Tucker-Lewis Index = .99, RNI = .98, RNI2= .74. Only T-values for Lambda X are greater than 2.0.

Table L.9

Task Structure: Maximum Likelihood Factor Loadings for Lambda X, Theta Deltas, and Squared Multiple Correlations

	Factor Loadings	Theta Delta	R^2
ITEM1	.65	.58	.42
ITEM2	.68	.54	.46
ITEM3	.72	.49	.51
ITEM4	.53	.72	.28
ITEM5	.54	.71	.29
ITEM6	.52	.73	.27
ITEM7	.68	.54	.46
ITEM8	.49	.76	.24
ITEM9	.41	.83	.17
ITEM10	.77	.40	.60
ITEM11	.33	.89	.11
ITEM12	.72	.49	.51
ITEM13	.54	.71	.29
ITEM14	.70	.51	.49
ITEM15	.69	.52	.48
ITEM16	.61	.63	.37
ITEM17	.78	.39	.61
ITEM18	.52	.72	.28
ITEM19	.71	.49	.51
ITEM20	.67	.55	.45

Note. N = 102. Estimates of goodness-of-fit are: Chi-square (df = 170, p < .01) = 682.06, goodness-of-fit index = .50, adjusted goodness-of-fit index = .38, root mean square residual = .14, Tucker-Lewis Index = .55, RNI = .53, RNI2= .48. All T-values are greater than 2.0.

Appendix M.

Study 2: Results of the Measurement Model Analysis for the Independent Latent Traits

Table M.1

Measurement Model Analysis for Independent Traits

	Lambda X Factor Loadings					
	TO	CN	IS	TS	Theta Delta	R^2
TO1	.95	.00	.00	.00	.10	.90
TO2	.97	.00	.00	.00	.05	.95
TO3	.92	.00	.00	.00	.16	.84
CN1	.00	.95	.00	.00	.11	.89
CN2	.00	.96	.00	.00	.07	.93
CN3	.00	.94	.00	.00	.12	.88
IS1	.00	.00	.70	.00	.50	.50
IS2	.00	.00	.88	.00	.22	.78
TS1	.00	.00	.00	.98	.04	.96
TS2	.00	.00	.00	.52	.72	.28
TS3	.00	.00	.00	.79	.38	.62

Factor Correlations (Phi)

	TO	CN	IS	TS
TO	1.00			
CN	.83	1.00		
IS	.76	.79	1.00	
TS	.49	.45	.50	1.00

Note. N = 101. Abbreviations are: TO = Team Orientation, CN = Consideration, IS = Initiating Structure, TS = Task Structure. Estimates of goodness-of-fit are: Chi-square (df = 38, $p < .01$) = 71.52, goodness-of-fit index = .89, adjusted goodness-of-fit index = .81, root mean square residual = .05, Tucker Lewis Index = .96, RNI = .94, RNI2 = .65. All T-values are 2.0 or greater except for the Theta Delta T-value for TS1.

Appendix N.

Study 2: Results of the Measurement Model Analysis for the Independent Latent Traits After Removing Correlated Measurement Error

Table N.1

Measurement Model Analysis for Independent Traits

	Lambda X Factor Loadings					
	TO	CN	IS	TS	Theta Delta	R^2
TO1	.95	.00	.00	.00	.10	.90
TO2	.97	.00	.00	.00	.06	.94
TO3	.92	.00	.00	.00	.16	.84
CN1	.00	.90	.00	.00	.19	.81
CN2	.00	.92	.00	.00	.15	.85
CN3	.00	.98	.00	.00	.05	.95
IS1	.00	.00	.70	.00	.51	.49
IS2	.00	.00	.88	.00	.22	.78
TS1	.00	.00	.00	.87	.24	.76
TS2	.00	.00	.00	.34	.88	.12
TS3	.00	.00	.00	.88	.21	.79

	Factor Correlations (Phi)			
	TO	CN	IS	TS
TO	1.00			
CN	.84	1.00		
IS	.76	.81	1.00	
TS	.53	.56	.54	1.00

Note. N = 101. Abbreviations are: TO = Team Orientation, CN = Consideration, IS = Initiating Structure, TS = Task Structure. Estimates of goodness-of-fit are: Chi-square (df = 35, $p > .05$) = 36.26, goodness-of-fit index = .94, adjusted goodness-of-fit index = .89, root mean square residual = .03, Tucker Lewis Index = 1.00, RNI = .97, RNI2 = .62. All T-values are 2.0 or greater except for the Theta Delta T-value for CN3.

Appendix O.

Study 2: Results of the Measurement Model Analysis for Dependent Latent Traits

Table O.1

Measurement Model Analysis for Dependent Latent Traits

	Lambda Y Factor Loadings							
	COM	MON	FDB	BKP	COO	PER	Theta Delta	R^2
COM1	.95	.00	.00	.00	.00	.00	.10	.90
COM2	.94	.00	.00	.00	.00	.00	.12	.88
COM3	.91	.00	.00	.00	.00	.00	.18	.82
MON1	.00	.74	.00	.00	.00	.00	.45	.55
MON2	.00	.95	.00	.00	.00	.00	.09	.91
MON3	.00	.79	.00	.00	.00	.00	.38	.62
FDB1	.00	.00	.89	.00	.00	.00	.21	.79
FDB2	.00	.00	.86	.00	.00	.00	.26	.74
FDB3	.00	.00	.89	.00	.00	.00	.20	.80
BKP1	.00	.00	.00	.93	.00	.00	.14	.86
BKP2	.00	.00	.00	.85	.00	.00	.28	.72
BKP3	.00	.00	.00	.83	.00	.00	.31	.69
COO1	.00	.00	.00	.00	.83	.00	.32	.68
COO2	.00	.00	.00	.00	.95	.00	.09	.91
COO3	.00	.00	.00	.00	.90	.00	.19	.81
PER1	.00	.00	.00	.00	.00	.83	.31	.69
PER2	.00	.00	.00	.00	.00	.95	.09	.91
PER3	.00	.00	.00	.00	.00	.98	.04	.96

Factor Correlations (Phi)

	COM	MON	FDB	BKP	COO	PER
COM	1.00					
MON	.59	1.00				
FDB	.91	.69	1.00			
BKP	.81	.53	.91	1.00		
COO	.84	.59	.88	.91	1.00	
PER	.70	.51	.67	.71	.86	1.00

Table O.1 (concluded)

Note. N = 101. Abbreviations are: COM (Communication), MON (Monitoring), FDB (Feedback), BKP (Backup), COO (Coordination), and PER Performance). Estimates of goodness-of-fit are: chi-square (df = 120, p < .01) = 288.68, goodness-of-fit index = .77, adjusted goodness-of-fit index = .67, root mean square residual = .09, Tucker Lewis Index = .90, RNI = .87, RNI2 = .68. All T-values are 2.0 or greater except for the Theta Delta T-value for MON2.

Appendix P.

Study 2: Results of the Measurement Model Analysis for Dependent Latent Traits After Removing Correlated Measurement Error

Table P.1

Measurement Model Analysis for Dependent Latent Traits

	Lambda Y Factor Loadings							
	COM	MON	FDB	BKP	COO	PER	Theta Delta	R^2
COM1	.95	.00	.00	.00	.00	.00	.10	.90
COM2	.94	.00	.00	.00	.00	.00	.12	.88
COM3	.91	.00	.00	.00	.00	.00	.18	.82
MON1	.00	.38	.00	.00	.00	.00	.86	.14
MON2	.00	.78	.00	.00	.00	.00	.39	.61
MON3	.00	.94	.00	.00	.00	.00	.12	.88
FDB1	.00	.00	.89	.00	.00	.00	.20	.80
FDB2	.00	.00	.86	.00	.00	.00	.26	.74
FDB3	.00	.00	.89	.00	.00	.00	.21	.79
BKP1	.00	.00	.00	.84	.00	.00	.30	.70
BKP2	.00	.00	.00	.76	.00	.00	.42	.58
BKP3	.00	.00	.00	.89	.00	.00	.22	.78
COO1	.00	.00	.00	.00	.83	.00	.31	.69
COO2	.00	.00	.00	.00	.95	.00	.09	.91
COO3	.00	.00	.00	.00	.90	.00	.20	.80
PER1	.00	.00	.00	.00	.00	.83	.31	.69
PER2	.00	.00	.00	.00	.00	.95	.09	.91
PER3	.00	.00	.00	.00	.00	.98	.04	.96

Factor Correlations (Phi)

	COM	MON	FDB	BKP	COO	PER
COM	1.00					
MON	.74	1.00				
FDB	.92	.83	1.00			
BKP	.89	.76	.91	1.00		
COO	.84	.73	.88	.97	1.00	
PER	.70	.62	.68	.83	.87	.00

Table P.1 (concluded)

Note. N = 101. Abbreviations are: COM (Communication), MON (Monitoring), FDB (Feedback), BKP (Backup), COO (Coordination), and PER Performance). Estimates of goodness-of-fit are: chi-square (df = 114, $p < .01$) = 180.08, goodness-of-fit index = .84, adjusted goodness-of-fit index = .76, root mean square residual = .05, Tucker Lewis Index = .96, RNI = .92, RNI2 = .69. All T-values are 2.0 or greater except for the Theta Delta T-value for MON3.

Appendix Q.

Study 2: Results of the Structural Model Analysis

Table Q.1

Structural Model Analysis

Lambda Y Factor Loadings

	COM	MON	FDB	BKP	COO	PER
COM1	.93	.00	.00	.00	.00	.00
COM2	.92	.00	.00	.00	.00	.00
COM3	.88	.00	.00	.00	.00	.00
MON1	.00	.73	.00	.00	.00	.00
MON2	.00	.93	.00	.00	.00	.00
MON3	.00	.82	.00	.00	.00	.00
FDB1	.00	.00	.90	.00	.00	.00
FDB2	.00	.00	.86	.00	.00	.00
FDB3	.00	.00	.88	.00	.00	.00
BKP1	.00	.00	.00	.89	.00	.00
BKP2	.00	.00	.00	.82	.00	.00
BKP3	.00	.00	.00	.87	.00	.00
COO1	.00	.00	.00	.00	.82	.00
COO2	.00	.00	.00	.00	.96	.00
COO3	.00	.00	.00	.00	.90	.00
PER1	.00	.00	.00	.00	.00	.83
PER2	.00	.00	.00	.00	.00	.95
PER3	.00	.00	.00	.00	.00	.98

Lambda X Factor Loadings

	TO	CN	IS	TS
TO1	.95	.00	.00	.00
TO2	.97	.00	.00	.00
TO3	.92	.00	.00	.00
CN1	.00	.94	.00	.00
CN2	.00	.96	.00	.00
CN3	.00	.94	.00	.00
IS1	.00	.00	.70	.00
IS2	.00	.00	.88	.00
TS1	.00	.00	.00	.98
TS2	.00	.00	.00	.53
TS3	.00	.00	.00	.79

Table Q.1 (continued)

Beta

	COM	MON	FDB	BKP	COO	PER
COM	.00	.00	.00	.00	.00	.00
MON	.62	.00	.00	.00	.00	.00
FDB	.82	.21	.00	.00	.00	.00
BKP	.90	.02	.00	.00	.00	.00
COO	.10	.00	.15	.70	.00	.00
PER	.00	.00	.00	.00	.85	.00

Standardized Indirect Effects of Eta on Eta

	COM	MON	FDB	BKP	COO	PER
COM	--	--	--	--	--	--
MON	--	--	--	--	--	--
FDB	.13	--	--	--	--	--
BKP	.01	--	--	--	--	--
COO	.78	.05	--	--	--	--
PER	.76	.04	.13	.60	--	--

Gamma

	TO	CN	IS	TS
COM	.39	.48	.08	.10
MON	.00	.00	.00	.00
FDB	.00	.00	.00	.00
BKP	.00	.00	.00	.00
COO	.00	.00	.00	.00
PER	.00	.00	.00	.00

Table Q.1 (continued)

Standardized Indirect Effects of Ksi on Eta

	TO	CN	IS	TS
COM	--	--	--	--
MON	.24	.30	.05	.06
FDB	.37	.46	.07	.10
BKP	.35	.44	.07	.09
COO	.34	.42	.07	.09
PER	.29	.36	.06	.08

Correlation Matrix of Eta and Ksi

	COM	MON	FDB	BKP	COO	PER
COM	1.00					
MON	.62	1.00				
FDB	.96	.73	1.00			
BKP	.91	.58	.87	1.00		
COO	.89	.58	.86	.93	1.00	
PER	.76	.50	.74	.79	.85	1.00
TO	.90	.56	.86	.82	.79	.68
CN	.91	.57	.87	.83	.81	.69
IS	.80	.50	.77	.73	.71	.61
TS	.55	.34	.53	.50	.49	.41

Correlation Matrix of Eta and Ksi

	TO	CN	IS	TS
TO	1.00			
CN	.83	1.00		
IS	.76	.79	1.00	
TS	.49	.46	.50	1.00

Table Q.1 (continued)

Psi

COM	MON	FDB	BKP	COO	PER
.10	.61	.06	.17	.13	.27

	Theta Epsilon	Theta Delta	R^2
COM1	.14		.86
COM2	.16		.84
COM3	.22		.78
MON1	.47		.53
MON2	.14		.86
MON3	.33		.67
FDB1	.19		.81
FDB2	.27		.73
FDB3	.23		.77
BKP1	.21		.79
BKP2	.32		.68
BKP3	.24		.76
COO1	.32		.68
COO2	.08		.92
COO3	.19		.81
PER1	.31		.69
PER2	.09		.91
PER3	.04		.96
TO1		.10	.90
TO2		.06	.94
TO3		.16	.84
CN1		.11	.89
CN2		.08	.92
CN3		.11	.89
IS1		.51	.49
IS2		.38	.62
TS1		.04	.96
TS2		.72	.28
TS3		.22	.78

Table Q.1 (continued)

R^2 For Structural Equations

COM	MON	FDB	BKP	COO	PER
.90	.39	.94	.83	.87	.73

Note. N = 101. The standardized solution is presented for Lambda Y, Lambda X, Beta, Gamma, and Psi matrices. Abbreviations are: TO (Orientation), CN (Consideration), IS (Initiating Structure), TS (Task Structure), COM (Communication), MON (Monitoring), FDB (Feedback), BKP (Backup), COO (Coordination), and PER (Performance). Estimates of goodness-of-fit are: Chi-square (df = 358, $p < .01$) = 824.59, goodness-of-fit index = .64, adjusted goodness-of-fit index = .56, root mean square residual = .09, Tucker Lewis Index = .85, RNI = .80, RNI2 = .70. For every matrix except the Standardized Indirect Effects, all T-values are greater than 2.0 except for the following: Beta(4,2), Beta(5,1), Beta(5,3), Gamma(1,3), and Theta Delta for TS1. The following T-values in the matrix for Standardized Indirect Effects of Eta on Eta are the only ones to achieve statistical significance: Element(3,1), Element(5,1), Element(6,1), and Element(6,4). The following T-values in the matrix for Standardized Indirect Effects of Ksi on Eta are the only ones that did not achieve statistical significance: Element(2,3), Element(3,3), Element(4,3), Element(5,3), and Element(6,3), Element(2,4).

Appendix R.

Study 2: Results of the Structural Model Analysis After Removing Correlated Measurement Error

Table R.1

Structural Model Analysis

Lambda Y Factor Loadings

	COM	MON	FDB	BKP	COO	PER
COM1	.89	.00	.00	.00	.00	.00
COM2	.88	.00	.00	.00	.00	.00
COM3	.84	.00	.00	.00	.00	.00
MON1	.00	.36	.00	.00	.00	.00
MON2	.00	.77	.00	.00	.00	.00
MON3	.00	.95	.00	.00	.00	.00
FDB1	.00	.00	.90	.00	.00	.00
FDB2	.00	.00	.84	.00	.00	.00
FDB3	.00	.00	.89	.00	.00	.00
BKP1	.00	.00	.00	.83	.00	.00
BKP2	.00	.00	.00	.76	.00	.00
BKP3	.00	.00	.00	.88	.00	.00
COO1	.00	.00	.00	.00	.83	.00
COO2	.00	.00	.00	.00	.95	.00
COO3	.00	.00	.00	.00	.90	.00
PER1	.00	.00	.00	.00	.00	.83
PER2	.00	.00	.00	.00	.00	.95
PER3	.00	.00	.00	.00	.00	.98

Lambda X Factor Loadings

	TO	CN	IS	TS
TO1	.95	.00	.00	.00
TO2	.97	.00	.00	.00
TO3	.92	.00	.00	.00
CN1	.00	.91	.00	.00
CN2	.00	.93	.00	.00
CN3	.00	.97	.00	.00
IS1	.00	.00	.70	.00
IS2	.00	.00	.88	.00
TS1	.00	.00	.00	.89
TS2	.00	.00	.00	.58
TS3	.00	.00	.00	.87

Table R.1 (continued)

Beta

	COM	MON	FDB	BKP	COO	PER
COM	.00	.00	.00	.00	.00	.00
MON	.78	.00	.00	.00	.00	.00
FDB	.85	.15	.00	.00	.00	.00
BKP	.96	.03	.00	.00	.00	.00
COO	-.67	.00	-.22	1.84	.00	.00
PER	.00	.00	.00	.00	.86	.00

Standardized Indirect Effects of Eta on Eta

	COM	MON	FDB	BKP	COO	PER
COM	--	--	--	--	--	--
MON	--	--	--	--	--	--
FDB	.12	--	--	--	--	--
BKP	.02	--	--	--	--	--
COO	1.73	.02	--	--	--	--
PER	.79	.02	-.19	1.72	--	--

Gamma

	TO	CN	IS	TS
COM	.43	.46	.09	.09
MON	.00	.00	.00	.00
FDB	.00	.00	.00	.00
BKP	.00	.00	.00	.00
COO	.00	.00	.00	.00
PER	.00	.00	.00	.00

Table R.1 (continued)

Standardized Indirect Effects of Ksi on Eta

	TO	CN	IS	TS
COM	--	--	--	--
MON	.33	.35	.07	.07
FDB	.41	.44	.08	.08
BKP	.42	.45	.09	.09
COO	.39	.42	.08	.08
PER	.24	.36	.07	.07

Correlation Matrix of Eta and Ksi

	COM	MON	FDB	BKP	COO	PER
COM	1.00					
MON	.78	1.00				
FDB	.97	.81	1.00			
BKP	.98	.77	.95	1.00		
COO	.91	.71	.87	.98	1.00	
PER	.79	.62	.75	.84	.86	1.00
TO	.93	.72	.90	.91	.84	.73
CN	.94	.73	.91	.91	.85	.74
IS	.83	.64	.80	.81	.75	.65
TS	.60	.47	.58	.59	.55	.47

Correlation Matrix of Eta and Ksi

	TO	CN	IS	TS
TO	1.00			
CN	.85	1.00		
IS	.76	.81	1.00	
TS	.53	.53	.53	1.00

Table R.1 (continued)

Psi

COM	MON	FDB	BKP	COO	PER
.05	.40	.05	.04	--	.25

	Theta Epsilon	Theta Delta	R^2
COM1	.20		.80
COM2	.22		.78
COM3	.30		.70
MON1	.87		.13
MON2	.41		.59
MON3	.09		.91
FDB1	.19		.81
FDB2	.29		.71
FDB3	.22		.78
BKP1	.32		.69
BKP2	.42		.58
BKP3	.24		.77
COO1	.31		.68
COO2	.09		.91
COO3	.20		.80
PER1	.31		.69
PER2	.09		.91
PER3	.04		.96
TO1		.10	.90
TO2		.06	.94
TO3		.16	.84
CN1		.18	.82
CN2		.14	.86
CN3		.07	.93
IS1		.51	.49
IS2		.22	.78
TS1		.21	.79
TS2		.66	.34
TS3		.23	.76

Table R.1 (concluded)

R^2 For Structural Equations

COM	MON	FDB	BKP	COO	PER
.95	.60	.95	.96	.99	.75

Note. N = 101. The standardized solution is presented for Lambda Y, Lambda X, Beta, Gamma, and Psi matrices. Abbreviations are: TO (Orientation), CN (Consideration), IS (Initiating Structure), TS (Task Structure), COM (Communication), MON (Monitoring), FDB (Feedback), BKP (Backup), COO (Coordination), and PER (Performance). Estimates of goodness-of-fit are: Chi-square (df = 348, $p < .01$) = 637.55, goodness-of-fit index = .71, adjusted goodness-of-fit index = .64, root mean square residual = .06, Tucker Lewis Index = .91, RNI = .84, RNI2 = .72. For every matrix except the Standardized Indirect Effects, all T-values are greater than 2.0 except for the following: Beta(3,2), Beta(4,2), Beta(5,1), Beta(5,3), Gamma(1,3), Gamma(1,4); Psi for MON, FDB, BKP, and COO; and Theta Epsilon for MON3. The following T-values in the matrix for Standardized Indirect Effects of Eta on Eta are the only ones to achieve statistical significance: Element(3,1), Element(6,1), and Element(6,4). The following T-values in the matrix for Standardized Indirect Effects of Ksi on Eta are the only ones that did not achieve statistical significance: Element(2,3), Element(2,4), Element(3,3), Element(3,4), Element(4,3), Element(4,4), Element(5,3), Element(5,4), Element(6,3), and Element(6,4).

Appendix S.

Study 2: Results of the Hypothesis Testing for Subgroups of Task Structure and Communication

Hypothesis #1

IV: Task Structure (Low, High)
IV: Communication (Low, High)
DV: $r_{(Orientation, Monitoring)}$

Task Structure

Communication	Low Fisher z Mean = .37	High Fisher z Mean = .48
Low Fisher z Mean = .17	r = .03, p < .88 Fisher z = .03 n = 33	r = .41, p < .08 Fisher z = .44 n = 19
High Fisher z Mean = .68	r = .77, p < .01 Fisher z = 1.02 n = 19	r = .46, p < .01 Fisher z = .50 n = 32

Fisher z Grand Mean = .40

Source	X^2	df
Communication	12.36**	1
Task Structure	.05	1
Interaction	4.41*	1

Hypothesis #3a

IV: Task Structure (Low, High)
IV: Communication (Low, High)
DV: $r_{(Initiating\ Structure, Monitoring)}$

Task Structure

Communication	Low Fisher z Mean = .29	High Fisher z Mean = .37
Low Fisher z Mean = .14	r = -.02, p < .90 Fisher z = -.02 n = 33	r = .41, p < .08 Fisher z = .43 n = 19
High Fisher z Mean = .52	r = .70, p < .01 Fisher z = .87 n = 19	r = .32, p < .07 Fisher z = .33 n = 32

Fisher z Grand Mean = .31

Source	X^2	df
Communication	6.90**	1
Task Structure	.03	1
Interaction	5.06*	1

Hypothesis #3b

IV: Task Structure (Low, High)
IV: Communication (Low, High)
DV: $r_{(Consideration,Monitoring)}$

Task Structure

Communication	Low Fisher z Mean = .57	High Fisher z Mean = .29
Low Fisher z Mean = .13	r = .14, p < .44 Fisher z = .14 n = 33	r = .10, p < .67 Fisher z = .10 n = 19
High Fisher z Mean = .75	r = .88, p < .01 Fisher z = 1.39 n = 19	r = .38, p < .03 Fisher z = .40 n = 32

Fisher z Grand Mean = .41

Source	X^2	df
Communication	20.85**	1
Task Structure	5.39*	1
Interaction	4.69*	1

Hypothesis #4

IV: Task Structure (Low, High)
IV: Communication (Low, High)
DV: $r_{(Monitoring,Feedback)}$

Task Structure

Communication	Low Fisher z Mean = .42	High Fisher z Mean = .72
Low Fisher z Mean = .34	r = .25, p < .16 Fisher z = .26 n = 32	r = .46, p < .05 Fisher z = .50 n = 19
High Fisher z Mean = .81	r = .63, p < .01 Fisher z = .74 n = 18	r = .69, p < .01 Fisher z = .84 n = 32

Fisher z Grand Mean = .54

Source	X^2	df
Communication	6.62*	1
Task Structure	.59	1
Interaction	.11	1

Hypothesis #5

IV: Task Structure (Low, High)
IV: Communication (Low, High)
DV: $r_{(Monitoring,Backup)}$

Task Structure

Communication	Low Fisher z Mean = .33	High Fisher z Mean = .39
Low Fisher z Mean = .04	$r = .02$, $p < .93$ Fisher $z = .02$ $n = 33$	$r = .09$, $p < .70$ Fisher $z = .09$ $n = 19$
High Fisher z Mean = .69	$r = .73$, $p < .01$ Fisher $z = .93$ $n = 19$	$r = .51$, $p < .01$ Fisher $z = .56$ $n = 32$

Fisher z Grand Mean = .34

Source	X^2	df
Communication	20.65**	1
Task Structure	.43	1
Interaction	1.04	1

Hypothesis #6

IV: Task Structure (Low, High)
IV: Communication (Low, High)
DV: $r_{(Feedback,Coordination)}$

Task Structure

Communication	Low Fisher z Mean = .98	High Fisher z Mean = .59
Low Fisher z Mean = .80	$r = .77$, $p < .01$ Fisher $z = 1.01$ $n = 32$	$r = .40$, $p < .09$ Fisher $z = .42$ $n = 19$
High Fisher z Mean = .76	$r = .72$, $p < .01$ Fisher $z = .91$ $n = 18$	$r = .60$, $p < .01$ Fisher $z = .69$ $n = 32$

Fisher z Grand Mean = .73

Source	X^2	df
Communication	.16	1
Task Structure	7.21**	1
Interaction	.68	1

Hypothesis #7

IV: Task Structure (Low, High)
IV: Communication (Low, High)
DV: $\underline{r}_{(Backup, Coordination)}$

Task Structure

Communication	Low Fisher z Mean = 1.18	High Fisher z Mean = .94
Low Fisher z Mean = 1.11	$r = .89$, $p < .01$ Fisher $z = 1.41$ $n = 33$	$r = .50$, $p < .03$ Fisher $z = .54$ $n = 19$
High Fisher z Mean = 1.00	$r = .61$, $p < .01$ Fisher $z = .71$ $n = 18$	$r = .82$, $p < .01$ Fisher $z = 1.16$ $n = 32$

Fisher z Grand Mean = .99

Source	X^2	df
Communication	.02	1
Task Structure	2.19	1
Interaction	8.79**	1

*$p < .05$ **$p < .01$

AUTOBIOGRAPHICAL STATEMENT

Rebecca Rosenstein was born in Baltimore, Maryland on November 20, 1966. She received a Bachelor of Arts degree in psychology from the University of Maryland Baltimore County in 1987 (summa cum laude) and a Master of Science degree in industrial-organizational psychology from the University of Baltimore in 1989. In 1994, she co-authored "Type Size and Performance of the Elderly on the Wonderlic Personnel Test" with Dr. Albert S. Glickman (Journal of Applied Gerontology, 13(2), pp.185-192).

Rebecca is an Adjunct Assistant Professor of Psychology and Management at the University of Baltimore and an Adjunct Assistant Professor of Psychology at Catonsville Community College in Catonsville, Maryland. Additionally, she has worked as a Research Statistician at the Maryland State Department of Health and Mental Hygiene. Rebecca is a member of Psi Chi and Phi Kappa Phi student honor societies and was a recipient of a graduate scholarship from the University of Baltimore. She is also a past winner of the Southern Management Association's Award for Outstanding Doctoral Student Paper, an American Psychological Association Dissertation Research Award, and a National Science Foundation Dissertation Improvement Award.