Effectiveness, Performance, and Motivation

In A Team-based Environment

by

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(ABSTRACT)

This research explores the meaning and relationship of the constructs of effectiveness, performance, and motivation among teams in a high performance manufacturing setting. Effectiveness is defined as actual outcomes; performance is characterized as those types of behaviors required of teams to achieve those outcomes. Motivation at the team level of analysis is conceived as collective efficacy -- the members' confidence in their team's ability to perform. Two types of antecedents to collective efficacy are explored -- prior success and compositional characteristics of the teams.

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"Being confident of this, that He Who began a good work in you will carry it on to completion until the day of Christ Jesus." (Phil. 1:6 NIV)

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Chapter 1

Introduction

Work teams are becoming an increasingly important component of organizational life in the United States. Self-managed work teams, a particular type of team, are the basis for many new work system designs (Lawler, 1992). In a team-based environment, the group is assigned responsibility for entire processes and is often given latitude in making day-to-day decisions about the execution of the tasks involved. The basic premise underlying the use of work teams is that the group outcome will be greater than the sum of individual outcomes (Lawler, 1986).

There is likely to be further growth in the use of teams, due to two trends. First, there is a trend in the United States toward employee involvement and participation. The use of work teams is often a progressive stage (a "more complex intervention" (p.320)) for organizations that have succeeded with such participative interventions as quality circles. Second, current technology, such as computer-integrated manufacturing, requires flexibility and rapid response times. These requirements align with the advantages often attributed to team-based work systems (Goodman, Devadas, & Hughson, 1988).

The potential and realized benefits of team-based systems, including improved flexibility, productivity, and job satisfaction, have been espoused by many writers, including Peters (1987), who argues that there is no place or circumstance under which a team-based structure does not make sense. While most writers are not this effusive, many do report positive outcomes from the implementation of team-based systems. The use of work teams has been largely driven by managerial practice, and much of what has been written is descriptive (Lawler, 1990). The few empirical

studies that have been conducted are evaluative in nature, assessing the impact of team-based interventions on attitudes and productivity (See, for example, Wall, Kemp, Jackson, & Clegg, 1986; Magjuka & Baldwin, 1991). Missing from these studies is a theoretical framework through which the field can move from evaluation of outcomes to understanding and explaining the linkages between the parts of a team-based system (Goodman, Devadas, & Hughson, 1988). For the researcher seeking such a framework, the literature on groups provides models of group effectiveness with which to begin the search for that understanding.

Several models have been proposed to explain the process and nature of group effectiveness. The four major models of the last decade (Levine & Moreland, 1990) each offers a conceptualization of the nature of group effectiveness and its antecedents. These models incorporate multiple concepts of effectiveness, including individual member satisfaction and task performance. The proposed antecedents include the group's task, technology, size, rewards, leadership, cohesiveness, communication patterns, norms, and processes (Levine & Moreland, 1990). The models differ in their proposed categorizations of these variables and the hypothesized relationships of the categories to effectiveness, but the models contain similar dependent and independent variables. These models are briefly described in the following paragraphs and more completely explicated in Chapter Two.

Gladstein's (1984) model follows an input-process-output format in which group and organizational level inputs produce outputs of performance and satisfaction through group processes, moderated by the nature of the group task. Pearce and Ravlin's (1987) model applies traditional group process variables to work teams and calls them preconditions for design, design and activation conditions, and process. The outcomes included in this model are satisfaction, absenteeism, turnover, safety, innovation, and productivity.

Hackman's (1987, 1990) normative model defines group effectiveness as productive output, the group being able to work together in the future, and the needs of the members being more satisfied than frustrated by the process. These ends are accomplished through the three "process criteria" (effort, application of knowledge and skills, and use of strategies), which emerge from the design of the group, the organizational context, and the synergy from the interactions of group members. Shea and Guzzo (1987a) conceptualize the immediate precursor of group task effective-

ness to be the group-level construct of potency, a collective belief in the group's efficacy to reach its goals. The group's efficacy is a function of its prior performance, its task interdependence, and its outcome interdependence.

The models outlined above share certain similarities, as would be expected from models originating from the same literatures. They all can be reduced to a variation of the hypothesis that group effectiveness is a function of group processes and that group processes emerge from the task, the organization, the characteristics of the group, or some interaction thereof. No one of these models has emerged from the literature as the "accepted" view of group effectiveness, because, it can be argued, no single one of them is adequate to explain group task effectiveness.

The adequacy of these models can be questioned on several fronts. The first is the definition of effectiveness in a work group setting. Three of the models (Gladstein, 1984; Hackman, 1987; Pearce & Ravlin, 1987) include measures of effectiveness incorporating member satisfaction or the meeting of member needs. The inclusion of these as outcomes has its basis in research on groups in other than work settings. Both Goodman, Ravlin, and Schminke (1987) and Shea and Guzzo (1987) argue that, in a work group setting, the effectiveness measures used should be the achievement of the charter/goal for which the group was formed, not member satisfaction.

A second criticism of the current models challenges the key assumption of all of the models. Goodman, Ravlin, and Schminke (1987), argue that technology, not group process, accounts for the majority of variance in effectiveness in most group task settings. They call for idiographic study of groups within the constraint of a specific technology to understand the relationship between a technological system, the organizational context, and the group processes. To understand or have an impact on effectiveness in such a setting, the researcher must determine the points within the technological system at which group behavior can affect task effectiveness.

The third weakness of the existing models of group effectiveness is the lack of delineation between performance and effectiveness. As argued by Goodman et al. (1987) above, performance and effectiveness are not necessarily the same construct. Campbell (1991) also distinguishes between the two, noting that performance is work behavior directed toward a goal and effectiveness is the evaluation of the outcomes of that behavior. Only Hackman's (1987) normative model

separates performance and effectiveness in his concept of three process criteria, or aspects of group behavior, that he posits as the immediate antecedents of group effectiveness.

Job performance at the individual level is typically multidimensional. In the criterion development phase of the Project A study (a large-scale selection and placement study conducted by the U.S. Army), five dimensions of military performance were empirically derived (Wise, McHenry, & Campbell, 1990). Based on these and other findings, Campbell (1991) suggests a general taxonomy of eight possible dimensions for consideration. Similarly, group performance is likely to be multidimensional. In Hackman's (1989) normative model, the process criteria (application of knowledge and skills, effort, and use of appropriate strategies) are presented as necessary and sufficient to determine group effectiveness.

Another major weakness of most of the models of group effectiveness is the lack of clear explication of why and how the work group enhances individual performance. Organizational designs based on work teams are built on the assumption that team effectiveness will differ from the sum of individuals' outputs due to capitalization on flexibility and shared knowledge and effort (Lawler, 1986). This assumption is contrary to the research findings on social loafing, in which group members have been found to expend less effort when working in a group than when working alone (Levine & Moreland, 1990). The models (except Shea & Guzzo, 1987) do not offer an explanation as to why the group members should respond positively rather negatively in a team setting.

Shamir (1990) proposes that traditional theories of individual motivation are insufficient to explain collectivistic motivation -- the willingness to put forth effort in a group setting. Social cognitive theory (Bandura, 1982) provides an explanation for such willingness. This theory suggests that individuals' choice of activities, level of effort, persistence, and application of skills are functions of their judgments of their capabilities (efficacy) in a particular setting. Application of this theory at the group level implies that choices by group members to exhibit certain behaviors are a result of their perceptions of their capability to perform effectively as a group. The inclusion of a construct such as this, reflecting the members' perception of shared reality, adds the dimension suggested by Shamir (1990) to a model of group task effectiveness. Beliefs in their collective

capabilities would provide members with the impetus for contributing to the group rather than engaging in social loafing.

Some models of group effectiveness attempt to explain group effects on task effectiveness by means of the construct of cohesiveness (Goodman et al. 1987; Pearce & Ravlin, 1986). However, the use of this construct from the traditional group literature (Cartwright & Zander, 1968) is problematic. Recent reviews (Goodman et al., 1987; Greene, 1989; Mudrach, 1989) reveal a lack of consistency in the assumed relationship between cohesiveness and performance, and Mudrach (1989) demonstrated the confusion and lack of precise definition of the construct itself within the literature. Even when the construct is defined as having two dimensions, task and interpersonal, a solid relationship is not found consistently between task cohesiveness and task performance (Zaccaro & Lowe, 1989). A better understanding of the task performance of teams could potentially be achieved by exploring alternative constructs.

Zander (1977) calls for the exploration of a motive for group achievement, somewhat like group motivation, that results from past successes and anticipation of future successes. Shamir (1990) and Spink (1991) use Bandura's (1986) term collective efficacy to reflect members' perceptions of the probability that collective effort will result in collective accomplishments. Hackman (1987) conceptualizes the process gain or loss resulting from interactions within the group as synergy. He describes synergy in terms of its effects, but does not define it. The construct synergy in this model does not capture the essence of Zander's (1977) or Shamir's (1990) ideas, for it does not provide any explanation as to why synergy is positive or negative. Shea and Guzzo's (1987) model is the only one that includes this construct, which they call potency and define as a group's shared belief in its ability to be successful.

Each of the current models of group effectiveness suffers from one or more of the above weaknesses. The proposed study presents a model which integrates the elements of previous models to distinguish between performance and effectiveness, clarifies the concept of team effectiveness, and includes a group motivation construct to explain how team behavior is affected by characteristics of the team and of the organization.

Proposed model

The focus of the proposed model is the performance of work teams that are formed for the output of a product/service. These teams are not temporary; they have no foreseeable end when they are formed. Members perceive themselves as a member of a specific team; transfer between teams is not trivial. The technological context is determined; the teams do not have the ability to alter the technology. The range of team effectiveness is determined by how well they manipulate the technology.

Team Effectiveness

A model of group effectiveness in a work team setting should acknowledge that the reason for the existence of the team is the continual achievement of the goals of the organization. As stated by Campbell (1991), effectiveness is evaluative in nature -- it speaks to the comparison of outcomes to a standard. Therefore, team effectiveness is defined as the achievement of the organization's goals in accordance with the position of Goodman et al. (1987) and Shea and Guzzo (1987) that satisfaction of the members or the meeting of their needs is not an appropriate focus in a model of work team effectiveness.

Team Performance

Campbell (1991), in his proposed model of individual performance, stresses that performance is the precursor to effectiveness and must be stated in behavioral terms. He offers eight dimensions of individual performance in work settings. The model proposed herein adopts this approach, building on Hackman's (1987) process criteria, but enlarging and redefining the construct space.

It is proposed that the immediate antecedent to team task effectiveness in a work team setting is the multidimensional construct of team performance. Team performance has four dimensions, three of which are drawn from Hackman's (1987) process criteria. The fourth expands the construct

to include behaviors which facilitate and enhance the execution of the other three. A variation of the type of behavior termed prosocial behavior by Brief and Motowildo (1987) and organizational citizenship behavior by Organ (1988), this dimension is called team citizenship behavior. The four dimensions of performance are defined as follows:

Effort. This dimension is the level of effort put forth by the team to meet its goals and its persistence.

Application of Knowledge and Skills. This dimension reflects behaviors directed toward the application of two types of skills (technical and interpersonal) needed to achieve the goals. This dimension incorporates the capitalization upon the diversity of skills available in the group, so that skills possessed by only some of the members benefit the team as a whole.

Choice of Strategies. This dimension reflects the team organizing themselves and their work, choosing plans of attack that will allow them to reach their goals, and coming up with creative ways to solve problems.

Team Citizenship Behavior. This dimension reflects the degree to which team members engage in prosocial behaviors to help others and the team and carry out their roles beyond the minimum required of them.

Collective Efficacy

As stated earlier, team-based management is founded on the assumption that the outcomes of such a job design will be greater than those of individual-based job designs. For such synergy to emerge, a group of individuals must be transformed into a team capable of such greater outcomes. In the proposed model, the force operating within the team to motivate it to produce such outcomes is termed collective efficacy. Collective efficacy is the group's collective belief that it can perform successfully, i.e., that it can marshal the effort, technical and interpersonal knowledge and skills, strategies, and extra-role behaviors needed to achieve its goals within the organization on an on-going basis. The dimensions of this belief parallel the actual performance dimensions. Unlike

Shea and Guzzo (1987), however, the current model hypothesizes collective efficacy as the antecedent of performance, not of effectiveness.

Antecedents to Collective Efficacy

If collective efficacy is related to team performance and, ultimately, to team effectiveness, the question arises as to the antecedents of collective efficacy. What factors facilitate perceptions of collective efficacy in a given situation? Spink (1990) suggests that the most important precursors to collective efficacy are the presence of feedback about prior success and the lack of factions within the group (which he labels cohesiveness). Shamir (1990) proposes that collective efficacy can be fostered by organizational activities (such as socialization and training) and leadership behaviors that support and encourage it. He argues that the structure of the organization and the behaviors within it should be calculated to "instill norms of cooperation and contribution" (p. 329). The research on social loafing has shown it is less likely to occur when subjects see the task as meaningful or the outcomes of task as having importance to them (Brickner, 1987).

The models of group effectiveness cited earlier contain various configurations of organizational and group design factors that are cited as necessary for group productivity. In addition, the prescriptive writings from the practitioner literature suggest organizational and group design characteristics important to group success. The factors from both literatures are not unlike the antecedents to efficacy discussed above.

All the models indicate that the success of work teams in dependent upon characteristics of the organization. Organizational features that occur in most of these lists include the organizational structure, the job design, the rewards system, the training system, the information and support systems, and the leadership style (Gladstein, 1984; Hackman, 1987; Kinlaw, 1992; Pearce & Ravlin, 1987; Shea & Guzzo, 1987). Lawler (1986) stresses the need for congruence of these organizational features and the need for them to exist within a set of core values that are expressed through actions and words.

The models also include two types of design characteristics that are likely to enable team performance. One type is the structure of the team and its responsibilities. This category includes the nature of the task assigned to the group, the process through which the task is performed, the leadership and coordination structure within the team, and the level of empowerment given to the team (Gladstein, 1984; Hackman, 1987; Kinlaw, 1992; Larson & LaFasto, 1990; Pearce & Ravlin, 1987; Shea & Guzzo, 1987a; Wellins, Byham & Wilson, 1992).

The other type of design factor is composition. Composition in this sense refers to the mix of attributes possessed by the members. This can be demographic characteristics such as age or gender, personal characteristics such as values or perspectives, or work-related characteristics such as experience, tenure, or skill level (Gladstein, 1984; Hackman, 1987; Pearce & Ravlin, 1987; Kinlaw, 1992).

The proposed model draws from many of the models discussed above but most directly combines the views of Hackman (1987) and Shea and Guzzo (1987). Like Hackman (1987), it suggests that aspects of the organizational context and of the group characteristics (such as composition) affect team performance. Like Shea and Guzzo (1987), it proposes that the impact of these classes of variables on performance is through collective efficacy. Also like Shea and Guzzo (1987), it acknowledges that the most important source of efficacy beliefs is feedback concerning prior performance.

O'Reilly (1991) discusses the need to consider the context in which work is performed. One of the types of contexts mentioned is the heterogeneity of work groups on demographic variables such as age and tenure. He cautions researchers to look for the effects of such differences on communication patterns and performance. Jackson (1992), addressing the predicted increased diversity of the American workforce, calls for study of the composition effects specifically in self-managing work teams, where they might have a great strong impact. Based on these suggestions, the proposed research will explore characteristics of teams such as the stability of membership and their composition mix in terms of age, gender, skills, and tenure as possible antecedents to collective efficacy, in addition to feedback. An idiographic research design, in which many of organizational context factors are the same for all teams, will allow for the exploration of composition effects.

In summary, the model proposed herein integrates and clarifies current models of group effectiveness. The key proposition is that a team's belief about its capabilities -- its collective efficacy -- is the immediate antecedent of its performance behaviors. Collective efficacy is the catalyst through which team members transform the characteristics of the organization, the characteristics of the group, and feedback about their prior performance into performance behaviors. A team's collective efficacy will influence its behaviors in terms of choice of activities, level of effort, and use of strategies, and citizenship behaviors. The model proposes that performance in a team setting is multidimensional, encompassing four types of behaviors. It acknowledges that, due to constraints imposed by technology, team performance is only one of the determinants of variance in team effectiveness. Effectiveness is defined in terms of the meeting of the goals of the organization. This view of team effectiveness gives rise to several basic questions which will drive the present research project:

- Is team performance related to effectiveness?
- What are the dimensions of team performance behaviors?
- Does the construct of collective efficacy exist as a group-level phenomenon that varies between teams?
- Is collective efficacy related to performance?
- What are the antecedents of collective efficacy?

The conceptual and empirical literature relevant to these questions is reviewed in Chapter Two.

Chapter 2

Literature Review

This chapter presents a review of the literature pertaining to team effectiveness. It contains two major sections. The first discusses the literature concerned with use and effectiveness of self-managed work teams from both academic and practitioner perspectives. Second, literature is presented pertaining to explain and support the components of the proposed model.

Work Team Effectiveness

Self-managing teams are characterized by Goodman et al. (1988) as groups who are given control over the management and execution of a whole set of interdependent tasks. These tasks are usually performed in a shared space with face-to-face interactions. The concept of self-managed work teams had its origins in the work of Trist (1951) and the Tavistock Institute. Their sociotechnical theory has been applied in recent years in the United States, often being referred to as a "new plant revolution" (Lawler, 1978; 1991). Based on the concept of "joint optimization" of technical and social systems, these plants are characterized by the use of teams (described as autonomous or self-managing) as the basic building block of the organization, flat organizational structures, enriched jobs, open communication systems, pay systems tied more to individuals' skill levels and less to traditional job evaluation methods, and heavy investments in training (Cummings, 1977; Kelly, 1978; Lawler, 1978, 1986, 1991; Pearce & Ravlin, 1987). Some of the best-known

examples of this type of organizational design are the Gaines dog food plant in Topeka, Kansas (Walton, 1972) and the Saturn automobile plant in Springhill, Tennessee (BW, 1992).

Many organizations have reported positive outcomes, especially in terms of productivity increases, from the use of team-based organizational designs. Guzzo, Jette, and Katzell's (1985) meta-analysis of the relationship between types of organizational interventions and productivity increases found sociotechnical-based programs to have substantial effects on productivity. Many of the aspects of such programs, such as job redesign, training, and goal setting, resulted in effects individually and even greater effects when combined.

Wall, Kemp, Jackson, and Clegg (1986) conducted a longitudinal comparison of levels of individual attitudes (job satisfaction, organizational commitment, and mental health) and organizational outcomes (efficiency and productivity) on two similar plants of the same company. One plant installed autonomous work teams, and the other served as a comparison site. Following the introduction of work teams in the one plant, the authors found increases in reported intrinsic job satisfaction, but not in commitment, motivation, mental health, or work performance. Productivity increased, but resulting more from the removal of the costs associated with an additional level of management than from increased output. They attribute the lack of output increases to the shortcomings in the organizational characteristics of the team setting, for little training was conducted and the rewards and feedback remained tied to individual, not group, performance. These violate characteristics considered vital to the successful implementation of a work team system.

The identity of the factors contributing to the success of work teams and the reasons for their contributions has been sought by academics and practitioners. The academic writings seek to apply, deductively, theory and research findings based on other types of groups (such as social groups, groups formed for experimental purposes, or short-lived project teams) to this particular type of group. Practitioners, on the other hand, attempt to apply, inductively, what has been successful in some settings to other similar settings. Although the routes taken are different and the terminology used is different, the two groups arrive at strikingly similar positions and describe similar phenomena. These two literatures are discussed next.

Theoretical Models of Group Effectiveness

Gladstein (1984) devised a comprehensive model of group effectiveness based on "traditional theories" from the group literature. The model groups the variables into the three categories of input, process, and output. Inputs are characterized as existing at the group level (composition and structure) and the organizational level (resources, rewards, training). Filtered through the group processes of communication, supportiveness, conflict, strategy discussion, weighting of inputs, and boundary management, these inputs produce outputs of performance and satisfaction. The process-outputs relationship is moderated by the nature of the group task, in that process variables will be more influential in success for tasks whose complexity, interdependence, and environmental uncertainty increase the information-processing requirements of the group. The model was tested on a sample of sales teams in an ongoing organization. Gladstein stresses the need to study intact groups in their actual work context rather than in the laboratory in order to understand the actual influences on productivity. Factor analysis was used to determine which variables were operating at the inter-group and intra-group levels. The LISREL test of the group model found that group members' ratings of characteristics of the organization (training, leadership) and of the group (processes) predicted effectiveness as measured by ratings of satisfaction and of perceived effectiveness, but not as measured by sales revenue.

Pearce and Ravlin (1987) constructed a model for the implementation and maintenance of self-regulating work teams. They stated their intention of building a model based on the premises of the sociotechnical theory of job design, and discuss why certain types of teams, such as quality circles, task forces, and temporary groups, do not qualify as self-regulating work teams. Their model, however, is not based on solely self-regulating teams. Due to a dearth of studies of self-regulating work teams, they include findings from laboratory studies (typically temporary groups of undergraduate students) and field studies of groups (not self-regulating teams) for empirical support of their model. The result is a model and a set of hypotheses that appear to be little more than the traditional group process variables rearranged and renamed into three categories of preconditions for design, design and activation conditions for process, and process criteria. The out-

comes included in this model are satisfaction, absenteeism, turnover, safety, innovation, and productivity.

Hackman's (1987, 1990) normative model defines effectiveness in a work team setting as having three dimensions. An effective team, according to this model, produces an output acceptable to its clients, uses a process that ensures the capability of the group to work together in the future, and meets more than frustrates the needs of the members. These ends are accomplished through three "process criteria" -- the level of collective effort, the amount of knowledge and skills applied, and the appropriate use of strategies by the group. The joint interaction of these process criteria enable the team to reach the three effectiveness goals. These process criteria are supported by certain conditions: the design of the group (task, structure, composition, and norms) and the organizational context of the group (its rewards, educational and information systems, and material resources). These two classes of variables produce the process criteria to the degree that the team is able to capitalize on positive synergy (process gain) and avoid negative synergy (process loss) that results from the interactions of the group members. Hackman does not suggest under what conditions synergy might be positive or negative; he merely describes its impact on the process criteria.

A laboratory test supported one part of an earlier version of the Hackman model (Hackman & Morris, 1975). Hackman, Brousseau, and Weiss (1976) found an interaction effect between the type of task and the strategy used by groups for a production outcome. The discussion of strategy by groups resulted in better performance when the task required coordination of information but actually inhibited performance for a straightforward task.

Shea and Guzzo (1987a) present a parsimonious model of group effectiveness. Their model can be applied to any formal group within an organization whose members see themselves and are seen by others as a group, who depend on each other for resources, and who must accomplish a task. They state that, within an organizational context, the outcome of interest for such formal groups should be the accomplishment of the charter/goal of the group. This model portrays effectiveness as being shaped by the variables of task interdependence, outcome interdependence, and potency. Their model conceptualizes the immediate precursor of group task effectiveness to be the group-level construct of potency. This is a collective belief in the group's efficacy to reach its goals.

The group's efficacy is a function of its prior performance, its level of task interdependence, and the interdependence of its outcomes.

Thus, Shea and Guzzo (1987) incorporate some of the other models' conditions for success, such as the nature of the task and the nature of the reward system, but they incorporate only a goal-oriented outcome variable. In addition, they incorporate a construct, collective efficacy, and suggest why it would have an impact on performance. This can be viewed as a version of Hackman's notion of synergy, but with more explanatory potential.

Shea and Guzzo (1987b) tested this model in a study of the effectiveness of groups of sales clerks. They surveyed the sales clerks before and after the implementation of a group bonus system (interdependent outcomes). They found support for their model for the dependent variable of customer service behaviors, but not for sales dollars. This provides support for the link between efficacy and behaviors, but not for a link between efficacy and outcomes. The strongest relationship found in the model was between groups' perceptions of their potency and the behaviors they exhibited.

Sundstrom, De Meuse, and Futrell (1990) present an "ecological" perspective on work teams. This heuristic model states the effectiveness (performance and viability) of teams can be understood best in view of the three aspects of their surroundings. These three aspects are team development (norms, cohesion, and roles), team boundaries (work team differentiation and external integration) and organizational context (organizational culture, task design, mission clarity, feedback, rewards, training, and the physical environment). Like Shea and Guzzo (1987), they see the aspects of the environment of the teams as reciprocally interdependent. The authors stress that work groups are probably not one type of "animal." There may be several species, or, at least, subspecies. They call for the longitudinal case study approach adopted by Hackman (1987a, 1990) to understand teams in their surroundings.

Goodman and his associates (Goodman, Ravlin, & Schminke, 1987; Goodman, Devadas, & Hughson, 1988; Goodman, Ravlin & Argote, 1986) argue that the literature on group productivity cited above borrows too heavily from research on non-work groups. The application of findings from groups that are social or temporary in nature to work groups results in too much emphasis

being placed on process variables and not enough being put on technology and task. Goodman et al. (1987) question the application of variables such as cohesiveness and group norms to work groups without a theoretical justification of why they would impact performance. Goodman et al. (1988) state that the researcher should assume that technology will account for most of the variance in outcomes and, in studying work groups, should look for points in the technological system where human factors can have an impact on outcomes. They call for the study of work groups within specific technological constraints.

Practitioner Models of Team Effectiveness

Larson and LaFasto (1989) take what they call a "grounded theory" (p. 19) approach to the study of teams. They started with a sample of successful teams from a wide range of society (including, for example, a team from the Centers for Disease Control, a Mt. Everest expedition, the McDonald's Chicken McNugget team, and two college football teams). From interviews with members and leaders of these teams, they identified eight characteristics of those teams that had been successful. These characteristics are: a clear, elevating goal, a results-driven structure, competent team members, unified commitment, a collaborative climate, standards of excellence, external support and recognition, and principled leadership. The list includes organizational and team level characteristics. These general characteristics are applicable, they say, to teams in any setting. It is not a far leap from this list to the categories devised from the models of group effectiveness cited above.

Some authors have moved away from teams in general and have studied self-managed work teams in particular. Based on a national survey and interviews conducted at twenty-eight plants, Wellins, Byham, and Wilson (1991) see the outcomes of the use of work teams as increased quality, productivity, and customer service. The critical component of effectiveness in their conceptualization of work team effectiveness is empowerment, which they define as "the passing on of authority and responsibility" (p.22). The organizational characteristics that lead to empowerment are organizational values/leadership actions, the human resource systems (such as rewards and train-

ing), and the organizational structure and job design. They view empowerment (and, therefore, team viability) as a process in which team members grow in their ability to accept responsibility and the organization correspondingly passes authority on to them. They characterize empowerment in terms of responsibility rather than behaviors.

Kinlaw (1992) presents a "practical model" of superior team development and performance, based largely on his work with teams at NASA. He describes four elements that are present in superior work teams. The elements are leadership, informal processes, team feelings, and results. The processes are activities that form the environment of the teams, such as communicating, adapting, influencing, and appreciating. He states that the elements do not occur in any sequence and are reciprocal, building on each other. Development of superior work teams, then, can be abetted by improvement in any or all of these elements.

Much of what has been written or "discovered" subsequently about work teams was discussed in Lawler's (1986) discourse on participative management, *High Involvement Management*. In this book he discusses various approaches to employee participation, including quality circles, job enrichment, gainsharing, and work teams. He states that the new plants based on the design features of sociotechnical theory "represent the best example in the United States of a congruent organization-wide approach to participative management" (p. 171). These designs merge physical layout, job design (usually team-based), pay system, selection practices, organizational structure, training, and management philosophy into a high involvement system that can jointly maximize effectiveness. Again, the features of these designs include organizational and group-level concerns.

In the sections above, it has been shown that, while the terminology used may be different, there is some agreement among academics and practitioners as to the conditions under which work teams succeed. Aspects of the organization that must be present to enable teams to succeed are pay and incentive systems, leadership philosophy, job design, and organizational structure. Additionally, the groups themselves must be designed and trained in order to have the skills needed to perform. What these models do not address, however, is <u>why</u> these design characteristics lead to success. The aspects of the model proposed to address this need are discussed in the following section.

Components of the Proposed Model

Criteria

Many of the models above incorporate multiple criteria for effectiveness, including member satisfaction and the meeting of the needs of the members. The proposed model uses the more limited criterion of the meeting of the task goals for which the team was founded. This criterion is based on the logic that the definition of effectiveness should be from the perspective of the organization in which the team operates. If the team was formed to produce something, the production of that thing should be the standard against which the effectiveness of the team should be judged. Criteria such as member satisfaction have been included because many of the models were borrowed from social group literature without thoughtful consideration of their applicability to work teams.

Effectiveness, as stated above, is the evaluation of outcomes. It has been pointed out, however, that outcomes are often a function of technology or other system factors and performance within the system. (Binnings & Barrett, 1989; Carson, Cardy, Dobbins, & Stewart, 1992; Dobbins, Cardy & Carson, 1991; Johns, 1991). It is necessary, then to delineate between outcomes and performance. Campbell (1991) defines performance as behaviors relevant to the organization's goals. Performance is action, not the results of the action. Performance, then, is the means to the end of effectiveness.

Many of the writers who have delineated between outcomes and performance have also recognized the need for the definition of the construct of performance. Borman (1992) decries the lack of theoretical models of job performance, and Campbell (1991) states "We have no theories of performance" (p.704). The major contribution made toward rectifying this gap in knowledge came from Project A, a long-term, large-scale study aimed at improving the selection and placement system within the U.S. Army (Borman, 1991). This project sought to build a theoretically meaningful and practically applicable model of predictors and criteria for a sample of jobs of enlisted Army personnel. Wise, McHenry, and Campbell (1990) report the results of the criterion devel-

opment stage. Overall performance was found to be captured best by the five latent criterion variables of (1) Core technical proficiency, (2) General soldiering proficiency, (3) Effort and peer leadership, (4) Personal discipline, and (5) Physical fitness.

Campbell (1991) draws on the Project A findings and offers a taxonomy of performance components as a step toward a definition of the latent structure of performance across jobs. His eight factors are sufficient, he states, to describe all the jobs in the *Dictionary of Occupational Titles*. All are not present in every job, and all do not take the same form (e.g., number five is the avoidance of negative behaviors, while others are positive). The eight factors are (1) Job specific task proficiency, (2) Non-specific task proficiency, (3) Written and oral communication, (4) Demonstrating effort, (5) Maintaining personal discipline, (6) Facilitating peer or team performance, (7) Supervision, and (8) Management/administration.

These two latent structure models (Wise et al., 1990; Campbell, 1991) characterize performance at the individual level. It is likely that if performance is multidimensional at the individual level, it is also multidimensional at the group level. The only model of group performance that addresses this issue is Hackman's (1987) normative model. The key proposition of that model is that differences in groups' outcome effectiveness are functions of their process criteria. The three process criteria, level of effort, the amount of knowledge and skill applied to the task, and the appropriateness of strategies used, are described as "hurdles a group must surmount to be effective" (p. 324). A more useful way of thinking about these criteria is in Campbell's behavioral terms, so that they are considered to be dimensions of performance at the group level of analysis.

If the Hackman (1987) process criteria are thought of as performance behaviors at the group level, they can be compared to the Campbell (1991) and Wise et al. (1990) models to determine the adequacy of their coverage of the content domain. Such a comparison shows overlap in the areas of task-related and general knowledge and skills and effort. What the Hackman (1987) dimensions leave untapped are the dimensions labeled Personal Discipline and Peer Leadership by Wise et al. (1990) and Maintaining Personal Discipline and Facilitating Peer Performance by Campbell (1991). These represent criterion dimensions beyond those of technical expertise or effort and often mani-

fest themselves in what are called organizational citizenship (OCB) (Organ, 1988) or prosocial (Brief & Motowildo, 1986) behaviors.

Organ (1988) defines OCB as "individual behavior that is discretionary, not directly or explicitly recognized by the formal reward system, and that in the aggregate promotes the effective functioning of the organization" (p.4). These types of behaviors are classified into two factors, Altruism (helping behaviors) and Conscientiousness (going beyond the minimum). Some studies (Organ, 1988) have shown the emergence of a third factor, Sportsmanship (not engaging in negative, petty slights or complaints). Organ (1988) considers the behaviors to be extra-role, i.e., they are not part of what is expected of the individual.

Brief and Motowildo (1986) define prosocial organizational behavior as behavior performed by an organization member toward an individual or group with the intention of promoting the welfare of the individual or group. This broader definition encompasses both role-prescribed and extra-role citizenship behaviors performed for the benefit of others. It also allows for the consideration that prosocial behaviors may be performed for the good of a group as well as for an individual and may not go unrewarded. In keeping with their broad definition, they list thirteen specific kinds of prosocial organizational behaviors. The ones most applicable to the present research include (1) Assisting co-workers with job-related matters, (2) Assisting co-workers with personal matters, (3) Complying with organizational values, policies and regulations, (4) Suggesting procedural, administrative, or organizational improvements, (5) Objecting to improper procedures or policies, (6) Putting forth extra effort on the job, (7) Volunteering for extra assignments. In a team-based environment, these would be considered prosocial but not extra-role.

Borman (1991) calls for the inclusion of a dimension such as prosocial behavior in a performance model for a team-oriented environment. In such an environment, the line between role-defined and extra-role prosocial behaviors becomes blurred, and so such behaviors should be considered a part of performance along with effort, application of knowledge and skills, and use of strategies.

Just as previous models of group performance do not adequately characterize group performance, they also do not sufficiently explain why some collections of individuals become effective

groups and others do not. In the following section some of the explanations for this phenomenon are explained and a useful construct is presented.

Group Motivation

Social Loafing. Before a group's outcome can be assumed to be greater than the sum of individual outputs, the phenomenon of social loafing must be addressed. Latane et al. (1979) coined the term to refer to the tendency of participants to put out less effort when working in a group than when working alone. In the laboratory, it has been shown to occur on both cognitive and physical tasks (Levine & Moreland, 1990). Recent research has shown, however, that social loafing may not be ubiquitous in all group tasks.

Bettenhausen (1991) reports that social loafing occurs less when the individuals or their outcomes are identifiable. Brickner et al. (1986) criticize earlier research for using tasks (such as clapping or screaming) that have no personal meaning or significant consequences for the lives of the subjects. They tested two mediators of social loafing, whether individual contributions were identifiable (identifiability) and whether the outcome of the performance had an impact on the person (involvement). They found that when involvement was absent, identifiability had an influence on social loafing. However, when involvement was present, social loafing disappeared, regardless of identifiability. Shepperd (1993) uses an expectancy theory framework to organize the research on productivity loss (which includes social loafing) in performance groups. His suggestions for overcoming the lack of motivation to contribute to a group effort include providing incentives for contributing, making contributions indispensable, and decreasing costs of contributing. In a work team setting in which one's performance impacts rewards and relationships with peers, involvement should override social loafing tendencies.

Cohesiveness. The models of group performance contain some explanation of what must happen to transform a collection of individuals into a group that functions as one. Most of these explanations are some variation or combination of group process variables. (See, for example, Gladstein, 1984; Pearce & Ravlin, 1987.) One of the most widely used has been the construct of

cohesiveness, following the writings of Cartwright and Zander (1968), who assign it a "central place" (p. 91) in the theories of groups. Their view is that cohesiveness, individuals' desire to remain a part of a group, will be related to their motivation to participate in its activities. This participation will result in higher performance levels for cohesive groups. This relationship has been presumed to hold (Greene, 1989) since the publication of the review by Cartwright and Zander (1968).

Recently, however, the relationship between cohesiveness and productivity has been questioned on several bases. First, several variables have been found to moderate the relationship. Greene (1989) found the relationship to be moderated by two variables, the degree to which the group accepts the organization's goals and the group's drive (i.e., motivation). Zaccaro and Lowe (1989) found evidence that cohesiveness may be multidimensional, with interpersonal and task cohesiveness demonstrating different relationships to performance.

Mudrack (1989) challenges the use of the construct of cohesiveness at all, due to inconsistencies between researchers in their definition and measurement of the term. He points out confusion in the level of analysis used to characterize the construct (e.g., is it an individual or a group characteristic?). He also accuses researchers of not linking their conceptualization to their measurement of the construct. Little confidence can be placed, he argues, on results based on the measurement of a construct defined and measured with such "inexcusable sloppiness" (p. 45) as has characterized the research on cohesiveness.

Even without the shortcomings above, the use of cohesiveness as a predictor of group performance in work settings has been criticized. Goodman et al. (1987) and Bettenhausen (1991) question the transplanting of a relationship from social groups into a work setting (they also bring out many of the problems with the construct and its measurement). Even more damaging to the use of this construct in a work team setting are the results of a meta-analysis of the relationship between group cohesiveness and performance conducted by Evans and Dion (1991). Despite having found a positive relationship, they caution the reader against generalizing the results to "real" [emphasis in original] work groups due to the laboratory settings in which most of the studies were conducted.

In light of these findings and recommendations, an alternative to cohesiveness needs to be found to explain groups' motivation to work together. Such an alternative is presented in the following section.

Collective Efficacy. Shamir (1990) points out that many of the new organizational structures, such as Lawler's high involvement organizations, are built on cooperation and require strong linkages between individual and collective effort. In such organizations, as stated above, the delineation between task behaviors and prosocial behaviors is blurred. In such a setting, traditional individualistic theories of motivation do not present a convincing model for the link between individual and collective actions. Zander's (1977) addressed this when he called for a measure to capture what he calls the motive for group achievement.

Social cognitive theory provides the basis for such a motive. Bandura (1986) states that research in psychosocial realms has tended to focus on one of two areas, the acquisition of knowledge or the formation of response patterns (performance). What is needed is a means of explaining the relationship between these, i.e., when is knowledge translated into action? Bandura (1986) stresses that possession of knowledge and skills must be accompanied by the appraisal of the adequacy of one's capabilities in order to be translated into action.

One of the major concepts of social cognitive theory, self-efficacy, is theorized as the link between possession of skills and performance. Self-efficacy is defined as "peoples' judgments of their capabilities to organize and execute courses of action required to attain designated types of performance" (Bandura, 1986, p. 391). It addresses one's judgments of what one can do with one's skills. Bandura (1986) theorizes that efficacy beliefs affect the choice of behaviors, effort levels, and persistence. Thus, highly efficacious persons choose activities carefully, work hard, and do not give up when faced with difficulties. Efficacy is such a central tenet of social cognitive theory that many writers testing only that part of the theory (Barling & Beattie, 1983; Gist, 1987; Saks, 1992) refer to it as self-efficacy (or simply efficacy) theory.

Bandura (1977) stresses that efficacy is not the same as performance-outcome expectancy. People may believe that a given level of performance will result in a given outcome, but will not make an attempt because of lack of belief in their ability to perform successfully. He argues that

expectancy beliefs often encompass hope and wishful thinking, while efficacy beliefs, if measured for specific tasks and levels of performance, represent perceptions of reality.

The theory was originally tested in clinical settings. Bandura (1977) found that three conditions were required for snake phobics to engage in coping behaviors. They had to have the requisite skills for performance, they had to have incentive to perform, and they had to have strong self-efficacy beliefs. Based on this and other studies, Bandura (1977) concludes that "given sufficient capabilities and incentives, ... efficacy expectations are likely to be a major determinant of people's choice of activities, how hard they strive, and how long they will persist in their attempts" (p. 138).

Gist (1987) demonstrates how the self-efficacy element of social cognitive theory can be applied to task performance in organizations. She relates efficacy to aspects of several motivational theories, showing that efficacy is either inherent in those theories or preferable to them. For example, she argues that efficacy beliefs differ from effort-performance expectancies in that efficacy beliefs encompass more, including judgments about coping mechanisms and internal motivation in addition to effort expenditure. She suggests several areas in which the theory of efficacy could be applied to organizational research, including training, leadership, performance appraisal, and team building.

Wood, Bandura, and Bailey (1990) tested self-efficacy theory among a sample of MBA students performing a managerial decision-making problem in a simulated organization. Thus, the laboratory study emulated organizational rather than clinical task performance. Measures taken at several points in the study found self-efficacy to be related to prior performance, the use of strategies to be related to self-efficacy, and performance to be related to use of strategies. Thus, they found self-efficacy to be positively related to persistence in the systematic use of strategies, which was related to performance.

In an actual business organization, Barling and Beattie (1983) used multiple regression to test the relationships between age, experience, performance-outcome expectations, and self-efficacy beliefs with four criterion measures of insurance sales performance. The performance-outcome expectations and self-efficacy measures were outcome- and task-specific to the type of job. The criterion measures reflected effort (number of calls), effort and skills (number of policies sold), and

performance success (dollar value of policies sold). Efficacy beliefs were found to be related to all three of these criteria, plus a composite measure of the three. Performance-outcome expectancies were not found to be significantly related to any of these outcomes.

Saks (1992) conducted a longitudinal field study of efficacy theory using entry-level accountants in CPA firms. In addition to his test of the changes in individuals' efficacy beliefs at different times, he tested relationships of self-efficacy with several criteria. In the test from the first time period, he found self-efficacy to be related to job performance. In the second time period, he found self-efficacy to be related to job satisfaction, intention to quit, and turnover. This study is a valuable addition to the literature for two reasons (Gist, 1992). First, the perceptions of self-efficacy were for a complex task in a real organization. Second, the measures of self-efficacy were designed from information gathered from job analyses, reflecting the idea that efficacy is multidimensional and specific to a task and a situation.

Bandura (1986) states that self-efficacy can be conceptualized at the collective level and calls for research into how its functioning is related to group performance. Versions of this construct have been incorporated into the literature on groups. Zander (1977), as mentioned above, calls for the exploration of group motivation. Gist (1987) calls for research into the possible relationship between group efficacy and performance in organizations at many levels of analysis. One level of analysis she suggests is that work team efficacy may be related to team task performance. Collective efficacy provides an possible explanation for the transformation of a collection of individuals into a team capable of performance. Guzzo, Yost, Campbell, and Shea (1993) explicate their proposed construct, potency, as a similar precursor to group effectiveness. It offers an explanation of why individuals would expend effort on a task rather than engaging in social loafing.

The application of efficacy theory to the group level is not untested. In the sports psychology literature (Spink, 1990a), collective efficacy has been shown to be a collective expectation for success that can be differentiated from individual confidence scores. Based on a one-item measure of efficacy, Spink (1990a) reports collective efficacy to be related to power play percentages and scoring percentages for hockey teams. Spink (1990b) also studied collective efficacy of two types of volleyball teams competing in a tournament, elite (competing for prize money) and recreational (no

prize money). Collective efficacy was positively related to final tournament placing for elite teams, but not for recreational teams. The two types of teams also had different relationships between collective efficacy and cohesion. Specifically, among groups with low efficacy, the recreational teams were much more likely to report high levels of cohesion than were the elite teams. The authors suggest this means that cohesiveness is more important for social groups (when it is an end in itself) than for task groups. For elite teams, efficacy was more strongly related to performance than was cohesion.

As cited above, Shea and Guzzo (1987a; 1987b) incorporate this construct, which they call potency, into their model of group effectiveness. Their test of the model (Shea and Guzzo, 1987b) showed the strongest relationship found in the model was between groups' perception of their potency and the behaviors they exhibited.

Lee (1992) explored the relationship between efficacy and performance at three levels of analysis, individual, supervisor-subordinate dyads, and work groups. He defined group efficacy as "the strength of subordinates' confidence in the capability of their formal work group to perform tasks successfully" (p.49). He found group efficacy to be distinct from self efficacy and found a positive relationship between groups' level of perceived efficacy and their ratings of their performance. The measures for all the variables in this study were obtained from a single questionnaire.

If the construct of collective efficacy is related to performance of work teams, the natural question that follows is that of the factors that affect teams' levels of efficacy. The following section addresses that question.

Antecedents to Collective Efficacy

The antecedents of collective efficacy are suggested by several writers using different terms. Bandura (1986) theorizes that self-efficacy judgments are based on four sources, mastery experiences (success in prior trials), modeling (watching others), social persuasion (encouragement), and physiological states (tension levels when performing). Of these four, mastery experiences are the most influential. When discussing collective efficacy, Bandura (1986) addresses not its sources but its

"underminers." Collective efficacy is thwarted by levels of bureaucracy, lack of shared purpose, and long delays between action and results.

Spink (1990b) suggests that the most important precursors to sports teams' collective efficacy judgments are feedback about prior performance, lack of factions within the group (shared purpose), and social support (encouragement). Shamir (1990) includes the following as organizational characteristics that support collective efficacy: socialization, training, leadership behaviors (such as feedback and encouragement), and organizational structure.

The above lists show great similarity. They point toward several necessary antecedents to collective efficacy: timely feedback, an organizational structure that supports rather than impedes group functioning, and tasks/goals that all members of the team share. These are not unlike the precursors of team effectiveness in the models of effectiveness (both academic and practitioner) delineated above. One mentioned in the effectiveness literature more than in the efficacy literature is the nature of the rewards. Gladstein (1984), Pearce and Ravlin (1987), Hackman (1987) and Shea and Guzzo (1987) all include rewards in their models. In work teams, a reward system based on interdependent outcomes can be seen as helping create shared purpose.

Included in all but Shea and Guzzo (1987) is the design of the teams in terms of their composition. In an exploratory study of the effectiveness of team-based employee involvement programs, Magjuka and Baldwin (1991) found administrators of such programs listed three variables as being most important in design and implementation. These three are rewards, resources available to the teams, and group composition.

Group composition, the homogeneity/heterogeneity of team membership on some personal or ability attribute, is of interest as a variable in the team literature because it may often be under the influence of managers. Composition, as many other constructs in the team literature, has been borrowed from the literature on groups in general. As such, clear generalizations to work teams are difficult to make from the findings (Tziner, 1986).

In one of the few studies that has addressed composition in actual teams, Magjuka and Baldwin (1991) characterized teams in terms of the heterogeneity of the functional areas represented within and found a positive relationship between heterogeneity and perceived effectiveness of the

teams. This study uses a sample of teams that is broadly defined (team-based employee involvement programs), however, so the generalizability may be no greater than that of studies from laboratory groups (such as Bass, 1980; Hawley & Heinen, 1979).

The most thoughtful treatment of this subject is by Jackson (1992). She states that in light of the increasingly diverse workforce predicted for the future (up to 80 percent of entrants into the workforce are predicted to be either female or non-white), the effects of compositional mixes on work groups would provide important information for forming and managing those groups. She reviews the scarce literature on the impact of composition (personal and ability attributes) on four types of tasks. Of interest herein are the findings on production tasks. She reports that the few extant studies seem to point to a relationship between the homogeneity of teams on personal attributes (personality, values, attitudes, and demographics) and productivity. The relationship is weak, at best. She states that the relationship between heterogeneity of ability and skills and productivity is assumed by most managers, but has not been tested.

Jackson (1992) poses two interesting questions. First, assuming that a team has the appropriate mix of skills and ability, what personal attributes are most important for it to be effective? Second, in light of the fact that teams are, by nature, both homogeneous and heterogeneous, which attributes should be maximized or minimized? She suggests that self-managed work teams provide excellent vehicles for exploration of the relationships between different compositional mixes. Findings from such settings, where incentives exist for high production, could provide sound tests of composition-productivity relationships.

In summary, the proposed model of group effectiveness is drawn from the theoretical and empirical bases discussed in this literature review. The outcome of interest is outcome effectiveness in production terms. Performance, the behaviors within a system that lead to outcomes, is depicted as being multidimensional. The motivational force in the model is the group-level construct of collective efficacy, the team's collective belief that it can perform successfully. Organizational and team-level design characteristics are precursors to collective efficacy. The following chapter presents the methods to be used in the current study, which will be an investigation designed to examine the critical elements of the model.

Chapter 3

Research Method

This research project can best be characterized as an in-depth, longitudinal field study of work teams in a single, high-involvement plant. The primary focus was on developing an understanding of the nature of team effectiveness in such a setting. Hence, the level of analysis was the work team. The perspective taken herein was both theory guided and exploratory. The model presented in the preceding chapter provided the initial framework for observation and measurement. However, given the existing differences in theoretical perspectives, the paucity of empirical literature, and the primitive state of measurement in this area of inquiry, modifications in perspective and measures were expected as the project unfolded, and this proved to be the case. The project can, therefore, be viewed as both an in-depth case study and a large-scale pilot for further studies.

This research used a combination of qualitative and quantitative methods (Siehl & Martin, 1988). The use of qualitative methods early in the process enabled the researcher to gain an in-depth understanding of the organizational context and improved the quantitative aspects of the study in that the instruments were tailored to the organization from which the data were gathered.

This research approach has much to recommend it, for it addressed several needs that have been pointed out in the organizational literature. Lawler (1985) argues that organizational researchers have too long assumed that they hold the key to knowledge (theory) and that it is their job to disseminate this knowledge to practitioners. Such assumptions lead researchers to miss significant advances in practice that have important theoretical implications. His view is that mean-

ingful research can be conducted that is useful for both theory and practice, with both researchers and practitioners learning from such endeavors.

Hackman (1990) demonstrates this model of research in his report on in-depth studies of types of work teams. He states in his introduction, "Even though our research strategy has a substantial inductive component, we did not start from scratch. ... We approached the teams that we studied with glasses on. They were, we hoped, glasses that would not distort what we saw--but were, in fact, tinted by what we already knew about group performance" (p. 7-8).

Boehm (1980) presented a model for such "real world" research. She suggests that the industrial/organizational psychologist's insistence on clinging to the traditional hard-science model of research has prevented many interesting but "messy" questions from being addressed. Real world research has characteristics (such as non-comparable "before" groups and interactions between predictor and criterion variables) that prevent conclusions being drawn as precisely as in controlled environments. But, she argues, while control and statistical precision may be given up, such designs are not without their strengths. The possible gains from such designs include an opportunity to use repeated measures, to develop more in-depth understanding of the phenomenon studied, and to have a genuine impact on organizational problems and theoretical development.

The research proposed herein took this approach. The goal was to gain an in-depth knowledge of "what is" (Boehm, 1980) in an actual team-based organization through a sound research design that combines qualitative and quantitative aspects. Data were gathered and interpreted in light of a theoretical framework in order to increase our understanding. The understanding gained was then used to revise and strengthen the theory and potentially contribute to organizational problem solving.

This chapter describes the site of the study, the qualitative aspects, the operational measures for each of the constructs, the data collection, and the analytic procedures.

Research Site

The site for the study was a manufacturing plant in a mid-Atlantic state. The plant uses continuous process technology to produce automotive parts (hereafter referred to as "ware"). The plant was designed in accordance with sociotechnical system concepts (Lawler, 1986) and was opened as a greenfield site in late 1980s, featuring self-managed work teams with a thin layer of leadership and engineering support. Eight teams of twelve employees work twelve-hour shifts on two production lines. Teams hold meetings at the beginning and end of each shift. The members distribute the job assignments within the team, train new members, certify skill acquisition, conduct peer appraisals of their members, and handle the first stages of disciplinary problems. Cross-training and a skill-based pay system encourage the employees to learn and use multiple skills. The job is designed at the group level; while there are tasks performed by individuals, the job is defined as the combination of those tasks. The team members must work together for the accomplishment of the job.

The role of liaison between the teams and top management is filled by the position of line leader and assistant line leader. The line leader and assistant line leader "supervise" in the sense that they provide feedback informally and formally to the groups, provide information to be used in setting production goals, clarify programs and procedures, and assist in production work when needed.

This site provided both advantages and disadvantages. The use of one site responded to Goodman et al.'s (1987) call for idiographic research within a technological context. Such a design allows for exploration of the points within a technological system at which the performance behaviors of incumbents can have impacts on outcomes. Because this research was conducted in one site, it was assumed that the technology and the organizational context (task design, reward system, information system, training, etc.) were the same for all teams. Also, the design of this plant was carefully planned according to Lawler's (1986) new plant model rather than retro-fitting an existing plant. Therefore, it was reasonable to assume that the task design, reward system, information system, and training served to facilitate team performance, and variance in team performance and

effectiveness was substantially attributable to team (group) factors. The major disadvantage was the small sample size provided by this site.

Qualitative Aspects

The primary qualitative research phases of this study occurred in the preparatory stages. The author spent over 300 hours in the plant during 1991 and 1992. She was present during selection interviews and assessment center exercises, attended plant reviews, visited another self-managed work team site with representatives of this plant, and, most importantly, spent dozens of hours with the production teams. She attended on-going and off-going (shift change) team meetings, sat through peer review and training sessions, and spent, on average, four to five hours per week working on the production floor with teams and line leaders. Working with a particular team for four to five weeks at a time, she performed production tasks such as tube gauging, loading green ware, and assisting with final audit. Initially, this observation provided knowledge of the process and terminology and established friendly relationships with the employees. Eventually, differences between teams in their intrateam relationships, their approach to problems, and their patterns of behavior were noted. She recorded (after the shift) anecdotes, events, and informative comments that had been noted. Through this extensive cross-team personal observation she was able to gain insight into the workings of the plant and to earn the trust of the production workers.

The second phase of the preparatory work was the job analysis process. Interviews were conducted with line leaders and a cross-team sample of ten production workers by the author and another researcher to supplement the knowledge gained during the observation stage. The goal of the job analysis was to (1) help define the content domain of team behaviors and (2) to elicit critical incidents for use in development of the team performance assessment instrument.

A semi-structured interview procedure was used in the job analysis (Bownas & Bernardin, 1988). A sample of ten employees, at least one from each team, was individually interviewed over a period of about three weeks. Each employee was asked to recall and describe occasions on which teams performed an aspect of their job particularly well or particularly poorly. The incidents elic-

ited from the interviewees were stated in behavioral terms and grouped into similar dimensions. The information gathered in this phase of the research was used to develop items for the measures of collective efficacy and team performance.

The qualitative aspect of the study continued throughout the data collection and analysis phases. Continued contact with the production workers and leadership was useful in clarifying and interpreting findings.

Measures

Collective efficacy

As defined in Chapter 1, collective efficacy is a group's aggregate belief that it can perform successfully. Bandura (1986) stresses that efficacy is situation-specific; i.e., it is not a generalized trait, but exists in relation to a specific set of tasks in a specific situation. Hence, any measure of efficacy must be tailored to the setting in which it will be administered. Saks (1992) suggests that efficacy measures be based on job analysis information to assure the alignment of perceptions with actual job requirements. Gecas (1989) follows on Bandura's (1986) approach that efficacy measures be task-specific and constructed for the task or competency at hand. He suggests the use of statements representing specific tasks with Likert scale response categories representing respondents' level of confidence in their ability to perform each task (e.g., No confidence at all; Complete confidence). This means of measuring efficacy was used by Gecas (1989) and Saks (1992) to measure self-efficacy and by Lee (1992) to measure collective efficacy. These authors suggest that the individuals' scores are aggregated to form a group-level measure.

The measure of collective efficacy used in the present study was obtained through a similar questionnaire. The items were based on the observations obtained during the preparatory phases. They were worded to assess each individual's confidence in his/her **team's** efficacy to exhibit specific behaviors representing the *a priori* dimensions of applying knowledge and skills, exerting effort, using appropriate strategies, and exhibiting team citizenship behaviors. The first dimension in-

cluded six items and was identified by the researcher as items K1 through K6. The other three dimensions included five items each and were identified as E1 through E5, S1 through S5, and C1 through C5. The items for the dimensions were interspersed throughout the questionnaire and numbered consecutively. (The prefixes K, E, S, and C did not appear on the questionnaire.) An additional measure of collective efficacy (GLOBEFF), the five items used by Lee (1992), was included. These five items are more global in nature than the items arising from the interviews. The questionnaire was pilot tested on an existing committee, the members of which represent all eight teams. The pilot testing allowed for clarification of the wording of items and the structure of the instrument. (The form is included as Appendix A.)

The questionnaire was administered initially in November, 1992. Each team was requested to come in thirty minutes early one evening in order to have the survey and its purpose explained to them and for them to complete it. Despite attendance at these meetings being voluntary, 88 of the 110 (80%) team members attended and completed questionnaires. All the teams decided that after this initial meeting, they would be able to complete subsequent questionnaires in regular oncoming or off-going team meetings.

Respondents were asked to identify the team to which they were assigned at the time of the survey. In order to encourage responses while maintaining anonymity, each employee was asked to number the questionnaire with a 6-digit number (last four digits of social security number and day of the month of birth). This number was the identification number for that employee for this project. The identification numbers for all usable questionnaires were entered into a lottery drawing for cash prizes after each round of the survey and, cumulatively, after three. In order to claim a prize, the employee needed only show that number belongs to him/her.

The results of the first administration of the questionnaire were used to test the psychometric properties of the instrument (Sackett & Larson, 1991). Dimensionality was assessed by subjecting the responses to exploratory factor analysis (Gorsuch, 1983). The initial extraction method was iterated principal factor analysis with squared multiple correlations on the diagonal. The communalities converged after 10 iterations. Examination of the eigenvalues of the reduced correlation matrix showed that 3 factors accounted for 100% of the common variance. These factors

were rotated using the varimax technique, which forces orthogonal (uncorrelated) factors. The significant factor loadings (.47 or greater) on the rotated factors are presented in Table 1.

It can be seen from the factor loadings in Table 1 that the *a priori* dimensions do not appear. (If they had, four factors would have emerged, with items with the K prefix would have loaded together, as would items with the E prefix, the S prefix, and the C prefix.) Rather, the three factors that emerged can be best interpreted as a factor representing the team's confidence in their technical knowledge and skills (factor 3) (TECHEFF), a factor representing the team's confidence in their social skills (factor 2) (SOCEFF), and a factor representing the team's confidence in their ability to be successful in their tasks (factor 1) (TASKEFF).

Before the scales measuring these dimensions could be used in a model, further tests of their psychometric properties had to be conducted. The reliability of each of the scales was estimated by means of coefficient alpha, which indicates the degree to which items in an instrument are interrcorrelated. It provides a measure of internal consistency reliability from a single administration of an instrument by computing the mean of all possible half-splits (Cascio, 1989). Nunnally (1978) recommends that in the early stages of research, coefficient alphas above .70 are sufficient. The coefficient alpha for TECHEFF was .79; for SOCEFF, it was .90; for TASKEFF, it was .94. Thus, the scales were sufficiently internally consistent to warrant their use.

Finally, because efficacy was conceptualized in this study at the group level of analysis, the appropriateness of the aggregation of individual responses into a group level construct was assessed. Dansereau et al. (1984) show that reliability measures are not sufficient to infer the existence of a construct at a level of analysis higher than that at which it was measured. They offer a statistical and inferential process, Within and Between Analysis (WABA), through which the appropriateness of a level of analysis and a focus (wholes or parts) at that level can be assessed. A WABA I test at a single level of analysis (SLA) would allow for a test of this inference. This technique was used to test the appropriateness of aggregation for the construct of group efficacy by Lee (1992). Its use to test the appropriateness of aggregation of the group-level dimensions of collective efficacy is described in the following paragraph.

Table 1. Factor Loadings for Initial Questionnaire Results

ID	ITEM	FACTOR1	FACTOR2	FACTOR3
E2	Committed to production	74		
C5	Above and beyond duty	73		
S2	Pull out of a slump	72		
E3	Jump in to solve problems	70		
S3	Solve performance problems	69		
K5	Assess right and wrong	64		
C3	Make personal sacrifices	63		
S1	Organize to maximum	62		
E4	Work hard for responsibilities	61		
E5	Do not waste time	59		
S5	Come up with better ways	58		
S4	Solve social problems		81	
K3	Has social skills needed		78	
K4	Uses social skills		75	
C2	Do not let personal feelings hinder		64	
C4	Do not take individual credit		62	
C1	No factions		58	
K6	Know when to ask for help		55	
K1	Has technical skills			73
E1	Committed to quality			69
K2	Uses technical skills			53

Values are multiplied by 100 and rounded to nearest integer.
Values greater than 47 are significant, and thus included.

WABA provides a means to examine the degree to which the variance in scores occurs between teams or within teams. Individuals' scores were imbedded into team scores. The eight team level scores were broken down into their two component parts, the variance accounted for by the group means (*eta* between) and the variance accounted for by the within-group residuals (*eta* within). The *eta* between is the statistical equivalent of the square root of the R^2 in a one-way ANOVA, and its statistical significance can be assessed through the F value of such a test. The meaning of this test is that if the *eta* between is significant, there are differences between teams in the mean level of the variable and that the use of mean scores to represent the team level construct is justified (a wholes focus) and results in little loss of information.

One-way ANOVAS were conducted on the three dimensions. The *eta* between for TECHEFF was .30 (n.s.). The *eta* between for SOCEFF was .38 ($p = .07$). The *eta* between for the TASKEFF was .45 ($p = .01$). These results indicate that no difference existed between teams

on the members' perceptions of their possession of technical skills. There may be difference between teams on their perceptions of their social skills. There were, however, significant differences between teams on their confidence that their team could successfully carry out their tasks. Therefore, the assumption that a group-level phenomenon, representing confidence in task success, was supported.

The dimension that was supported empirically corresponds very closely to the construct of collective efficacy as espoused in the literature. The empirical evidence that collective efficacy in this sociotechnial setting is best represented by one or two dimensions rather than the four *a priori* dimensions is not illogical. As stated by Bandura (1986), the three necessary components for effective action are ability, incentive, and efficacy beliefs. In this setting, incentives were constant across teams. As can be seen above, there was no difference in the teams' perceptions of their possession of technical skills. In such a case, differences between teams in behaviors would result from differences in motivation to choose activities, exert effort, and show persistence due to beliefs in their efficacy.

The 5-item global efficacy scale (GLOBEFF) was also examined. The five items loaded on one principal factor, explaining 100% of common variance. The coefficient alpha was .90. The *eta* between was .396 ($p = .05$), indicating that there was a significant difference between teams in their mean scores on this scale. The correlation between the scores on TASKEFF and GLOBEFF at the individual level ($n = 88$) was .54 ($p = .0001$).

Based on these results, the questionnaire was modified before the second administration. The items composing the TECHEFF scale were removed. Because SOCEFF approached significance, an attempt was made to strengthen this scale. The item with the lowest intercorrelation was eliminated, and two items were added. In light of the new conceptualization of efficacy, eight items were added to the TASKEFF scale to better capture that construct. The instrument is included as Appendix B.

The revised questionnaire was administered in December, 1992. Team members completed the questionnaire during regular on-coming or off-going team meetings. Again, 88 team members completed the questionnaire.

The psychometric qualities of the scales in this version of the questionnaire were assessed. For the 19-item TASKEFF scale, iterated principle factor analysis with squared multiple correlations on the diagonal showed that one factor accounted for 92% of common variance, with all items loading significantly on that factor. The coefficient alpha for the 19-item scale was .95. The *eta* between for the scale was .425 ($p = .02$).

Because items were changed for this administration of the questionnaire, three smaller sets of the questions in the TASKEFF scale were examined. A 16-item scale was formed by dropping the 3 items with the lowest correlations with the other items. The factor analysis, coefficient alpha, and ANOVA results were identical to the 19-item scale. Next, a scale was formed by the 11 items retained from the original version. Again, the factor analysis, coefficient alpha, and ANOVA results did not change. Finally, a 10-item scale was formed by dropping the item "Members make personal sacrifices for the good of the team" because two respondents had commented on their questionnaire that they did not think they were expected to make personal sacrifices. It was feared by the researcher that this item's meaning was unclear.

Based on the 10-item scale, the principle factor analysis demonstrated that one factor accounted for 94% of common variance. The coefficient alpha was .93 for the scale. The *eta* between was .425 ($p = .02$). Based on the examination of the properties of the various scales, it was decided that the 10-item version of TASKEFF would be used for this and subsequent administrations of the questionnaire.

The SOCEFF scale was also examined subsequent to the second administration. Two versions were examined -- the full 7-item scale and a scale consisting of the 5 questions contained in the original questionnaire. Principal factor analysis showed that one factor accounted for 90% of common variance of the 7-item and 94% of common variance of the 5-item scale. The coefficient alpha for the 7-item scale was .93 and for the 5-item scale was .92. It was concluded that the inclusion of the two items did not strengthen the scale. The *eta* between for the 7-item scale was .387 ($p = .06$) and for the 5-item scale was .395 ($p = .05$). Based on the 5-item scale, there were differences between teams. Therefore, the 5-item version of SOCEFF would be used for the first two and subsequent administrations of the questionnaire.

Collective efficacy as a two-dimensional construct, represented by the 15 items of the two scales, was examined. For each of the administrations the coefficient alpha was .94. The *eta* between for the first administration was .393 ($p = .05$) and for the second administration was .397 ($p = .05$). Thus, collective efficacy (COLLEFF) can be considered as a group-level construct with two dimensions, each of which is justified to be considered at the group level.

The results of GLOBEFF scale for the second administration were similar to those from the first administration. The coefficient alpha was .90. The *eta* between was .36 ($p = .11$), indicating that there was not a significant difference between teams in their mean scores on this scale. The correlation between COLLEFF and GLOBEFF at the individual level (n = 88) was .54 ($p = .0001$).

The questionnaire was administered in January, 1993, with 100 respondents. The fourth administration was conducted in February, 1993, with 95 respondents. The instrument in included as Appendix C. The coefficient alphas and the *etas* between for each scale are presented in Table 2.

Performance

Team performance was conceptualized as the patterns of actual behaviors exhibited by teams. The critical behaviors were derived from the literature, personal observation, and job analyses. Items were constructed for each of the four dimensions of team performance (See Appendix D.) Each item was a statement of effective or ineffective team behavior.

The performance ratings were completed by the persons with most intimate knowledge of the teams' behaviors, the line leaders and assistant line leaders who "supervise" the teams. The author had communicated with the line leaders throughout the preparatory stages of this project, stressing their importance to its completion. In addition, their role was stressed in a staff meeting with the plant manager and HR director.

The two raters for each team were asked to rate each behavior item on a continuum representing the percentage of time (0% to 100%) the team demonstrated that behavior in the previous period. The items on the rating scale should not have been unfamiliar to the line leaders, for they

Table 2. Psychometric Measures of Scales for Each Administration

SCALE	ADMINISTRATION	ALPHA	*ETA* BETWEEN
TASKEFF	1	.94	.45*
	2	.93	.43*
	3	.93	.44*
	4	.93	.36**
SOCEFF	1	.90	.38*
	2	.92	.40*
	3	.90	.35
	4	.91	.40*
COLLEFF	1	.94	.39*
	2	.94	.40*
	3	.94	.40*
	4	.93	.36**
GLOBEFF	1	.90	.40*
	2	.90	.36**
	3	.90	.42*
	4	.90	.39*

* $p = .05$.
** $p = .10$.

had participated in the job analysis interviews on which the items were based. All raters were instructed regarding the format and purpose of the ratings before they completed the ratings. The rating instruments were distributed to the raters during the week immediately following the end of a performance period. The raters were asked to return the ratings to the researcher within a week. Ratings were administered five times, the first occurring the period before the first efficacy questionnaire, and the next four corresponding to the same as it.

The only feasible alternative to this approach was to use self ratings of behavior by the teams. However, this method was ruled out due to problems of bias in such assessments and the need to avoid common method variance. One possible confound exists. Because the raters were the persons providing the teams with reviews based on their effectiveness outcomes (see below), they were aware of the last period's outcomes when they rated the teams' behaviors. Thus, they may have considered the outcomes when making the ratings. However, one rater told the researcher that he had tried to use the outcomes in making his ratings and but was unable to do so.

The small sample size (two raters for each of eight teams) precluded the use of factor analysis to examine the posited dimensionality of team performance. However, the reliability of the scales was assessed through the examination of inter-rater agreement. Inter-rater agreement was assessed by correlating the ratings of the two raters for each team at the item and the dimension level. For the first administration, the average inter-rater correlation at the item level was .72. The inter-rater correlation at the dimension level ranged from .88 to .99, with an average of .93. The subsequent administration yielded similar inter-rater correlations. Because the inter-rater correlations were high, the teams' performance scores were created by averaging the two item ratings. (For the fourth collection, only one rater completed the ratings for each line. This was due to personnel changes within the organization that made two of the previous raters unavailable. Due to the high inter-rater correlations on previous administrations, this was not viewed as a serious problem.) The four dimension scores (RKNOW, REFFORT, RSTRST, RTCB) were created as the means of the item scores. Overall performance (MNPERF) was measured by the unit weighted mean of the four dimension scores. The intercorrelations of these dimensions are shown in Table 3, based on total observations across collections ($n = 32$) and as the mean for teams across collections ($n = 8$) The intercorrelations presented in Table 3 suggest that the dimensionality of this instrument is questionable, at best.

Effectiveness

Consistent with the perspective of Goodman et al. (1987) and Shea and Guzzo (1987), the measures of effectiveness were limited to assessments of task-oriented outcomes directly related to the goals of the organization. Effectiveness in this study was measured by three outcome variables used by the company to track team effectiveness. The three are quality, efficiency, and quantity. During the period of this study the teams were aware of these numbers on a regular basis from reports in change-of-shift and from their SPC system. On a weekly basis, these indicators were posted outside the team rooms. In addition, teams received formal feedback on their results, in absolute

Table 3. Intercorrelations of Performance Dimensions

The intercorrelations below the diagonal are total observations across the 5 collections ($n = 40$); those above the diagonal are mean team scores across the 5 collections ($n = 8$).

	RKNOW	REFFORT	RSTRAT	RTCB	MNPERF
RKNOW		.724	.944	.975	.951
REFFORT	.717		.904	.798	.896
RSTRAT	.866	.826		.971	.999
RTCB	.799	.708	.815		.977
MNPERF	.917	.880	.944	.912	

* $p = .05$.

and comparative terms, at the end of each four-week period. The numbers were provided to the researcher by the line leaders.

Quality (QUAL) is measured by the number of flawed pieces per million that were packed (and found at final audit). The standard is always zero. Thus, a higher value represents a less desirable outcome. Efficiency (MATU) is measured as a percentage of the raw materials put into the system that resulted in usable product. A higher value represents a more desirable outcome. Quantity (QUAN), a measure of productivity, is measured by the number of fired pieces packed per hour. A higher value represents a more desirable outcome.

The values of the efficiency and quantity outcome measures, as measured by the organization, were not comparable across production lines due to product mix and short-term experimental technological changes that could impact teams differentially. In order to allow comparison across lines, the distribution of those two outcomes measures for line 1 was transformed to match the mean and standard deviation of that measure for line 2 for that period (Nunnally, 1978). (Line 1 runs experimental and specialty products, so the product mix on line 2 tends to be more standard to the plant.) Also, because the measures are scaled on different units (pieces per hour v. parts per million, for example), the construction of a composite outcome measure per team was impossible

from the raw numbers. Therefore, the values of each of the outcome measures for each period were standardized to Z scores. A team's score for each variable was the number of standard deviations above or below its line average for that period for that variable. A composite effectiveness measure (COMP) was then computed as the mean of the Z scores for the three indicators for each team for each period.

Feedback

Based on the literature in Chapter 2, feedback was explored as a source of efficacy beliefs in this research. Bandura (1986) states that the most important source of efficacy beliefs is prior success in the endeavor. Feedback was measured two ways. The first was the composite effectiveness measure from the prior period review. This characterized the overall nature of the feedback as positive or negative.

The second measure of feedback was a perceptual measure of the nature of their last feedback, whether the tone of the last period review was positive or negative. In order to capture this perception, team members were asked four questions on the questionnaire about the tone of their last period review. (See Appendix A.) The responses from the first and second administration for the four feedback items were subjected to psychometric tests and showed the same results. Principle factor analysis showed that three of the items (Numbers 1, 3, and 4) loaded on one factor that accounted for 92% of common variance. The coefficient alpha was .65 for the four items, but increased to .78 when item 2 was eliminated. Hence, a three-item scale (FBSC) was formed. The *eta* between for this scale was .817 ($p = .0001$), indicating that there were significant differences between teams on their perception of the positive/negative tone of their last period review. Question 2 was eliminated from further administrations of the questionnaire. The coefficient alphas and *etas* between for the three-item feedback scale were similar on subsequent administrations.

Composition

As stated in Chapter 2, much speculation exists regarding the influence of compositional configurations of teams on their behaviors and outcomes. Except for findings from a few specialized settings, data are not available. Most of the current literature simply calls for further exploration of the impact of such configurations. The present research undertook such an exploration. Compositional configurations are generally considered in terms of a homogeneity-heterogeneity continuum. The more similar the members of a team are on a particular attribute, the more homogeneous the team is assumed to be. Alternatively, the more the team members are distributed among the possible categories of an attribute, the more heterogeneous the team is assumed to be.

Characteristics of the teams were gathered two ways. Much of the information, such as age, race, gender, years of education, and tenure, was taken from company records in order to allow team members anonymity. Some of the information, such as prior work experience, was gathered through the survey instrument that measures collective efficacy. (See Appendix A). O'Reilley, Caldwell, and Barnett (1989), in their studies on work group demography, suggest the use of the coefficient of variation (the standard deviation divided by the mean) as a direct and scale-invariant measure of group dispersion (i.e., heterogeneity) on a demographic characteristic. This index was used to compare teams in terms of their age (AGECV), tenure (TENCV), education (EDUCV), and years of work experience (WEXPCV) composition. The dichotomous variables were used to characterize teams as to their percentage of members with prior manufacturing experience (MANPC) and the percentage of the team membership that is 'diverse' (either black or female) (DIVPC).

An additional attribute was the stability of membership of the team. A team's efficacy beliefs should be adversely affected by membership changes. Stability was planned to be measured two ways, through archival records of membership changes (number of changes during preceding year) and a perceptual measure of the stability of the team. The researcher was unable, however, to gain access to the archival records due to the changes in personnel in the plant.

The examination of the three items used to measure perception of stability (STABSC) showed that the first two items loaded onto one factor (accounting for 77% of common variance). The coefficient alpha for the 3-item scale was .70, but the correlation between the two remaining items was .77 with the elimination of the third item. Therefore, only the first two items were used. The two-item stability scale was included in all four administrations of the questionnaire. The *eta* between for this scale never reached above .28 (*n.s.*), indicating that there were no significant differences between teams in their perceptions of stability. This may be due the fact that in a plant this small, movement of persons in and out of teams affects all teams approximately equally.

Research Questions

As stated in Chapter 1, the purpose of this study is to explore the relationship between the components of the proposed model of group effectiveness. This section translates the research questions from Chapter 1 into hypotheses, based on the measures described above. The analytical techniques used to test the relationships are then described.

Research Question 1

Research question 1 addresses the relationship between the behaviors exhibited by teams and their actual outcomes. This relationship is examined through the test of the following general hypothesis:

H1. Team performance behaviors are positively related to team outcome measures.

This general hypothesis is tested using the composite measure of outcome effectiveness (COMP) and the overall performance score (MNPERF). The four dimensions of team performance behavior should logically be related to different outcomes. The dimension-to-dimension relationships are presented in the following hypotheses:

H1a.Better performance in quality is associated with behaviors representing the application of knowledge and skills and demonstration of effort.

H1b.Higher efficiency outcomes are positively related to behaviors representing the application of knowledge and skills and effective work strategies.

H1c.Higher levels of quantity outcomes are positively related to behaviors representing level of effort, effective work strategies, and team citizenship behaviors.

Research Question 2

Research question 2 addresses the relationship between collective efficacy and team performance behaviors. The hypothesis for this question is:

H2. Collective efficacy of work teams is positively related to overall team performance behaviors as well as the specific dimensions of application of knowledge and skills, use of strategies, demonstration of effort, and team citizenship behaviors.

Research Question 3

Research question 3 considers three distinct possible antecedents of collective efficacy, feedback, group heterogeneity, and group stability.

H3a: Teams' levels of collective efficacy are positively related to their prior period's feedback on outcomes.

H3b: Teams' levels of collective efficacy are negatively related to their heterogeneity on compositional characteristics.

The stability of team membership was also hypothesized as an antecedent of collective efficacy. The relationship between stability of membership and levels of efficacy cannot be tested, however, due to the unavailability of the data for the archival measure and the lack of differences in teams' scores on the perceptual measure.

Analysis

The empirical tests of the hypothesized relationships were performed based on four cycles of data. The availability of multiple observations ($n = 32$) for multiple teams ($J = 8$) allowed for the performance of a WABA II (Dansereau et al., 1984) test of the each of the relationships represented above. This technique decomposes the correlational relationship based on the total sample into its between-group and within-group components to determine which of the components best represents the relationship. This approach to data analysis provides two advantages to the researcher. First, it allows for the comparison of hypotheses, rather than simply the rejection or lack of rejection of one hypothesis at a time. Second, it provides tests of such hypotheses that are not based on sample size. The nature of the relationship between two variables is tested using the Covariance Theorem, as follows:

$$r_{xy,T} = \eta_{Bx}\eta_{By}r_{xy,B} + \eta_{Wx}\eta_{Wy}r_{xy,W} \tag{3.1}$$

Where:

$r_{xy,T}$ = Total individual level correlation of x and y

η_{Bx} = Between-eta of variable x

η_{By} = Between-eta of variable y

$r_{xy,B}$ = Between-group correlation of x and y

η_{Wx} = Within-eta of variable x

η_{Wy} = Within-eta of variable y

$r_{xy,W}$ = Within-group correlation of x and y

In this case, the between-group scores represent the average for each team for all measurement periods. The correlation based on these scores (with J degrees of freedom) addresses the cross-sectional question: Do teams with higher scores on one variable also have higher scores on the other variable? The within-group scores represents the variation of each team's score for each measurement period around its average for all periods. The correlation based on these scores (with N-J

degrees of freedom) answers the longitudinal question: Do teams scores on one variable change at the same time as their scores on the other variable? (Markham & McKee, 1991).

In order to interpret the Covariance theorem, the magnitude of the between-group correlation and the within-group are each compared to zero and to each other. The within-group *etas* are tested for the significance of the variance. In addition, the between-group component of the equation ($\eta_{Bx}\eta_{By}r_{xy,B}$) is compared to the within-group component ($\eta_{Wx}\eta_{Wy}r_{xy,W}$) to determine which contributes more to the relationship. WABA provides tests of both statistical and practical (irrespective of sample size) significance. The results of these tests allow for a more exact interpretation of the relationship between variables and a determination of the correct focus (wholes or parts) for the relationship. The results of the tests for these three hypotheses are presented in Chapter 4.

Chapter 4

Results

The purpose of this chapter is to present and analyze the results of the tests of the hypotheses stated in Chapter 3. The first part of the chapter describes the tests for statistical and practical significance used in WABA II (Dansereau, et al. 1984). The results are then presented in the order the hypotheses were given in Chapter 3. The interpretations of the statistical tests are given in this chapter; the broader conclusions regarding the study are presented in Chapter 5.

WABA Tests

The goal of WABA II is to allow the researcher to make an induction as to the focus of the relationship between two variables. Four inductions are possible. In a ***wholes*** condition, entities (in this research, teams) are viewed as representable by a single score, with any differences within that entity viewed as error. In a ***parts*** condition, entities are viewed as containing independent parts, with differences expected within that entity, and differences between entities viewed as error. In an ***equivocal*** condition, differences both between and within entities are found, making an inference of wholes or parts erroneous. In an ***inexplicable*** condition, differences are found neither between nor within entities, making an inference of wholes or parts impossible.

When examining the relationship between two variables using WABA II, the within-cell and the between-cell correlations must be tested for differences and magnitude. Both may be assessed

two ways through tests of statistical significance and of practical significance (which are not based on sample size). These tests are explained below.

WABA II

Difference -- Practical Significance. The difference between the within and between correlations is assessed practically through the A ratio. In this geometric test, the absolute value of each correlation is expressed as its corresponding cosine, and the angles are subtracted as follows:

$$A_{BWXY} = \theta_{WXY} - \theta_{BXY} \tag{4.1}$$

The range of the possible values for this angular difference test is from -90° to 90°, with a positive value indicating that the between correlation is larger. The difference between the correlations may be assessed at three levels of stringency, the 0° test, the 15° test, and the 30° test. The decision intervals for these levels are presented below.

Table 4. Decision Intervals for A test

	0°	15°	30°
Between	A > 0	A ≥ .26	A ≥ .52
Within	A < 0	A ≥ -.26	A ≥ -.52

Difference -- Statistical Significance. The differences between the two correlations can be assessed statistically using a Z test, in which the absolute values of each correlation are converted to Fisher's Z' and tested using the following formula:

$$Z_{BW} = \frac{Z'_B - Z'_W}{\sqrt{1/(N-J-2) + 1/(J-3)}} \tag{4.2}$$

The statistical significance of the Z'_{BW} is assessed according to the standards presented below.

Table 5. Decision Intervals for Z′ Test		
	$p < 0.05$.	$p < 0.01$.
Between	Z > 1.66	Z > 2.33
Within	Z < -1.66	Z < -2.33

Magnitude -- Practical significance. The magnitude tests of practical significance allow for the inference of whether the correlation is different from zero and are performed on the correlation shown to be the larger by the difference tests. They are called *R* ratios. The formula for the between-cell *R* ratio is:

$$R_{BXY} = \frac{r_{BXY}}{\sqrt{1 - r^2_{BXY}}} \tag{4.3}$$

The formula for the within-cell *R* ratio is:

$$R_{WXY} = \frac{r_{WXY}}{\sqrt{1 - r^2_{WXY}}} \tag{4.4}$$

As with the *A* ratio above, three levels of stringency, the 0° test, the 15° test, and the 30° test. have been established. The decision intervals for these levels are presented below.

Table 6. Decision Intervals for R Ratios			
	0°	15°	30°
	R > 1	R > .27	R > .58

Magnitude -- Statistical Significance. The statistical tests for the correlations are the traditional *t* tests for the significance of *r*, adjusted for the appropriate degrees of freedom. The formulas are given below.

$$t_{BXY} = R_{BXY}\sqrt{J - 2} \tag{4.5}$$

$$t_{WXY} = R_{WXY}\sqrt{N - J - 1} \tag{4.6}$$

The significance is assessed using a *t* distribution with 1 and *N-J-1* degrees of freedom (for between-cell) or 1 and *J-2* degrees of freedom (for within-cell).

WABA I

The tests used in WABA I to assess the eta correlations may also be used within WABA II to make more complete inferences. The eta correlations can be assessed statistically using the traditional *F* test (as explained in Chapter 3) or through an *E* ratio of the between-eta to the within-eta correlation. The formula and the decision intervals for the *E* ratio are presented below.

$$E = \eta_B / \eta_W \tag{4.7}$$

Table 7. Decision Intervals for the E Ratios

	0°	15°	30° test.
Between	E > 1	R ≥ 1.3	R ≥ 1.73
Within	E < 1	R ≤ .77	R ≤ .58

Combining the WABA I and WABA II tests allow the researcher to make inductions on more complete information. Based on the agreement between these indicators, two types of inductions can be made. Any other combination of indicators results in no induction being made.

Table 8. Possible Inductions

	WABA I INDUCTION	WABAII INDUCTION	FINAL INDUCTION
Category I	Wholes	Wholes	Wholes
	Parts	Parts	Parts
	Equivocal	Equivocal	Equivocal
	Inexplicable	Inexplicable	Inexplicable
Category 2	Equivocal	Wholes	Wholes
	Wholes	Inexplicable	Wholes
	Equivocal	Parts	Parts
	Parts	Inexplicable	Parts

Components. A final consideration in making an induction of wholes or parts is a comparison of the between-cell component with the within-cell component, which indicates which com-

ponent contributes most to the relationship. Using this practical test, a induction of wholes is made if the between component is greater than the within component, and a induction of parts is made if the within component is greater than the between component.

Hypothesis Tests

In this section, the Covariance theorem will be presented for each hypothesis. As explained in Chapter 3, the Covariance theorem is the representation of the relationship between two variables that allows for a comparison of their within and between components. Then, the indicators of practical and statistical significance will be presented and assessed according to their respective standards. Inductions will then be reported. It should be noted here that the small number of teams ($J = 8$) on which this study is based will require that most inductions will be made on the basis of tests of practical significance.

Hypothesis 1

This hypothesis addressed the relationship between the performance behavior ratings and the outcome measures using the mean rating (MNPERF) and the composite outcome score (COMP). The n for this hypothesis is 40 (J = 8 * 5) because ratings and outcomes were collected one period earlier than the other data in order to have prior period data for the first round of efficacy data. The Covariance theorem for this relationship is as follows:

(.24) = (.848)* (.56) (.398) + (.529)(.82)(.13)

This equation is interpreted as follows:

1. The correlation based on the raw scores ($df = 40\text{-}2$) is .24. ($p < .12$)
2. The correlation based on each team's mean score ($df = 8\text{-}2$) is .398.
3. The correlation based on residuals around each team's mean score ($df = 40\text{-}8\text{-}1$) is .13.
4. The between-cell component is (.189), and the within-cell component is (.04).

The indicators for this equation are presented in the following table.

Table 9. Indicators for MNPERF and COMP

WABA II Tests	Value	Standard Met	Induction
DIFFERENCE			
A	.39	15°	WHOLES
Z'	.58	*n.s.*	
MAGNITUDE (of r_B)			
R	.436	15°	WHOLES
t	1.07	*n.s.*	
WABA I Tests			
MNPERF			
E	1.6	15°	WHOLES
F	11.71	$p < .01$	
COMP			
E	.68	none	
F	2.41	$p < .06$	
COMPONENTS			
Between	.189		WHOLES
Within	.05		
FINAL INDUCTION		WHOLES (CATEGORY II)	

Based on the practical significance tests, there is a relationship between overall performance ratings and the composite measure of outcomes at the team level. This means that the teams with higher average rating scores also have higher composite outcomes. The equivocal resutls of the WABA I tests (COMP) requires that this induction be Category II.

In addition to the relationship between the overall ratings and the composite measure of outcomes, several dimension-to-dimension relationships were hypothesized. The results of the tests of these are presented in the following section.

Quality (QUAL) and Knowledge (RKNOW). The Covariance theorem for this relationship is as follows:

$$(.06) = (.574)(.809)*(.274) + (.819)(.588)(-.14)$$

This equation is interpreted as follows:

1. The correlation based on the raw scores ($df = 40\text{-}2$) is .06.

2. The correlation based on each team's mean score ($df = 8\text{-}2$) is .274.

3. The correlation based on residuals around each team's mean score ($df = 40\text{-}8\text{-}1$) is -.14.

4. The between-cell component is (.127), and the within-cell component is (-.06).

The indicators for this equation are presented in the following table.

Table 10. Indicators for QUAL and RKNOW

WABA II Tests	Value	Standard Met	Induction
DIFFERENCE			
A	.12	*n.s.*	
Z'	.24	*n.s.*	
MAGNITUDE (of r_B)			
R	.28:	*n.s.*	
t	.70	*n.s.*	
WABA I Tests			
QUAL			
E	.70	*n.s.*	
F	2.24	$p < .05$	WHOLES
RKNOW			
E	1.44	15°	WHOLES
F	8.66	$p < .01$	WHOLES
COMPONENTS			
Between	.127		WHOLES
Within	-.06		
FINAL INDUCTION		INEXPLICABLE	

Based on the practical significance tests, there is no relationship between quality and knowledge ratings at the team level.

Quality (QUAL) and Level of Effort (REFFORT). The Covariance theorem for this relationship is as follows:

(.157) = (.574) (.895)*(.313) + (.819) (.446)(-.01)

This equation is interpreted as follows:

1. The correlation based on the raw scores (*df= 40-2*) is .157.

2. The correlation based on each team's mean score (*df= 8-2*) is .313.

3. The correlation based on residuals around each team's mean score (*df= 40-8-1*) is -.01.

4. The between-cell component is (.19), and the within-cell component is (-.02).

The indicators for this equation are presented in the following table.

Table 11. Indicators for QUAL and REFFORT

WABA II Tests	Value	Standard Met	Induction
DIFFERENCE			
A	.33	15°	WHOLES
Z'	.66	*n.s.*	
MAGNITUDE (of r_B)			
R	.33	15°	WHOLES
t	.80	*n.s.*	
WABA I Tests			
QUAL			
E	.70	*n.s.*	
F	2.24	$p < .05$	WHOLES
REFFORT			
E	2.0	30°	WHOLES
F	18.4	$p < .01$	WHOLES
COMPONENTS			
Between	.19		WHOLES
Within	-.02		
FINAL INDUCTION		WHOLES	

Based on the practical significance tests tests, there is a positive relationship between quality and effort ratings at the team level. Those teams that, on average, display the higher levels of effort have the higher levels of quality rejects. The sign of this relationship is opposite from that hypothesized, since higher levels of this quality measure mean poorer performance. Hence, this hypothesized relationship must be rejected.

Efficiency (MATU) and Knowledge (RKNOW). The Covariance theorem for this relationship is as follows:

$$(.179) = (.20)\,(.809)*(.576) + (.96)\,(.588)(.15)$$

This equation is interpreted as follows:

1. The correlation based on the raw scores ($df = 40\text{-}2$) is .179.

2. The correlation based on each team's mean score ($df = 8\text{-}2$) is .576. ($p < .13$)

3. The correlation based on residuals around each team's mean score ($df = 40\text{-}8\text{-}1$) is .15.

4. The between-cell component is (.10), and the within-cell component is (.08).

The indicators for this equation are presented in the following table.

Table 12. Indicators for MATU and RKNOW

WABA II Tests	Value	Standard Met	Induction
DIFFERENCE			
A	.65	30°	WHOLES
Z'	1.0	*n.s.*	
MAGNITUDE (of r_B)			
R	.70	30°	WHOLES
t	1.72	*n.s.*	
WABA I Tests			
MATU			
E	.25	*n.s.*	
F	.18	*n.s.*	
RKNOW			
E	1.44	15°	WHOLES
F	8.66	$p < .01$	WHOLES
COMPONENTS			
Between	.10		WHOLES
Within	.08		
FINAL INDUCTION		WHOLES (CATEGORY II)	

Based on the practical significance tests, there is a positive relationship between efficiency and knowledge ratings at the team level. Those teams that, on average, display the higher levels of knowledge have the higher levels of efficient use of materials. The WABA I tests of MATU require this induction to be Category II.

Efficiency (MATU) and Use of Strategies (RSTRAT). The Covariance theorem for this relationship is as follows:

(.16) = (.20)(.807)*(.568) + (.96)(.596)(.124)

This equation is interpreted as follows:

1. The correlation based on the raw scores (*df= 40-2*) is .16.

2. The correlation based on each team's mean score (*df= 8-2*) is .568. ($p < .13$)

3. The correlation based on residuals around each team's mean score (*df= 40-8-1*) is .124.

4. The between-cell component is (.10), and the within-cell component is (.06).

The indicators for this equation are presented in the following table.

Table 13. Indicators for MATU and RSTRAT

WABA II Tests	Value	Standard Met	Induction
DIFFERENCE			
A	.46	15°	WHOLES
Z'	1.06	*n.s.*	
MAGNITUDE (of r_B)			
R	.69	30°	WHOLES
t	1.69	*n.s.*	
WABA I Tests			
MATU			
E	.25	*n.s.*	
F	.18	*n.s.*	
RSTRAT			
E	1.35	15°	WHOLES
F	8.19	$p < .01$	WHOLES
COMPONENTS			
Between	.10		WHOLES
Within	.06		
FINAL INDUCTION		WHOLES (CATEGORY II)	

Based on the practical significance tests, there is a positive relationship between efficiency and use of strategies at the team level. Those teams that, on average, design and implement better performance strategies have higher levels of efficient use of materials. The WABA I tests of MATU require this induction to be Category II.

Quantity (QUAN) and Effort (REFFORT). The Covariance theorem for this relationship is as follows:

$$(.470)^* = (.70)^*(.895)^*(.652) + (.70)\,(.446)\,(.178)$$

This equation is interpreted as follows:

1. The correlation based on the raw scores ($df = 40\text{-}2$) is .470. ($p < .01$)
2. The correlation based on each team's mean score ($df = 8\text{-}2$) is .652. ($p < .07$)
3. The correlation based on residuals around each team's mean score ($df = 40\text{-}8\text{-}1$) is .178.
4. The between-cell component is (.41), and the within-cell component is (.06).

The indicators for this equation are presented in the following table.

Table 14. Indicators for QUAN and REFFORT

WABA II Tests	Value	Standard Met	Induction
DIFFERENCE			
A	.55	30°	WHOLES
Z'	1.22	*n.s.*	
MAGNITUDE (of r_B)			
R	.85	30°	WHOLES
t	2.11	*n.s.*	
WABA I Tests			
QUAN			
E	1	0°	
F	3.35	($p < .05$)	
REFFORT			
E	2.0	30°	WHOLES
F	18.39	$p < .01$	WHOLES
COMPONENTS			
Between	.41		WHOLES
Within	.06		
FINAL INDUCTION		WHOLES	

Based on the statistical significance tests, there is a positive relationship between quantity of production and effort at the team level. Those teams that, on average, display the higher levels of effort have the higher levels of production. Because all the indicators agree, this is a category I induction of wholes.

Quantity (QUAN) and Use of Strategies (RSTRAT). The Covariance theorem for this relationship is as follows:

$$(.380)^* = (.70)^*(.807)^*(.42) + (.70)\,(.596)\,(.363)$$

This equation is interpreted as follows:

1. The correlation based on the raw scores (*df= 40-2*) is .380. ($p < .01$)
2. The correlation based on each team's mean score (*df= 8-2*) is .420.
3. The correlation based on residuals around each team's mean score (*df= 40-8-1*) is .363.
4. The between-cell component is (.230), and the within-cell component is (.151).

The indicators for this equation are presented in the following table.

Table 15. Indicators for QUAN and RSTRAT

WABA II Tests	Value	Standard Met	Induction
DIFFERENCE			
A	.08	0°	
Z'	.10	*n.s.*	
MAGNITUDE (of r_B)			
R	.46	15°	WHOLES
t	1.13	*n.s.*	
WABA I Tests			
QUAN			
E	1	0°	
F	3.35	($p < .05$)	
RSTRAT			
E	1.35	15°	WHOLES
F	8.19	$p < .01$	WHOLES
COMPONENTS			
Between	.23		WHOLES
Within	.15		
FINAL INDUCTION		EQUIVOCAL	

Based on the practical significance tests, there is a positive relationship between quantity of production and use of performance strategies, but there is also a relationship within teams. No clear interpretation can be made, leading to an equivocal induction.

Quantity (QUAN) and Citizenship Behaviors (RTCB) The Covariance theorem for this relationship is as follows:

(.212) = (.70)*(.80)*(.444) + (.70) (.598)(-.05)

This equation is interpreted as follows:

1. The correlation based on the raw scores (*df= 40-2*) is .212. ($p < .10$)
2. The correlation based on each team's mean score (*df= 8-2*) is .444. ($p < .17$)
3. The correlation based on residuals around each team's mean score (*df= 40-8-1*) is -.05.
4. The between-cell component is (.232), and the within-cell component is (-.02).

The indicators for this equation are presented in the following table.

Table 16. Indicators for QUAN and RTCB

WABA II Tests	Value	Standard Met	Induction
DIFFERENCE			
A	.41	15°	WHOLES
Z'	1.24	*n.s.*	
MAGNITUDE (of r_B)			
R	.49	30°	WHOLES
t	1.21	*n.s.*	
WABA I Tests			
QUAN			
E	1	0°	
F	3.35	$p < ..05$	
RTCB			
E	1.33	15°	WHOLES
F	8.08	$p < .01$	WHOLES
COMPONENTS			
Between	.232		WHOLES
Within	-.02		
FINAL INDUCTION		WHOLES	

Based on the practical significance tests, there is a positive relationship between quantity of production and citizenship behaviors at the wholes focus for the team level. Those teams that, on average, display the higher levels of effort have the higher levels of citizenship behaviors. Because all the indicators agree, this is a category I induction of wholes.

Summary of Hypothesis 1. Overall, the hypothesized relationships were found to be supported. All the inductions were at the team level of analysis. There was a relationship between quantity of production and both level of effort and citizenship behaviors, but an unclear relationship with use of strategies. Despite efficiency having more variance within teams than between, category II inductions were made for its relationship to both knowledge and strategies. There was, however, no support for either hypothesis concerning quality. The relationship with knowledge was inexplicable, with no relationship occurring at the parts or wholes level. The relationship with effort has the opposite sign from that hypothesized.

Hypothesis 2

This hypothesis addressed the relationship between collective efficacy (COLLEFF) and team performance using the mean rating (MNPERF) and each of the dimension scores (RKNOW, REFFORT, RSTRAT, AND RTCB). The *n* for this hypothesis is 32, because the efficacy questionnaire was administered four times to the eight teams. The Covariance theorem for the relationship between COLLEFF and MNPERF is as follows:

(.384) = (.882)(.867)(.557) + (.471)(.498)(-.176)

This equation is interpreted as follows:

1. The correlation based on the raw scores (*df= 32-2*) is .384.

2. The correlation based on each team's mean score (*df= 8-2*) is .557.

3. The correlation based on residuals around each team's mean score (*df= 32-8-1*) is -.176.

4. The between-cell component is (.425), and the within-cell component is (-.04).

The indicators for this equation are presented in the following table.

Table 17. Indicators for COLLEFF and MNPERF

WABA II Tests	Value	Standard Met	Induction
DIFFERENCE			
A	.42	15°	WHOLES
Z'	.92	*n.s.*	
MAGNITUDE (of r_B)			
R	.67	30°	WHOLES
t	1.7	*n.s.*	
WABA I Tests			
COLLEFF			
E	1.87	30°	WHOLES
F	11.9	$p < .01$	WHOLES
MNPERF			
E	1.75	15°	WHOLES
F	10.36	$p < .01$	WHOLES
COMPONENTS			
Between	.425		WHOLES
Within	-.04		
FINAL INDUCTION		WHOLES	

Based on the practical significance tests there is a relationship between collective efficacy and performance ratings at the team level. This means that teams with higher perceptions of their collective efficacy demonstrate higher level of performance behaviors, as measured by the mean of the four rating dimensions. The agreement of all the indicators allows this induction to be Category I.

Collective Efficacy (COLLEFF) and Knowledge (RKNOW). The Covariance theorem for the relationship between COLLEFF and RKNOW is as follows:

(.380) = (.882)(.829)(.611) + (.471)(.559)(-.252)

This equation is interpreted as follows:

1. The correlation based on the raw scores (*df= 32-2*) is .380.
2. The correlation based on each team's mean score (*df= 8-2*) is .611.
3. The correlation based on residuals around each team's mean score (*df= 32-8-1*) is -.252.
4. The between-cell component is (.447), and the within-cell component is (-.07).

The indicators for this equation are presented in the following table.

Table 18. Indicators for COLLEFF and RKNOW

WABA II Tests	Value	Standard Met	Induction
DIFFERENCE			
A	.39	15°	WHOLES
Z'	.90	*n.s.*	
MAGNITUDE (of r_B)			
R	.77	30°	WHOLES
t	1.89	*n.s.*	
WABA I Tests			
COLLEFF			
E	1.87	30°	WHOLES
F	11.9	$p < .01$	WHOLES
RKNOW			
E	1.48	15°	WHOLES
F	7.53	$p < .01$	WHOLES
COMPONENTS			
Between	.447		WHOLES
Within	-.07		
FINAL INDUCTION		WHOLES	

Based on the practical significance tests, there is a relationship between collective efficacy and demonstration of knowledge at the team level. This means that teams with higher average perceptions of their collective efficacy demonstrate higher levels of knowledge, as measured by the ratings. The agreement of all the indicators allows this induction to be Category I.

Collective Efficacy (COLLEFF) and Effort (REFFORT). The Covariance theorem for the relationship between COLLEFF and REFFORT is as follows:

(.256) = (.882)(.877)(.409) + (.471)(.479)(-.266)

This equation is interpreted as follows:

1. The correlation based on the raw scores (*df= 32-2*) is .256.

2. The correlation based on each team's mean score (*df= 8-2*) is .409. 3. The correlation based on residuals around each team's mean score (*df= 32-8-1*) is -.266.

4. The between-cell component is (.316), and the within-cell component is (-.06).

The indicators for this equation are presented in the following table.

Table 19. Indicators for COLLEFF and REFFORT

WABA II Tests	Value	Standard Met	Induction
DIFFERENCE			
A	.20	0°	WHOLES
Z'	.44	*n.s.*	
MAGNITUDE (of r_B)			
R	.44	15°	WHOLES
t	1.08	*n.s.*	
WABA I Tests			
COLLEFF			
E	1.87	30°	WHOLES
F	11.9	$p < .01$	WHOLES
REFFORT			
E	1.80	15°	WHOLES
F	11.41	$p < .01$	WHOLES
COMPONENTS			
Between	.316		WHOLES
Within	-.06		
FINAL INDUCTION		WHOLES	

Based on the practical significance tests, there is a relationship between collective efficacy and demonstration of effort at the team level. This means that teams with higher average perceptions of their collective efficacy demonstrate higher levels of effort, as measured by the ratings. The agreement of all the indicators allows this induction to be Category I.

Collective Efficacy (COLLEFF) and Use of Strategies (RSTRAT). The Covariance theorem for the relationship between COLLEFF and RSTRAT is as follows:

(.337) = (.882)(.837)(.496) + (.471)(.546)(-.111)

This equation is interpreted as follows:

1. The correlation based on the raw scores (*df= 32-2*) is .337.

2. The correlation based on each team's mean score (*df= 8-2*) is .496.

3. The correlation based on residuals around each team's mean score (*df= 32-8-1*) is -.111.

4. The between-cell component is (.368), and the within-cell component is (-.03).

The indicators for this equation are presented in the following table.

Table 20. Indicators for COLLEFF and RSTRAT

WABA II Tests	Value	Standard Met	Induction
DIFFERENCE			
A	.43	15°	WHOLES
Z'	.90	*n.s.*	
MAGNITUDE (of r_B)			
R	.58	30°	WHOLES
t	1.46	*n.s.*	
WABA I Tests			
COLLEFF			
E	1.87	30°	WHOLES
F	11.9	$p < .01$	WHOLES
RSTRAT			
E	1.53	15°	WHOLES
F	8.05	$p < .01$	WHOLES
COMPONENTS			
Between	.368		WHOLES
Within	-.03		
FINAL INDUCTION		WHOLES	

Based on the practical significance tests, there is a relationship between collective efficacy and the use of strategies at the team level. This means that teams with higher average perceptions of their collective efficacy demonstrate more effective use of performance strategies, as measured by the ratings. The agreement of all the indicators allows this induction to be Category I.

Collective Efficacy (COLLEFF) and Citizenship Behaviors (RTCB). The Covariance theorem for the relationship between COLLEFF and RTCB is as follows:

(.376) = (.882)(.823)(.540) + (.471)(.567)(-.06)

This equation is interpreted as follows:

1. The correlation based on the raw scores (*df= 32-2*) is .376.

2. The correlation based on each team's mean score (*df= 8-2*) is .540.

3. The correlation based on residuals around each team's mean score (*df= 32-8-1*) is -.06.

4. The between-cell component is (.392), and the within-cell component is (-.015).

The indicators for this equation are presented in the following table.

Table 21. Indicators for COLLEFF and RTCB

WABA II Tests	Value	Standard Met	Induction
DIFFERENCE			
A	.53	30°	WHOLES
Z'	1.08	*n.s.*	
MAGNITUDE (of r_B)			
R	.65	30°	WHOLES
t	1.59	*n.s.*	
WABA I Tests			
COLLEFF			
E	1.87	30°	WHOLES
F	11.9	$p < .01$	WHOLES
MNPERF			
E	1.45	15°	WHOLES
F	7.23	$p < .01$	WHOLES
COMPONENTS			
Between	.392		WHOLES
Within	-.015		
FINAL INDUCTION		WHOLES	

Based on the practical significance tests, there is a relationship between collective efficacy and demonstration of citizenship behaviors at the team level. This means that teams with higher perceptions of their collective efficacy demonstrate higher levels of citizenship behaviors, as measured by the ratings. The agreement of all the indicators allows this induction to be Category I.

Summary of Hypothesis 2. The results of all the tests, overall and by dimension, demonstrated the same team-level relationship between collective efficacy and performance behaviors. The similarity of the relationships shown here and the intercorrelations between the dimensions shown in Chapter 3 point toward non-independence of the dimensions. This will be discussed further in Chapter 5.

Hypothesis 3

Hypothesis 3a. This hypothesis addresses the antecedents of collective efficacy. Hypothesis 3a examines prior success as an antecedent. The first measure of success used is the perception by the team of the overall nature of the feedback (FBSC) received concerning the prior period. The Covariance theorem for the relationship between COLLEFF and FBSC and the corresponding indicators are presented below.

$$(.429)^* = (.882)^*(.840)^*(.406) + (.471)\,(.543)\,(.503)^*$$

This equation is interpreted as follows:

1. The correlation based on the raw scores ($df = 32\text{-}2$) is .43. ($p < .03$)
2. The correlation based on each team's mean score ($df = 8\text{-}2$) is .406.
3. The correlation based on residuals around each team's mean score ($df = 32\text{-}8\text{-}1$) is .503. ($p < .01$)
4. The between-cell component is (.300), and the within-cell component is (.128).

The indicators for this equation are presented in the following table.

Table 22. Indicators for COLLEFF and FBSC

WABA II Tests	Value	Standard Met	Induction
DIFFERENCE			
A	-.12	0°	PARTS
Z'	-.11	*n.s.*	
MAGNITUDE (of r_w)			
R	.54	15 °	PARTS
t	2.74	*n.s.*	
WABA I Tests			
COLLEFF			
E	1.87	30 °	WHOLES
F	11.9	$p < .01$	WHOLES
FBSC			
E	1.55	15 °	WHOLES
F	8.19	$p < .01$	WHOLES
COMPONENTS			
Between	.300		WHOLES
Within	.128		
FINAL INDUCTION		EQUIVOCAL	

Based on the practical significance indicators, no induction of wholes or parts can be made at the team level between COLLEFF and FBSC. While the WABA I indicators show differences between teams on both variables, the WABA II indicators show differences both between and within teams.

The second measure of success used is the composite measure of the outcomes from the prior period. The Covariance theorem for the relationship between COLLEFF and LCOMP and the corresponding indicators are presented below.

$(.391)^* = (.882)^* (.65)^* (.583) + (.471) (.760) (.238)$

This equation is interpreted as follows:

1. The correlation based on the raw scores ($df = 32\text{-}2$) is .391 ($p < .05$)

2. The correlation based on each team's mean score ($df = 8\text{-}2$) is .583. ($p < .11$)

3. The correlation based on residuals around each team's mean score ($df = 32\text{-}8\text{-}1$) is .238.(*n.s.*)

4. The between-cell component is (.331), and the within-cell component is (.06).

The indicators for this equation are presented in the following table.

Table 23. Indicators for COLLEFF and LCOMP

WABA II Tests	Value	Standard Met	Induction
DIFFERENCE			
A	.39	15 °	WHOLES
Z'	.86	*n.s.*	
MAGNITUDE (of r_B)			
R	.72	30°	WHOLES
t	1.83	*n.s.*	
WABA I Tests			
COLLEFF			
E	1.87	30°	WHOLES
F	11.9	$p < .01$	WHOLES
LCOMP			
E	.90	none	
F	3.25	$p < .01$	WHOLES
COMPONENTS			
Between	.331		WHOLES
Within	.06		
FINAL INDUCTION		WHOLES (CATEGORY II)	

The final induction is that the relationship between COLLEFF and LCOMP exists at the team level based on the WABA II indicators. The WABA I test indicate that there is variance within teams on the outcomes measures. Therefore, Hypothesis 3a, that teams' level of collective efficacy is related to their prior performance, is accepted for both outcome measures.

Hypothesis 3b. Hypothesis 3b explores several compositional characteristics of the teams as possible antecedents of collective efficacy. The nature of the data collected prevents the use of the raw scores (N = 32) in a multiple regression for the examination of more than one of these simultaneously, for the error terms would not be independent, because most of the respondents were the same from period to period. Therefore, the characteristics of the teams will be examined bivariately with collective efficacy through the use of WABA, as described above. An induction of WHOLES would mean that the team's average level of collective efficacy is related to the team's average level of heterogeneity on the characteristic of interest. An induction of PARTS would mean that there is a relationship between the level above or below the team's averages of the variables over the time measured. The Covariance theorem and the indicators for the relationship between collective efficacy and each of the variables are presented below. The variables ending in CV are measures of

variation expressed in percentage (higher equals more variation), so a negative relationship would be expected. The variables ending in PC are measures of the percentage of team members belonging to a particular group.

Years of Previous Work Experience (WEXPCV). This variable measures the amount of variation in the previous years of work experience by a team's members. A lower value indicates that there is great similarity in the amount of work experience among team members. The Covariance theorem for the relationship between WEXPCV and COLLEFF is:

(-.07) = (.882) (.796) (-.11) + (.471) (.605) (.02)

This equation is interpreted as follows:

1. The correlation based on the raw scores (*df= 32-2*) is -.07.
2. The correlation based on each team's mean score (*df= 8-2*) is -.11.
3. The correlation based on residuals around each team's mean score (*df= 32-8-1*) is .02.
4. The between-cell component is (-.07), and the within-cell component is (.00).

The indicators for this equation are presented in the following table.

Table 24. Indicators for COLLEFF and WEXPCV

WABA II Tests	Value	Standard Met	Induction
DIFFERENCE			
A	.08	0°	
Z'	.18	*n.s.*	
MAGNITUDE (of r_B)			
R	.116	0 °	
t	.285	*n.s.*	
WABA I Tests			
COLLEFF			
E	1.87	30°	WHOLES
F	11.9	$p < .01$	WHOLES
WEXPCV			
E	1.31	15°	WHOLES
F	5.92	$p < .01$	WHOLES
COMPONENTS			
Between	-.07		WHOLES
Within	.00		
FINAL INDUCTION		INEXPLICABLE	

The WABA I tests indicate that while both the variables can be conceived of at the team level, the WABA II tests show no relationship between them. While Dansereau (1984) states that this "can be viewed as compatible with a wholes condition" (p.184), this researcher prefers to make no induction, hence rejecting the hypothesis that there is a relationship between the variability of work experience between team members and the team's level of collective efficacy.

Education Level (EDUCCV). This variables measures the variation of teams' members in their years of education. As with other heterogeneity measures, it was expected that greater variation would be associated with lower collective efficacy. The Covariance theorem for this relationship is:

$$(-.099) = (.882)(.925)(-.04) + (.471)(.378)(-.30)$$

This equation is interpreted as follows:

1. The correlation based on the raw scores ($df = 32\text{-}2$) is -.099.
2. The correlation based on each team's mean score ($df = 8\text{-}2$) is -.04.
3. The correlation based on residuals around each team's mean score ($df = 32\text{-}8\text{-}1$) is -.03.
4. The between-cell component is (-.04), and the within-cell component is (-.05).

The indicators for this equation are presented in the following table.

Table 25. Indicators for COLLEFF and EDUCCV

WABA II Tests	Value	Standard Met	Induction
DIFFERENCE			
A	-.27	15°	PARTS
Z'	.54	*n.s.*	
MAGNITUDE (of r_w)			
R	.31	15°	PARTS
t	1.43	*n.s.*	
WABA I Tests			
COLLEFF			
E	1.87	0°	WHOLES
F	11.9	$p < .01$	WHOLES
EDUCCV			
E	.56	0°	PARTS
F(of η_w)	.93	*n.s.*	
COMPONENTS			
Between	-.04		WHOLES
Within	-.05		
FINAL INDUCTION		INEXPLICABLE	

The contradictory results allow for no induction to be made. There appears to be no relationship between the variability in education levels and the level of collective efficacy. This is due, most likely, to a floor effect, because everyone in the plant has at least the equivalent of a high school education.

Age (AGECV). This variable measures the variability in age of team members. As with other heterogeneity measures, it was expected that greater variation would be associated with lower collective efficacy. The Covariance theorem for this relationship is:

(.626)* = (.882)*(.948)*(.704)* + (.471) (.316) (.245)

This equation is interpreted as follows:

1. The correlation based on the raw scores (*df= 32-2*) is .626. ($p < .01$)
2. The correlation based on each team's mean score (*df= 8-2*) is .704. ($p < .06$)
3. The correlation based on residuals around each team's mean score (*df= 32-8-1*) is .245.
4. The between-cell component is (.587), and the within-cell component is (.036).

The indicators for this equation are presented in the following table.

Table 26. Indicators for COLLEFF and AGECV

WABA II Tests	Value	Standard Met	Induction
DIFFERENCE			
A	.53	30°	WHOLES
Z'	1.30	*n.s.*	
MAGNITUDE (r_B)			
R	.99	30°	WHOLES
t	2.43	$p < .05$	WHOLES
WABA I Tests			
COLLEFF			
E	1.87	30°	WHOLES
F	11.9	$p < .01$	WHOLES
AGECV			
E	2.86	30°	WHOLES
F	18.8	$p < .01$	WHOLES
COMPONENTS			
Between	.587		WHOLES
Within	.036		
FINAL INDUCTION		WHOLES	

Based on statistical significance indicators, there is a clear positive relationship between team's variability in age and their average levels of collective efficacy. This is opposite of the hypothesized relationship.

Tenure in the Blacksburg Plant (TENURCV). This measure represents the variability in the length of time team members have been employed at the Blacksburg plant. As with other measures, the hypothesized relationship was that higher levels of variability would be associated with lower levels of collective efficacy. The Covariance theorem for this relationship is:

$$(-.20) = (.882)(.825)(-.27) + (.471)(.319)(-.01)$$

This equation is interpreted as follows:

1. The correlation based on the raw scores ($df = 32-2$) is -.20.
2. The correlation based on each team's mean score ($df = 8-2$) is -.27.
3. The correlation based on residuals around each team's mean score ($df = 32-8-1$) is -.01.
4. The between-cell component is (-.195), and the within-cell component is (-.002).

Table 27. Indicators for COLLEFF and TENURCV

WABA II Tests	Value	Standard Met	Induction
DIFFERENCE			
A	.26	15°	WHOLES
Z'	.54	*n.s.*	
MAGNITUDE (of r_B)			
R	.28	15°	WHOLES
t	.68	*n.s.*	
WABA I Tests			
COLLEFF			
E	1.87	30°	WHOLES
F	11.0	$p < .01$	WHOLES
TENURCV			
E	2.50	30°	WHOLES
F	2.35	$p < .01$	
COMPONENTS			
Between	-.195		WHOLES
Within	-.002		
FINAL INDUCTION		WHOLES	

The WABA I and WABA II tests indicate a negative relationship at the team level between average tenure and collective efficacy. This relationship supports the hypothesis that greater variability in tenure results in lower collective efficacy.

Diversity Percentage (DIVPC). This variable captures the WORKFORCE 2000 idea of diversity by measuring the percentage of a team's membership that are not white males. It is hypothesized that higher levels of diversity will result in lower levels of collective efficacy.

(-.121) = (.882) (.920) (-.134) + (.471) (.277) (-.05)

This equation is interpreted as follows:

1. The correlation based on the raw scores (*df= 32-2*) is -.121.
2. The correlation based on each team's mean score (*df= 8-2*) is -.134.
3. The correlation based on residuals around each team's mean score (*df= 32-8-1*) is -.05.
4. The between-cell component is (-.113), and the within-cell component is (.05).

Table 28. Indicators for COLLEFF and DIVPC

WABA II Tests	Value	Standard Met	Induction
DIFFERENCE			
A	.08	0°	
Z'	.16	*n.s.*	
MAGNITUDE (of r_B)			
R	.135	0°	WHOLES
t	.33	*n.s.*	
WABA I Tests			
COLLEFF			
E	1.87	30°	WHOLES
F	11.0	$p < .01$	WHOLES
DIVPC			
E	3.35	30°	WHOLES
F	28.99	$p < .01$	WHOLES
COMPONENTS			
Between	-.113		WHOLES
Within	-.05		
FINAL INDUCTION		INEXPLICABLE	

As with WEXPCV above, this relationship is considered inexplicable, in that there is variance within teams on both variables but no relationship between the variables at the team level of analysis, either based on means or residuals.

Manufacturing Experience (MANUFPC). This variable measures the percentage of a team's membership that had manufacturing experience before joining the Blacksburg plant. It is hypothesized that higher levels of prior manufacturing experience will be associated with higher levels of collective efficacy. The Covariance theorem for this relationship is:

(.22) = (.882) (.807) (.126) + (.471) (.591) (.455)

This equation is interpreted as follows:

1. The correlation based on the raw scores ($df = 32\text{-}2$) is .22.
2. The correlation based on each team's mean score ($df = 8\text{-}2$) is .126.
3. The correlation based the residuals ($df = 32\text{-}8\text{-}1$) is .455.
4. The between-cell component is (.089), and the within-cell component is (.126).

Table 29. Indicators for COLLEFF and MANUFPC

WABA II Tests	Value	Standard Met	Induction
DIFFERENCE			
A	-.32	30°	PARTS
Z'	.68	*n.s.*	
MAGNITUDE (of r_w)			
R	.50	15°	PARTS
t	2.38	$p < .05$	PARTS
WABA I Tests			
COLLEFF			
E	1.87	0°	WHOLES
F	11.9	$p < .01$	WHOLES
MANUFPC			
E	1.36	15°	WHOLES
F	6.41	$p < .05$	WHOLES
COMPONENTS			
Between	.089		EQUIVOCAL
Within	.126		
FINAL INDUCTION		EQUIVOCAL	

The contradictory indicators lead to a rejection of the team level as the focus for the relationship between prior manufacturing experience and collective efficacy.

The results for hypothesis 3b are mixed. They can be summarized as follows:

1. The hypothesized negative relationship between heterogeneity and collective efficacy was supported for tenure in the plant.
2. The hypothesized negative relationship between heterogeneity and collective efficacy was rejected for age.
3. No relationship between heterogeneity and collective efficacy was found for prior work experience, whether number of years or nature, for education level, or for diversity of membership.

Exploratory Tests

While the tests above explore the hypothesized linkages within the model, alternative linkages can be considered. Tests of other linkages can shed light on, for example, the importance of performance behaviors in the model. The following sections reports the outcomes of some possible alternative explanations.

Efficacy (COLLEFF) and Outcomes (COMP). By comparing the relationship of COLLEFF and MNPERF to that of COLLEFF and COMP, some insight can be gained as to whether performance as defined in this model is actually a necessary component. The reader will recall that the Covariance theorem for COLLEFF and MNPERF is:

$$(.384) = (.882)(.867)(.557) + (.471)(.498)(-.176).$$

The Covariance theorem for COLLEFF and COMP is:

$$(.225) = (.882)(.502)(.457) + (.471)(.866)(.037).$$

A comparison of these two equations shows that, while there is a relationship between collective efficacy and outcomes, there is a stronger relationship between collective efficacy and performance. This indicates that the presence of performance does add to this model.

Compositional Measures (AGECV/TENURCV), Performance (MNPERF), and Outcomes (COMP). By examining the relationship of the significant compositional measures with performance and outcomes, the importance of collective efficacy can be suggested. The Covariance theorem for the relationship of AGECV and COLLEFF is:

$$(.626) = (.882)\,(.948)\,(.704) + (.471)\,(.316)\,(.245).$$

The Covariance theorem for the relationship of AGECV and MNPERF is:

(.317) = (.948) (.867) (.403) + (.316) (.498) (-.09).

Additionally, the Covariance theorem for the relationship of AGECV and COMP is:

(.284) = (.948) (.502) (.665) + (.316) (.866) (-.10).

It can be seen that while variability in age is related to performance and outcomes, its relationship to collective efficacy is stronger than either of the others. This suggests that the variability in age works through collective efficacy to influence performance and outcomes.

The relationship between the variability in tenure in the plant is explored below. The Covariance theorem for the relationship between TENURCV and COLLEFF is:

(-.20) = (.882) (.825) (-.27) + (.471) (.319) (-.01)

The Covariance theorem for the relationship between TENURCV and MNPERF is:

(.08) = (.825) (.867) (.06) + (.565) (.498) (.14)

The Covariance theorem for the relationship between TENURCV and COMP is:

(-.15) = (.825) (.502) (-.22) + (.565) (.866) (-.11)

As with AGECV above, TENURCV has a stronger relationship with COLLEFF than with either MNPERF or COMP. This indicates that COLLEFF does add to the model.

Chapter 5

Summary and Conclusions

The purpose of this chapter is to summarize the results of this research, to draw conclusions from those results, and to point out the limitations of the design. Extensions and refinements of this research are also suggested. In the first section, the results of the findings concerning each of the research questions presented in Chapter 1 will be summarized and conclusions drawn. The final section presents suggestions for future research.

Research Questions

Research Question 1

Research question 1 asked "Is team performance related to effectiveness, and what are the dimensions of team performance?" The results of the tests showed that, at the team level of analysis, there was a relationship between mean levels of overall performance and effectiveness. At a more specific level, relationships were found between material utilization and both the application of knowledge and the use of strategies. Quantity of output was found to be related to the level of effort and the demonstration of citizenship behaviors. A relationship was found between quality and effort, but the sign was in the opposite direction from the hypothesis.

Overall, the findings provide mixed support for the hypothesized relationships between dimensions of behavior and types of outcomes. While the dimensions of Hackman's normative

model were not supported, his core concept of the importance of patterns of group behaviors was supported. Raters in this study could see differences between teams in the exhibition of certain behaviors, and those differences were reflected in results. Hence, findings support the basic thrust of the normative model but they raise issues regarding the number of dimensions comprising performance and whether those dimensions can be separated in the minds of observers. The intercorrelations between the four performance dimensions (see Chapter 3) indicate that the raters did not see them as independent and may have based all their ratings on a more global view of team performance. The dimensions may not, in fact, be independent in this setting. The mean performance rating and the dimension ratings had similar relationships with the outcomes.

However, stronger relationships were found between specific dimensions and outcomes. For example, use of strategies was related to material utilization but not to quantity, and effort was related to quantity but not to quality. In addition, quantity was more strongly related to effort that was mean performance. These point to an alternative view that there may be dimensions that do not correspond to the *a priori* dimensions of this study.

Campbell (1991) states that his proposed dimensions of individual performance are suggested as a possible exhaustive list, and that not all will be present in all situations. This logic should be applied to the Hackman dimensions. It may be that in certain settings the use of strategies subsumes the use of knowledge, or that effort predominantly determines outcomes. In this setting, there are at least two patterns of dimensions that could be suggested.

The first is based on the efficacy questionnaire, which was constructed around the four *a priori* dimensions. The items closely paralleled those on the performance rating form. The responses to the efficacy questionnaire yielded two dimensions, not four. Applying this logic leads to the suggestion that performance dimensions in this setting may, in fact, correspond to the task and social dimensions of collective efficacy. This would be consistent with the theory of sociotechnical joint optimization underlying the high performance work system of this site.

The second is based on the different patterns of relationships of the dimensions to the outcomes in the present study. The dimensions of application of knowledge and the use of strategies had similar relationships to outcome measures, and the dimensions of effort and citizenship be-

haviors had similar relationships to the outcome measures. Extending this logic leads to the formation of rather common sense dimensions of "working smart" and "working hard." It may be that teams can reach some outcomes and achieve some measure of success merely by applying effort. In addition, they must organize their resources and use their knowledge to solve problems. However, in order to optimize their results they must both apply the correct skills and put forth sufficient levels of effort.

Research Question 2

Research question 2 asked "Does collective efficacy exist as a group-level phenomenon and is it related to performance?" The results support an affirmative answer to both parts of this question. Collective efficacy was shown to be a construct with two dimensions, confidence in task ability and confidence in social skills. It was shown to differ between teams, to have more variance between than within teams, and to be related to team performance.

The fact that there exists a sense of confidence that differs between teams is important because the teams in this sample saw no difference between themselves in the levels of technical knowledge and skills. In addition, they were in the same organization, in which a strong technical component exists. The incentives are designed at the individual level (skill-based pay) and the organizational level (goal-sharing), but not at the team level. Hence, a motivating factor for their performance can be construed to be their confidence in their ***team's*** performance. This is the essence of Bandura's (1977) concept -- that, given sufficient of skills and incentives, efficacy is a major determinant of choice of behaviors.

Discussions with team members shed some light on the presence of this phenomenon. During the months spent in the plant, the researcher noticed that two teams consistently had the most problems with production. Members of those teams made comments like "When things go wrong, we tend not to bounce back, but rather concentrate on what we did wrong. We get down on ourselves, and then we don't try as hard, because we think we can't do it." When the team then performed poorly, they received negative period reviews, which reinforced their negative image of

themselves. This process is what Hackman (1986) calls a negative synergy spiral. These two teams consistently had the lowest scores on the efficacy questionnaire.

Another characteristic of one of these teams, described by more than one of its members, was that its members will make statements or set goals out of a sense of image management rather than out of commitment to the organization's goals. This leads to inconsistent behaviors by team members and to the abandonment or lowering of goals when trouble arises. Both these teams also reported the presence of cliques within the team. These subgroups had different norms from the group, and, on occasion, could impose those norms on the group. These subgroups exhibited behaviors such as arriving for team meetings late (together) and having personal conversations during team meetings.

On the other hand, the teams that scored highest on the efficacy questionnaire were characterized by behaviors such as all members attending all meetings (and being on time). There is a strong sense of membership within these teams. A member of one of these teams was overheard saying to another high-scoring team, "If I weren't on __ team, I wouldn't mind being on this team." When they had a problem, it was addressed immediately, rather than letting it fester. Additionally, the problem was generally kept within the "family", and not discussed with members of other teams. Members described encountering a problem, addressing it, and then "shaking it off" and going on.

The most often-mentioned characteristic of the better-performing teams was their ability to "see the big picture." This has several meanings in this plant. First, at the individual level, operations associates that see the big picture were described as "considering the entire process as their job." They monitor the team's progress and float to other tasks as needed. Teams that see the big picture do not get bogged down in detail or routine to the point that they cannot make quick changes to take advantage of situations. Additionally, they look beyond the team to the overall good of the line and the organization. They readily send help to those areas shared by the two lines or to the other line when needed. They realize that while it is important for their outcome numbers to look good, the plant's performance is the ultimate objective.

Research Question 3

This question addressed the antecedents of collective efficacy. Two closely related antecedents of collective efficacy were teams' perceptions of their feedback from the prior period and their outcomes from the prior period. Prior outcomes was found to have a stronger relationship to collective efficacy then did verbal feedback. Bandura (1986) states that the most influential basis of efficacy judgments is past success, which he calls mastery experiences. Both outcomes and feedback provide teams with information about their success, but outcome information was less ambiguous than the reviews given by the line leaders, who often concentrated on what the team had done wrong in their feedback sessions. (It is interesting to note that teams are now doing their own period reviews, based on their outcome data, without the input of a line leader.)

A second group of antecedents measured the teams' composition on personal and job-related characteristics. Due to lack of guidance on the direction of the hypothesis (the literature provides suggestions that both homogeneity and heterogeneity are related to performance), a general hypothesis that heterogeneity would lead to lower collective efficacy was offered.

The only variable that showed the hypothesized negative relationship between heterogeneity and collective efficacy was variability of tenure in the plant. There are at least two possible explanations for this relationship. One is that those teams with more variance in tenure have more new members. In this plant, on-the-job training is conducted by team members, so new employees mean time taken away from the actual performance of the job to train. In addition, new team members are less of a known entity to other team members, so the team's efficacy could be reduced due to uncertainty about the new member's capabilities.

Another explanation is that of a "generation gap." When this plant was opened, a group of employees was brought in before even the machinery was delivered. Most of this group, known as the "start-up team," are still employed. They take great ownership of the plant and the processes. There is a perception among members of the start-up team that newer employees often do not have the same commitment to the plant as they do. On the other hand, newer employees sometimes feel the members of the start-up team think they know more and are reluctant to take inputs from

newer employees. This was captured in a conversation when the researcher told a member of the start-up team that newer employees feel that start-up team members think they know more, she was told "That's because they do." The mix of a team's membership between generations could affect its sense of collective efficacy.

A strong positive relationship was found between teams' age heterogeneity and collective efficacy. This can be interpreted that variety of age is a positive aspect of team formation. Further examination of the data reveals that the distribution of AGECV is rather bimodal, with four teams having values above 26 and three teams having scores below 20. The relationship appears to be driven largely by those teams on the higher end of the scale, with the two teams with AGECV scores above 29 also having COLLEFF scores above 7. AGECV is one of many clues that point to collective efficacy. It may be meaningful in that AGECV is representing variety in points of view or problem-solving approaches. It may be that variety of age creates more of a "family" feeling within a team. The actual meaning of this relationship bears further exploration.

No relationship was found for heterogeneity of amount of prior work experience or for the percentage of members with prior manufacturing experience. The situation appears to be strong enough to overcome positive or negative (or lack of) prior work experience. The nature of members' prior work experience that was not explored that could be important are characteristics such as unionization, labor/management relationships, job breadth, nature of supervision, and reason for leaving. No relationship was found for variation in education level. This is due, most likely, to a floor effect, all employees having at least a high school education.

In addition, no relationship was found between collective efficacy and heterogeneity of teams on diversity. Diversity is one of the compositional characteristics about which contradictory suppositions exist, with some arguing that diversity should contribute to better problem solving (due to more varied inputs), with other arguing that differences can impair communication patterns. Neither of these was supported. This organization has a code of values and beliefs that supports the appreciation of all persons as individuals and conducts on-going diversity training. This seems to have paid off to the degree that diversity is not inhibiting collective efficacy, but not to the degree that it is contributing.

The conclusions that can be drawn from the examination of the compositional characteristics reflect the statement by Jackson (1992) that little is known about the mix of variables whose homogeneity or heterogeneity affect group performance (or in this case, collective efficacy). In this study, variability in age was associated with higher levels of performance and outcomes, but most strongly with collective efficacy, while greater diversity of gender and race or past work experience showed no relationship. It can be said from these findings that heterogeneity does not have to be a detractor from collective efficacy. In fact, if a culture is established in which contributions are valued, heterogeneity on personal factors may even have a positive influence. When the researcher once asked an employee at this site what it takes to make a successful team, she was told "A team needs to have a little of everything -- some men, some women, some old, some young." While many speculations exist as to the "right" mix of teams on compositional factors, there may, in fact, not be such a thing. The principle of equifinality, that there are multiple routes to success, may apply here.

Suggestions for Future Research

As stated in Chapter 3, this research was viewed as an in-depth case study and a pilot for further studies. A great deal was learned and several questions were raised that should direct future study. Suggestions for future research arise both from the limitations of this study and its findings.

Additional qualitative work in the same plant will explore the meaning of the findings. Continued observation and interviews will allow for the interpretation of the construct of collective efficacy and will shed light on the dimensions of performance. The expansion of the plant and the introduction of new products are planned for the near future. Extension of the data collection over this longer period of time will allow for the impact of system factors on the constructs and their relationships.

From a measurement point of view, extensions of this study should explore alternative (additional) measures of the constructs. For example, Gist (1987) suggests group interviews to determine levels of collective efficacy. This could be incorporated after survey results have been

gathered. Alternative measures of performance, such as self-reports or direct observation, could be added.

At least three options for replication/extension of this study would be appropriate. One is other studies in small plants to determine if the constructs and their relationships are similar to those found herein. This has the advantage of enabling further qualitative work to be done similar to the extended qualitative work in this study. A second option would be to replicate this study in a larger plant with sufficient sample size. The plant would not have to be very large -- some of the between-cell correlations in this study would be statistically significant with a sample size only half again as large. A larger sample with multiple raters would provide a better test of the dimensionality of performance. Ideally, a third alternative would be to conduct the study over a longer period of time in a larger plant. This would provide a truer test of the longitudinal aspects of the relationships. A study spanning a longer period could also possibly consider the impact of system factors on the constructs and their relationships.

The insights gained from this study have both practical and theoretical significance. For years researchers and managers have sought the elusive characteristic that makes some groups more productive than others -- that enables synergy to emerge or productivity loss to be avoided. The finding that collective efficacy does exist and differs among teams equal in other aspects operating in the same setting is heartening. The key task seems now to be to define the behaviors required for effectiveness in a setting and facilitate team's efficacy for performing those behaviors.

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Appendix A
Employee Survey

First Administration

1. The team has the technical knowledge and skills it needs.
2. Members of this team are committed to high standards of quality.
3. The team can organize its work to make to most of its resources and talents.
4. There are no factions within the team that affect productivity.
5. The team makes good use of its technical knowledge and skills.
6. Members of this team are committed to high standards of production.
7. The team can pull itself out of a slump.
8. The members of the team do not let personal feelings get in the way of getting the job done.
9. The team has the social skills it needs.
10. When the team faces a problem, everyone will jump in and work until it is resolved.
11. The team can find solutions to problems with its performance.
12. Members of this team will make personal sacrifices for the good of the team.
13. The team makes good use of its social skills.
14. Team members work hard to fulfill the team's overall responsibilities.
15. The team can find solutions to interpersonal problems.
16. On this team, individuals do not take credit for team accomplishments.
17. The team can assess what it's doing right and what it's doing wrong.
18. Members of this team do not waste time.
19. This team is able to come up with better ways to do its tasks.
20. Team members go above and beyond the call of duty.
21. Members of this team know when to ask for help.
22. This team is capable of performing at a high level.
23. This team is capable of accomplishing tasks successfully.
24. This team is capable of successfully handling even difficult assignments.
25. This team is capable of producing both high quality and high quantity of work.
26. The members of this team are optimistic that they can get the job done.

1. This team has had stable membership over the last three months.
2. We have had a lot of membership changes in this team in the last three months.
3. Our team has been negatively affected by membership changes in the last three months.
4. During our last period review, the line leader/assistant line leader concentrated on what we had done wrong. (R)
5. In our last period review, the opportunities were stressed over the positive results. (R)
6. We were praised for what we had done right in our last period review.
7. Overall, our last period review was positive.

Second Administration

1. This team works hard to meet deadlines.
2. This team works hard when there are no deadlines pressing.
3. The team can organize its work to make the most of its resources and talents.
4. When things are slow in an area, team members assigned there go to other areas to help out.
5. Members of this team maintain their focus.
6. Members of this team are committed to high standards of production.
7. The team can pull itself out of a slump.
8. Members of this team see the big picture.
9. This team is able to come up with better ways to do its tasks.
10. When the team faces a problem, everyone will jump in and work until it is resolved.
11. The team can find solutions to problems with its performance.
12. Members of this team will make personal sacrifices for the good of the team.
13. Members come in early or stay late for the good of the team.
14. Team members work hard to fulfill the team's overall responsibilities.
15. Members of this team look around for things to be done.
16. The team can assess what it's doing right and what it's doing wrong.
17. Members of this team do not waste time.
18. The members of this team share information readily.
19. Team members go above and beyond the call of duty.
20. The team has the social skills it needs.
21. The team makes good use of its social skills.
22. The team can find solutions to its interpersonal problems.
23. There are no factions within the team that affect performance.
24. Members of this team do not let personal feelings get in the way of getting the job done.
25. This team is willing to address conflict when it arises.
26. This team is able to resolve conflict when it arises.
27. This team is capable of performing at a high level.
28. This team is capable of accomplishing tasks successfully.
29. This team is capable of successfully handling even difficult assignments.
30. This team is capable of producing both high quality and high quantity of work.
31. The members of this team are optimistic that they can get the job done.

1. This team has had stable membership over the last three months.
2. We have had a lot of membership changes in this team in the last three months.
3. Our team has been negatively affected by membership changes in the last three months.
4. During our last period review, the line leader/assistant line leader concentrated on what we had done wrong.
5. In our last period review, the opportunities were stressed over the positive results.
6. We were praised for what we had done right in our last period review.
7. Overall, our last period review was positive.

Third and Fourth Adminstrations

1. The team can organize its work to make the most of its resources and
2. Members of this team are committed to high standards of production.
3. The team can pull itself out of a slump.
4. This team is able to come up with better ways to do its tasks.
5. When the team faces a problem, everyone will jump in and work until it is resolved.
6. The team can find solutions to problems with its performance.
7. Team members work hard to fulfill the team's overall responsibilities.
8. The team can assess what it's doing right and what it's doing wrong.
9. Members of this team do not waste time.
10. Team members go above and beyond the call of duty.
11. The team has the social skills it needs.
12. The team makes good use of its social skills.
13. The team can find solutions to its interpersonal problems.
14. There are no factions within the team that affect performance.
15. Members of this team do not let personal feelings get in the way of getting the job done.
16. This team is capable of performing at a high level.
17. This team is capable of accomplishing tasks successfully.
18. This team is capable of successfully handling even difficult assignments.
19. This team is capable of producing both high quality and high quantity of work.
20. The members of this team are optimistic that they can get the job done.

1. This team has had stable membership over the last three months.
2. We have had a lot of membership changes in this team in the last three months.
3. During our last period review, the line leader/assistant concentrated on what we had done wrong.
4. We were praised for what we had done right in our last period review.
5. Overall, our last period review was positive.

Appendix B
Team Performance Rating

First Administration

TEAM PERFORMANCE CATEGORY I : The extent to which the team tapped and applied the knowledge and skills of its members during the period.
DURING PERIOD 11:

1. The team effectively assessed what it was doing right and what it was doing wrong.
2. The team demonstrated the technical knowledge and skills required to solve routine problems.
3. The team applied appropriate technical knowledge and skills to solve non-routine problems.
4. The team demonstrated that it had the interpersonal skills needed to work together smoothly.
5. The team demonstrated the interpersonal skills required to solve social problems that arose.
6. This team applied appropriate interpersonal skills to help the team or team members.
7. Members of this team called for help at appropriate times.
8. Members of this team inappropriately swapped off to avoid jobs they don't like.

TEAM PERFORMANCE CATEGORY 2: The extent to which effort or motivation was demonstrated in the behavior of the team during the period.
DURING PERIOD 11:

9. This team set high production goals.
10. When things were slow in an area, team members assigned there went to other areas and helped out.
11. This team wasted time at the beginning or end of shifts.
12. Members of this team maintained their focus.
13. Socializing on the floor exceeded acceptable levels.
14. Members of this team took on "opportunities" readily.
15. This team readily lowered or abandoned its goals.
16. This team worked hard to meet deadlines.
17. This team worked hard when deadlines were not pressing.

TEAM PERFORMANCE CATEGORY 3: The way the team approaches and manages its daily tasks and duties in order to achieve its production goals.
DURING PERIOD 11:

18. The team organized its work to make to most of its resources and talents.
19. The team set priorities appropriately.
20. The team successfully identified/analyzed problems with its task performance.
21. The team solved problems with its task performance.
22. The team successfully identified/analyzed interpersonal problems.
23. The team solved interpersonal problems.
24. This team did a good job of flowing to the bottlenecks.
25. Members of this team were able to see the big picture.
26. This team was able to come up with better ways to do its tasks.
27. This team made effective use of the coordinators' roles.

TEAM PERFORMANCE CATEGORY 4: The extent to which team members go "above and beyond" the basic requirements of the job.
DURING PERIOD 11:

28. Members of the team helped others with their work when needed.
29. Team members volunteered to do things not formally required.
30. Members of this team had good attendance.
31. Members of this team gave advance notice if unable to come to work.
32. Members of this team did things to help the overall image of the organization.
33. The members of the team did not let personal feelings get in the way of getting the job done.
34. Members of this team made personal sacrifices for the good of the team.
35. Team members came in early or stayed late for the benefit of the team.

OVERALL PERFORMANCE QUESTIONS

36. Overall, the team made good use of the technical knowledge and skills of its members.
37. Overall, the team made good use of the interpersonal knowledge and skills of its members.
38. Members of this team worked hard.
39. The team efficiently planned and organized its work.
40. Members of this team did "extras" for the good of the team.

Second Administration

TEAM PERFORMANCE CATEGORY I : The extent to which the team tapped and applied the knowledge and skills of its members during the period.

DURING PERIOD 12:

1. The team effectively assessed what it was doing right and what it was doing wrong.
2. The team demonstrated the technical knowledge and skills required to solve routine problems.
3. The team applied appropriate technical knowledge and skills to solve non-routine problems.
4. The team demonstrated that it had the interpersonal skills needed to work together smoothly.
5. The team demonstrated the interpersonal skills required to solve social problems that arose.
6. This team applied appropriate interpersonal skills to help the team or team members.
7. Members of this team inappropriately swapped off to avoid jobs they don't like.

TEAM PERFORMANCE CATEGORY 2: The extent to which effort or motivation was demonstrated in the behavior of the team during the period.

DURING PERIOD 12:

8. This team set high production goals.
9. When things were slow in an area, team members assigned there went to other areas and helped out.
10. This team wasted time at the beginning or end of shifts.
11. Members of this team maintained their focus.
12. Socializing on the floor exceeded acceptable levels.
13. Members of this team took on "opportunities" readily.
14. This team worked hard to meet deadlines.
15. This team worked hard when deadlines were not pressing.

TEAM PERFORMANCE CATEGORY 3: The way the team approaches and manages its daily tasks and duties in order to achieve its production goals.

DURING PERIOD 12:

16. The team organized its work to make to most of its resources and talents.
17. The team set priorities appropriately.
18. The team successfully identified/analyzed problems with its task performance.
19. The team solved problems with its task performance.
20. The team successfully identified/analyzed interpersonal problems.
21. The team solved interpersonal problems.
22. This team did a good job of flowing to the bottlenecks.
23. This team was able to come up with better ways to do its tasks.
24. This team made effective use of the coordinators' roles.

TEAM PERFORMANCE CATEGORY 4: The extent to which team members go "above and beyond" the basic requirements of the job.

DURING PERIOD 12:

25. Members of the team helped others with their work when needed.
26. Team members volunteered to do things not formally required.
27. Members of this team did things to help the overall image of the organization.
28. The members of the team did not let personal feelings get in the way of getting the job done.
29. Members of this team made personal sacrifices for the good of the team.
30. Team members came in early or stayed late for the benefit of the team.

OVERALL PERFORMANCE QUESTIONS

31. Overall, the team made good use of the technical knowledge and skills of its members.
32. Overall, the team made good use of the interpersonal knowledge and skills of its members.
33. Members of this team worked hard.
34. The team efficiently planned and organized its work.
35. Members of this team did "extras" for the good of the team.

Third, Fourth, and Fifth Administrations

TEAM PERFORMANCE CATEGORY 1 : The extent to which the team tapped and applied the knowledge and skills of its members during the period.

DURING PERIOD 13 (1) (2):

1. The team effectively assessed what it was doing right and what it was doing wrong.
2. The team demonstrated the technical knowledge and skills required to solve routine problems.
3. The team applied appropriate technical knowledge and skills to solve non-routine problems.
4. The team demonstrated that it had the interpersonal skills needed to work together smoothly.
5. The team demonstrated the interpersonal skills required to solve social problems that arose.
6. This team applied appropriate interpersonal skills to help the team or team members.

TEAM PERFORMANCE CATEGORY 2: The extent to which effort or motivation was demonstrated in the behavior of the team during the period.

DURING PERIOD 13 (1) (2):

7. This team set high production goals.
8. When things were slow in an area, team members assigned there went to other areas and helped out.
9. This team wasted time at the beginning or end of shifts.
10. Members of this team maintained their focus.
11. Members of this team took on "opportunities" readily.
12. This team worked hard to meet deadlines.
13. This team worked hard when deadlines were not pressing.

TEAM PERFORMANCE CATEGORY 3: The way the team approached and managed its daily tasks and duties in order to achieve its production goals.

DURING PERIOD 13 (1) (2):

14. The team organized its work to make the most of its resources and talents.
15. The team set priorities appropriately.
16. The team successfully identified/analyzed problems with its task performance.
17. The team solved problems with its task performance.
18. The team successfully identified/analyzed interpersonal problems.
19. The team solved interpersonal problems.
20. This team did a good job of flowing to the bottlenecks.
21. This team was able to come up with better ways to do its tasks.
22. This team made effective use of the coordinators' roles.

TEAM PERFORMANCE CATEGORY 4: The extent to which team members went "above and beyond" the basic requirements of the job.

DURING PERIOD 13 (1) (2):

23. Members of the team helped others with their work when needed.
24. Team members volunteered to do things not formally required.
25. Members of this team did things to help the overall image of the organization.
26. Members of this team made personal sacrifices for the good of the team.
27. Team members came in early or stayed late for the benefit of the team.

OVERALL PERFORMANCE QUESTIONS

28. Overall, the team made good use of the technical knowledge and skills of its members.
29. Overall, the team made good use of the interpersonal knowledge and skills of its members.
30. Members of this team worked hard.
31. The team efficiently planned and organized its work.
32. Members of this team did "extras" for the good of the team.

Appendix C
Descriptive Statistics

Raw Scores

Scales from Efficacy Questionnaire (N = 32)

	Mean	Standard Deviation
TASKEFF	6.99	.486
SOCEFF	6.11	.614
COLLEFF	6.67	.490
GLOBEFF	7.81	.361
FBSC	3.68	.604

Dimensions of Performance Behaviors (N = 40)

RKNOW	69.78	14.52
REFFORT	78.37	15.87
RSTRAT	70.70	14.69
RTCB	61.51	20.92
MNPERF	69.82	14.83

Outcome Measures (N = 40)

QUAL	467.93	400.99
MATU	66.37	4.92
QUAN	767.90	110.47
COMP	.015	.56

Composition Measures (N = 32)

WEXPCV	39.02	10.48
EDDUCCV	11.59	11.23
AGECV	23.90	4.64
TENURCV	37.89	8.65
DIVPC	58.40	14.15
MANUFPC	48.67	16.27

Residual Scores

Scales from Efficacy Questionnaire (N = 32)

	Mean	Standard Deviation
RTASKEFF	0	.209
RSOCEFF	0	.279
RCOLLEFF	0	.233
RGLOBEFF	0	.227

Rating Dimensions (N = 40)

RRKNOW	0	8.53
RREFFRT	0	7.08
RRSTRAT	0	8.74
RRTCB	0	12.3
RMNPERF	0	7.86

Outcome Measures (N = 40)

RQUAL	0	328.42
RMATU	0	4.84
RQUAN	0	82.59
RCOMP	0	.47

Composition Measures (N = 32)

RWEXPCV	0	6.35
REDDUCCV	0	9.80
RAGECV	0	2.20
RTENURCV	0	6.37
RDIVPC	0	5.53
RMANUFPC	0	10.05

Between-team Mean Scores

Scales from Efficacy Questionnaire (N = 8)

	Mean	Standard Deviation
BTASKEFF	6.99	.438
BSOCEFF	6.11	.546
BCOLLEFF	6.67	.432
BGLOBEFF	7.81	.280

Rating Dimensions (N = 8)

BRKNOW	69.04	12.01
BREFFRT	78.01	13.21
BRSTRAT	70.20	11.71
BRTCB	59.17	16.41
BMNPERF	68.77	12.01

Outcome Measures (N = 8)

BQUAL	440.22	201.53
BMATU	67.53	1.21
BQUAN	784.34	81.40
BCOMP	.019	.29

Composition Measures (N = 8)

BWEXPCV	39.02	8.34
BEDDUCCV	11.59	5.49
BAGECV	23.90	4.09
BTENURCV	37.89	5.85
BDIVPC	58.39	13.02
BMANUFPC	48.67	12.80

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PUBLICATIONS

Journal Articles

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