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# To Lead a Team: Construct Validity Evidence for Team Leadership in the High-Tech Industry

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# TO LEAD A TEAM: CONSTRUCT VALIDITY EVIDENCE FOR TEAM LEADERSHIP IN THE HIGH-TECH INDUSTRY

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## ABSTRACT

TO LEAD A TEAM: CONSTRUCT VALIDITY EVIDENCE
FOR TEAM LEADERSHIP IN THE HIGH-TECH INDUSTRY

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Two studies were conducted to gather evidence of construct validity for functions of team leadership. The research built on a continuing line of background research. Three hundred and thirty-seven team leaders from sixty-three companies in the manufacturing electronics industry participated in the studies and completed surveys.

Four types of validity evidence were examined: content, criterion-related, convergent, and discriminant. Content validity evidence was demonstrated in Study 1. The overwhelming majority of team leaders performed the proposed functions and rated them as important. A confirmatory analysis did not indicate a parsimonious fit among the seven functions that were generated from background research and from an integration of team and leadership literature. An exploratory analysis, however, did demonstrate a structure that corresponded to the twenty activities associated with the seven functions. Each factor related to these activities was transformed into a scale. Nine of the sixteen resulting scales were included in Study 2.

Study 2 examined criterion-related, convergent, and discriminant validity evidence. Strong support was shown for the criterion-related propositions. These propositions included relationships between the team leader activities and other variables related to organizational functioning. Strong evidence for discriminant validity was also found. The team leader scales did not relate to variables that were outside the nomological net. In contrast, only partial evidence for convergent validity was demonstrated.

Overall, initial support for the existence, importance, and validity of the team leader functions and activities was found. Methodological limitations and implications for future research were discussed.

*To acquire the sciences and arts is the greatest glory of mankind...*

*-'Abdu'l-Bahá*

**For Mama and Papa**

**and for Mahnaz Dadressan – May you fly freely and happily.**

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I thank Jeff Sinn for delving into the theory with me, challenging me, and inspiring me to think critically; Laura Hamill and Andrea Berndt for their help with statistics; and Barbara Bonheur for listening to my latest thinking on our daily runs. Drs. Peter and Janet Khan, Ardythe and Bob Morrow, Carole and Dwight Allen, and Ronn Bonheur offered professional guidance, and so many others wonderful friends, too numerous to mention, have contributed substantially through their encouragement and support. Finally, I thank my loving family, and especially my parents Oscar and Winnie Merritt, without whom this never would have been possible.

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# CHAPTER I

## INTRODUCTION AND STUDY 1 LITERATURE REVIEW

The world of work has changed dramatically in recent years and has required the adoption of new roles and responsibilities for workers (e.g., Cascio, 1995; Graham & LeBaron, 1994; Heifitz & Laurie, 1997; Lawler, 1992; Peters, 1987; Pfeffer, 1995; Walton, 1985). Popular press and academic periodicals alike have argued that work processes and management philosophies must change in order to ensure organizational effectiveness in the emerging global marketplace. Some of the most touted characteristics of successful companies focus on quality, flexibility, attention to the customer, increased and improved communication, rapid response times, a multi-skilled workforce, and an increasing reliance on teams.

Team development is a critical human resource issue currently facing companies. Many human resource professionals have stated that team development is the single most important issue of the decade (Flynn, 1994). And effective teams hinge on having effective leaders (Katzenback & Smith, 1993). Therefore, as teams increasingly are emphasized, developed, and implemented in organizations, team leaders' contributions to company performance must be examined as well.

Until team leadership behavior issues are addressed more thoroughly, team effectiveness itself will not be optimized (Pratt & Jiambalvo, 1981). When considering work teams and related research, several authors have urged that the roles of team leaders and leadership not be overlooked (Ilgen, Major, Hollenbeck & Sego, 1993; Mohrman, Cohen, & Mohrman, 1995; Ruggeberg, 1996). Formal team leadership is crucial for team success or failure (Fisher, 1994; Ginnett, 1990), and an ineffective team leader can contribute to teamwork failures (Burgess, Riddle, Hall, & Salas, 1992; Oakland, 1989; Stewart & Manz, 1994).

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The Publication Manual of the American Psychological Association (4th ed.) was used as a model for the formatting of this dissertation.

Leadership does not only mean "influencing team effort" but rather fundamentally altering what team effort is all about (Larson & LaFasto, 1989). Team leaders impact team effectiveness by re-framing thinking, by intervening judiciously at different stages of team development and in different types of team performance situations (Kozlowski, Gully, McHugh, Salas, & Cannon-Bowers, 1996; Morgan, Glickman, Woodard, Blaiwes, & Salas, 1986), by ensuring that shared goals and communication are emphasized (Katzenback & Smith, 1993), and by assisting teams to become mature and self-managed (Jessup, 1990; Manz & Sims, 1993).

## Overview

This study was part of a larger program of research designed to define and validate the functions or work-related roles of the most successful team leaders in the high-tech manufacturing industry, an industry at the leading edge in the development of innovative technology and human resource practices (Kravetz, 1988; Warrick, 1990). Extensive background research efforts led to this study and to the identification of seven functions and twenty activities of team leadership. The purpose of the present research was to gather construct validity evidence for those functions and activities. This was accomplished by a content validation effort in Study 1, exploring the prevalence, importance, and model fit of the seven team leader functions. Toward that end, leadership theory and a model of team effectiveness were reviewed and then integrated with the functions of team leadership identified in the background research. Furthermore, specific team leadership literature was reviewed for support of the functions. Based on the findings from Study 1, Study 2 explored criterion-related, convergent, and discriminant validity evidence of team leader functions and activities. Organizational models and the relationship between organizational variables and team leadership functions were considered and reviewed in support of Study 2 propositions of validity evidence.

## Background Research

The background research efforts are briefly outlined here first because the functions identified through that research formed the foundation of the present study. Following this section, the theoretical framework for the present study will be introduced. The background research will be reviewed in more detail in the Methodology chapter.

As a foundation for this study, the American Electronics Association (AEA), the primary trade association for the high-tech industry, was contracted by the U.S. Department of Labor to define the critical facets of team leadership in manufacturing electronics teams. The project was a national effort to strengthen the skills of the United States' high-tech workforce. The three goals of the project were: (a) to develop voluntary, industry-driven skill standards for key work roles throughout the high-tech industry; (b) to assist companies to use those standards to improve training, hiring, and performance management systems; and (c) to work with educators and trainers to use the standards to better prepare people for work in the high-tech industry. The present study addressed the first goal in particular, and future research building on this study will address the other two goals.

The project was funded for the electronics industry by the U.S. Department of Labor with matching support from the AEA and AEA member firms. It was one of 23 industry-based, government-supported projects to develop skill standards for occupational areas across different American industries (Antonucci & Merritt, 1996). Prior to this study, AEA sponsored the development and validation of skill standards using a similar methodology for three other high-tech front-line occupational groups: manufacturing specialists, administrative/information specialists, and pre- and post-sales representatives (Antonucci & Tannenbaum, 1995).

The background research for the present study included several steps. Extensive information was solicited from over 100 subject matter experts, including team leader

incumbents, human resource specialists, educational reviewers, and technical experts in the field of industrial/organizational psychology. The research steps included preliminary interviews with human resource experts to broadly describe the team leader occupation and to determine its prevalence and form in the high-tech industry. At the same time, an extensive literature review was conducted to ensure the study was grounded in a theoretical and empirical basis. Next, panel discussions were conducted in two phases with front-line team leaders and their supervisors at four company sites in different parts of the country to identify functions, activities, and performance indicators of team leadership. "Functions" were the general overarching team leader roles, "activities" were the broad tasks that had to be completed to fulfill the function role, and "performance indicators" were task items that ensure the activity was successfully completed. According to Department of Labor guidelines, the resulting model of functions, activities, and performance indicators was labeled the "manufacturing specialist team leader standards" (Antonucci & Merritt, 1996).

Following this initial identification of the standards, researchers made site visits to three companies to observe the work of team leaders and to interview incumbents and human resource specialists to gather further evidence of the appropriateness of the standards. Reviews of the findings were conducted by the researchers to ensure their accuracy throughout the research effort. In the next phase, telephone interviews with eight human resource executives were conducted to determine whether the standards were comprehensive, whether they included any areas of work that were irrelevant, and to refine the general wording and the performance indicator items. Further reviews by the technical team were then conducted to refine the standards – the listing of the functions, activities, and performance indicators; and a draft survey to validate the standards was developed. Next, a conference call with five industry and educational experts was held to preview the standards and the related team leader survey.

Editing and technical changes were made to the standards and to the survey as a result of this conference. The revised survey was the measure used in the current study to validate the team leader functions and activities.

In the final stages of the background research, the standards and the survey were presented to two project managing committees to review their comprehensiveness, accuracy and applicability. Finally, a pilot study of the measure was conducted with participants from four companies to further refine the measure for the construct validation research in the present study. The seven functions and twenty activities (Antonucci, Merritt, & Rose, 1995) that were identified based on this research were the focus of the current study and are outlined in Table 1.

The purpose of the present research in Studies 1 and 2 was to gather construct validity evidence for the functions and activities identified in Table 1. Study 1 introduced a theoretical rationale for the team leader standards, drawing from leadership theories, models of team effectiveness, and team leadership literature. Content validity propositions were the focus of Study 1. Study 2 drew on the findings from Study 1 to relate the relevant team leadership functions to other organizational variables outlined in a model of effective organizational functioning. Study 2 examined criterion-related, convergent, and discriminant validity propositions.

Table 1

Functions and Activities of Team Leadership Identified in Background Research

| | | |
|---|---|---|
| Function 1: **Production Process** – Enable team to develop, monitor and improve production processes and systems to meet business requirements and customer needs. | | |
| Activity | 1.1 | Help team to interpret process flow instructions and monitor manufacturing cycle time. |
| | 1.2 | Help team to develop and monitor measurements of production performance and address problems that arise. |
| | 1.3 | Help team to improve overall production processes to ensure product quality, and to meet customer specifications and business requirements. |
| Function 2: **Material Resources** – Ensure the availability of machines, equipment, and materials to meet business requirements and customer needs. | | |
| Activity | 2.1 | Help team to ensure the availability and maintenance of machines and equipment. |
| | 2.2 | Help team to obtain and allocate materials to meet business requirements and customer needs. |
| Function 3: **Team Relationships** – Facilitate and model productive work relationships within the team. | | |
| Activity | 3.1 | Help team to improve communications within the team. |
| | 3.2 | Help team create an environment that encourages and supports change. |
| | 3.3 | Help train and encourage team in problem-solving and decision-making. |

Table 1 (continued)

| | | |
|---|---|---|
| Function 4: **Human Resources** – Help team to ensure it has necessary human resources to meet business requirements and customer needs. | | |
| Activity | 4.1 | Help team to identify and plan for team human resource requirements and customer needs. |
| | 4.2 | Help team to assess and meet team and individual training and development requirements. |
| | 4.3 | Help team to assess and provide feedback on performance. |
| | 4.4 | Help team to make recommendations for team hiring, reward, reassignment, and removal based on company standards, legal requirements, team needs and other key considerations. |
| Function 5: **External Relationships** – Enable team to establish and enhance linkages beyond the team to meet business requirements and customer needs. | | |
| Activity | 5.1 | Help team to build productive working relationships beyond the team. |
| | 5.2 | Help team to communicate effectively with customers. |
| Function 6: **Motivating to Excellence** –Provide leadership to help team meet business and customer needs. | | |
| Activity | 6.1 | Help team to coordinate and align its activities and goals with the mission, values, and business strategy of the larger organization. |
| | 6.2 | Motivate fellow team members to excel and encourage team members to motivate each other. |
| | 6.3 | Resolve conflicts and make decisions when team is unable to do so on its own. |

Table 1 (continued)

| | | |
|---|---|---|
| Function 7: **Continuous Improvement** – Enable team to understand the process of continuous improvement and integrate it into everything they do. | | |
| Activity | 7.1 | Ensure the team understands the continuous improvement processes. |
| | 7.2 | Ensure the team understands customer needs and business requirements in making continuous improvements. |
| | 7.3 | Help team to make continuous improvements based on customer needs and business requirements. |

The most logical literature base to draw from to substantiate the team leader functions in Study 1 first appeared to be the team leadership literature. However, the empirically-based leadership literature directly applied to teams was relatively small (see Ruggeberg, 1996). Despite the proliferation of studies on team effectiveness and on leadership behaviors, few authors have proposed and empirically tested models of effective team leader behaviors. Because both the leadership and team literatures and their empirical bases are voluminous, it was surprising that there was so little empirical work on their integration applied to team leadership. Thus, this study represented a unique effort to integrate the team effectiveness and leadership literatures in order to define and examine the role that team leaders play in one setting, the high-tech industry.

Figure 1 demonstrates the general framework adopted for integrating the literatures in this study. The figure does not represent an empirical model but rather a heuristic illustrating how the literatures were approached and integrated in Study 1 to support the identification of team leader functions. In general, it was proposed that appropriate leadership enables teams to

function effectively and that seven team leadership functions represent effective team leadership in the high-tech industry. In particular, four leadership processes were considered that enable leaders to help teams achieve success. The specific duties of an effective team were represented by seven functions of a team model. The relationship between leadership processes and team effectiveness were considered, and then the seven team leadership functions identified in the background research were integrated with the seven team functions.

## Leadership Theory

Many theoretical approaches have been offered in the leadership literature (e.g., Bass, 1990; Graen & Scandura, 1987; Stogdill, 1974; Vroom & Yetton, 1973; Yukl & Van Fleet, 1992). Though Hackman and Walton's (1986) functional leadership approach was adopted for the present research, it is important to first review what is meant by leadership, in general. Leadership has been commonly viewed as an influence process. Chemers (1993) defined leadership as a process of social influence and stated that effective leadership is the successful application of influence to accomplish the mission of the group or individual being led. Similarly, after a comprehensive review of the literature, Yukl and Van Fleet (1992, p. 149) presented a working definition of leadership as "a process that includes influencing the task objectives and strategies of a group or organization, influencing people in the organization to implement the strategies and achieve the objectives, influencing group maintenance and identification, and influencing the culture of the organization." This definition was adopted in the present study.

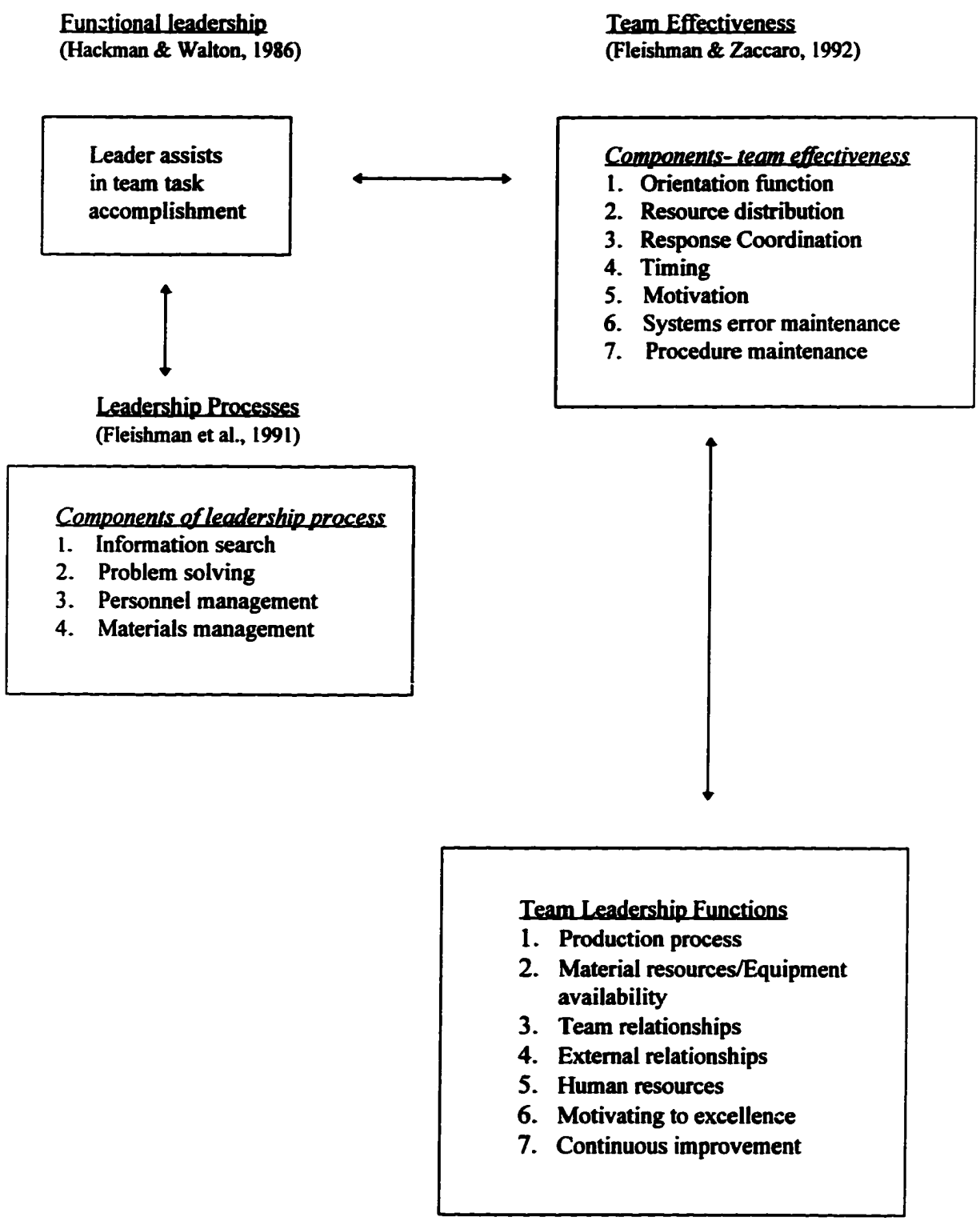


Figure 1. Framework for integrating team and leader literatures.

Many theoretical perspectives on the process of leadership, each with a different focus, have been offered in the literature. Some emphasize the personality of the leader, in particular the charismatic influence of leader personality (e.g., Conger & Kanungo, 1987; House, 1977), the transformational aspects of leadership (e.g., Bass, 1985, 1990; Bass, Avolio, & Goodheim, 1987), and task- vs. people-oriented leaders (e.g., Fiedler, 1967, 1978). Others examine the unique characteristics of dyads of leaders and followers (e.g., Graen, 1975; Graen & Scandura, 1987), substitutes for leadership (e.g., Kerr & Jermier, 1978), subordinate perceptions of leaders (e.g., Lord, DeVader, & Alliger, 1986; Lord & Maher, 1991), specific behavioral practices (e.g., Yukl, 1989; Yukl & Van Fleet, 1992), or decision-making styles (e.g., Beach, 1993). Each of these theories has a substantial empirical basis and wide applicability for understanding leadership in general.

Other leadership theories place less emphasis on the leader and the individual characteristics of the follower and focus instead on the outcomes that should result from leadership. One such approach, known as functional leadership (Hackman & Walton, 1986). was adopted in this study. Leadership was examined in terms of the completion of team tasks rather than as a focus on leader personality, follower perceptions, or cognitive models.

## Functional Leadership Theory

Hackman and Walton (1986) proposed a theory of functional leadership based on the leadership of groups in particular. Their main thesis was that leaders occupy functional social roles and that effective leader behavior enables the group's task accomplishment, whether the leader acts in a direct or an indirect manner to facilitate performance. This theory stated that the focus should not be on what the leader *does* but rather on what needs to be achieved. Therefore, a leader has done his or her job well when s/he ensures, by any possible means, that every critical function for effective team performance has been adequately carried out.

This approach to leadership as a process for enabling team work has been well-suited for recent workplace changes. Cascio (1995) suggested that in rapidly changing organizations in the current marketplace, the use of narrow job descriptions to describe the role of workers has been inappropriate and that a better means of describing work would be to focus on the "work that needs to be done." This approach to describing the work of front-line employees was represented in the background research efforts for this study of team leaders (Antonucci & Merritt, 1996), as well as in previous validity studies on other occupations (Antonucci & Tannenbaum, 1995).

Hackman and Walton (1986) argued in favor of the functional leadership approach by contrasting former President John F. Kennedy's leadership in the Bay of Pigs and in the Cuban Missile Crisis. The President's handling of the latter was considered much more effective because he did *not* get too involved in the actual work of his advisory team, whereas in the former situation, many of the ineffective actions were a result of the leader attempting to lead in every aspect of the team's functioning, rather than relying on team members to successfully carry out their individual tasks. While one should not infer that this means the team leader must never do the actual work him or herself, it does imply that a leader must survey the capabilities of the team and the most important functions of the team to determine the most appropriate type of leadership. Obviously, a team may be effective *in spite of* the efforts of a leader; however, this caveat will have to be considered in future research. The purpose of the present research was to examine effective team functioning and then define team leader roles in light of what makes a team successful.

Hackman and Walton's (1986) view, thus, offered a perspective on leadership as a process to enable team accomplishment rather than on it as a leader trait (e.g., Bass, 1990; Fiedler, 1978; Stogdill, 1974), as a characteristic of leader-member relations (e.g., Graen &

Scandura, 1987), or as the result of cognitive attributions of followers (e.g., Lord & Maher, 1991). Based on this perspective, the seven functions of team leadership identified in the background research were defined by the desired accomplishments of the team rather than long task lists of detailed actions. The assumption was one of equifinality, that a number of different leader styles and traits could lead to the same outcome. This approach was not meant to discount the unique effects of traits, situations, or other aspects of leadership. This study sought only to describe a general classification of team leadership functions that lead to team effectiveness and to relate those functions to other aspects of organizational functioning.

In contrast to some approaches, most notably Kerr and Jermier's substitutes for leadership (1978), leadership was defined here in relation to a single individual occupying a social role. The functional leadership theory framed leadership in terms of an individual in a particular social role who seeks to influence transformation processes so that organizational systems reach their goals (Mumford, 1986). Although leadership responsibilities may rotate, organizational variables besides leadership may play a more prominent role in team success, or more than one person may carry out different leadership roles, the focus in the present study was on one individual formally recognized as the leader.

## Leadership Dimensions

The functional leadership approach focuses on a leader's desire to achieve team outcomes and was built on the premise that a leader defines goals and seeks to attain them (Fleishman et al., 1991). This approach implies intentional goal-oriented behaviors and processes on the part of the leader. Fleishman and colleagues reviewed four decades of leadership models addressing dimensions of leader behavior and integrated them into a taxonomy. Their review demonstrated that there were, as indicated in Figure 1, four general processes for effective leadership: information search and structuring, problem solving,

maintaining personnel resources, and maintaining material resources. These processes were the dimensions of their leadership taxonomy and are briefly considered below in relation to functional leadership.

In an effort to integrate findings from many authors, Fleishman and colleagues (1991) formulated a general taxonomy of leadership processes drawing from 65 previous leadership classification systems. The taxonomy was based on three steps of classification (Fleishman & Quaintance, 1984): an explicit definition of the targeted domain of leadership; identification of the causal variables that affect the domain; and evaluation of the classification based on validity evidence. First, they defined effective leader behavior in terms of functional behaviors which influence the transformation process of relevant subsystems, interacting with individuals and groups. Leaders occupy a social role and their behaviors are reflected in both overt and covert actions (Hackman & Walton, 1986; Katz & Kahn, 1977; Mumford, 1986). Combining their discussion of leadership with an emphasis on sociotechnical systems theory, the authors argued that collective, group action is a better means of achieving organizational goals than individual efforts and that leader behavior must attend to both subordinate interactions and task accomplishment.

In the second step of classification, Fleishman et al. (1991) identified variables related to one another in a causal model of leadership. They found three similarities across the classifications of leadership: a social emphasis exemplified by "consideration" in Fleishman's (1953) leadership framework; a dimension of task accomplishment, similar to "initiating structure" in Fleishman's (1953) framework; and a focus on human and material resource management. These similarities were represented in four leadership processes in their taxonomy: information search and structuring, problem solving, maintaining personnel

resources, and maintaining material resources (Fleishman et al., 1991). See Table 2 for an outline of the processes and related sub-dimensions.

Table 2

Leadership Behavior Dimensions

1. Information Search and Structuring
    a. Acquiring information
    b. Organizing and evaluating information
    c. Feedback and Control
2. Information Use in Problem-Solving
    a. Identifying needs and requirements
    b. Planning and coordinating
    c. Communicating information
3. Managing Personnel Resources
    a. Obtaining and allocating personnel
    b. Developing personnel resources
    c. Motivating personnel resources
    d. Utilizing and monitoring personnel resources
4. Managing Material Resources
    a. Obtaining and allocating material resources
    b. Maintaining material resources
    c. Utilizing and monitoring material resources

Each of the four processes outlined in Table 2 were inter-related and were proposed to enable leader effectiveness and therefore to lead to group effectiveness. As the third and final step in classification, the authors reviewed several studies that upheld this proposition and lent construct validity evidence to their taxonomy.

The first process, information search and structuring, related to the leader's examination of the general group situation. As noted in Table 2, sub-dimensions included acquiring information, organizing and evaluating information, and feedback and follow-up. The leader used that information for active problem-solving in the second dimension of leadership. The related sub-dimensions were the identification of needs and requirements, planning and coordination, and communication. In the third dimension, to successfully manage personnel resources, the leader obtained and allocated the resources, developed resources, motivated personnel, and used and monitored the available personnel resources. As with managing personnel resources, three sub-dimensions for the final dimension of managing material resources were obtaining and allocating material resources, maintaining them, and using and monitoring the available material resources.

## Relationship between Leadership Processes and Team Leader Functions

Fleishman and colleagues' (1991) four leadership processes were reflected in the team leader functions developed for the present study (refer to Table 1). The purpose was not to define a one-to-one correspondence between the four leadership dimensions and the seven team leader functions but rather to consider how these four leadership processes were represented across and within the seven functions. The assumption was that each of the seven functions included components of the four processes.

The leader information search and acquisition dimension and its sub-dimensions of acquiring, organizing, and feeding back information were reflected throughout the team leader

functions. Phrases such as "monitor...processes," "interpret process flow," "identify...resource requirements and customer needs," "assess...training and development requirements," "assess... performance," and "provide feedback on performance" in the team leader functions all related to gathering information and using it for follow-up as described by this leadership process.

The problem-solving process and its sub-dimensions of identifying needs, planning, and communicating were also evident throughout the team leader functions. These were reflected in the team leader functions such as "improv[ing] production processes," "motivat[ing] team members to excel," "resolv[ing] conflicts when the team is unable to," and "ensur[ing] the team makes continuous improvements." The sub-dimension of identifying needs and requirements was specifically included as well. For example, the human resources team leader function included "identify and plan for...requirements and needs" and "meet team and individual training and development requirements." Planning was likewise identified in activities about "allocat[ing] materials" and "plan[ning] human resource requirements." And the final sub-dimension of communicating was found in both the Team Relations and External Relations functions with activities that specifically addressed "improv[ing] communications."

Finally, the third and fourth leadership processes regarding personnel and material resource maintenance were related to the team leader functions as well. Two particular functions addressed these processes. In the Material Resources function, team leaders assist the team to ensure they have machines, equipment, and materials available for meeting business and customer needs. The leader also enables the team to survey its human resources in the Human Resources function and assists them in identifying and planning activities based on these resources. Additionally, the Motivating to Excellence function addressed the leadership sub-dimension directed at motivating personnel. Furthermore, the Continuous Improvement function was aimed at ensuring that all team functions are monitored, maintained and improved – relating

to each of the sub-dimensions of the third and fourth dimensions of leadership, maintaining and utilizing resources.

The relationship between the leadership processes and the team leader functions demonstrated a compatibility in approaches. The last two leadership resource dimensions addressed specific functions that were explicit in the team leader functions. The other two leadership information dimensions were focused on more general processes and therefore were related to a number of the team leader functions. As has been noted, both the leadership taxonomy (Fleishman et al., 1991) and the background research (Antonucci & Merritt, 1996) drew from Hackman and Walton's (1986) functional leadership theoretical approach and therefore this compatibility was not surprising.

The focus of the functional leadership approach on the outcomes that need to be achieved rather than on the personality or specific behaviors of the leader lent itself to the focus in this study on the process of leadership as a means of achieving group goals. It was proposed that drawing on these underlying leadership processes, an effective "functional" leader works to achieve the desired team outcomes. Based on this goal of team success, models of team effectiveness are examined next.

## Model of Team Effectiveness

Having described both the general approach to leadership (Hackman & Walton, 1986) and the specific processes by which leaders assist groups, the next necessary step was an examination of team effectiveness, the ultimate outcome of interest for an effective team leader. Particular team outcomes were expected to occur when the appropriate process for leadership was in place. This section outlines the team definition and the model (Fleishman & Zaccaro, 1992) that was adopted for understanding team functioning and effectiveness in this study.

## Definition of Team

Across the vast amount of literature available on teams, the definition of a team appeared to have some consistency. One common definition described a team as two or more individuals who are interdependent and who interact adaptively to attain specific, shared goals (Morgan et al., 1986). Very similar definitions have been adopted by a number of authors (e.g., Ilgen, Major, Hollenbeck, & Sego, 1995; Salas, Dickinson, Converse, & Tannenbaum, 1992; Yanushefski, 1995). Elaborating on the purpose of teams, Fisher (1994) described teams as non-authoritarian work structures with shared responsibility for decision-making, problem-solving and organizational design. This definition and description of teams was adopted in the present research. The key components appeared to be that a distinguishable and small set of people is working together dynamically on a task goal that requires their interdependence and coordination.

## Taxonomy of Team Effectiveness

Many models were proposed for describing team relations and effectiveness (e.g., Campion, Medsker, & Higgs, 1993; Dickinson et al., 1992; Fleishman & Zaccaro, 1992; Gladstein, 1984; Hackman, 1983; Kozlowski et al., 1996; McGrath, 1984; Morgan et al., 1986; Nieva, Fleishman, & Rieck, 1978; Salas et al., 1992; Sundstrom, De Meuse, & Futrell, 1990). It was noteworthy that most of these models were based on reviews and integrations of previous work. Therefore, although many of these were proposed recently, they were built on decades of research on groups and teams.

These team models addressed a number of different variables, including team processes and changes over time with associated team training models (e.g., Gersick, 1988; Morgan et al., 1986; Salas et al., 1992), stress and mental models that develop in stressful situations (e.g., Burgess et al., 1992; Kozlowski et al., 1996), specific task and technology demands (e.g., Fry &

Slocum, 1984; Goodman, 1986), decision-making processes (e.g., Guzzo & Salas, 1995; Ilgen et al., 1995) and individual characteristics of group members such as effort, motivation, and attitudes (e.g., Hackman & Morris, 1975; Hackman & Oldham, 1980; House, 1971).

Although these variables are important, in the present research, teams were not being examined in terms of time, training models, team composition, or member characteristics. Because the focus of this research was on functional leadership and what needs to be accomplished by leaders for team effectiveness, behavioral team models appeared the most relevant for this study (e.g., Dickinson et al., 1992; Gladstein, 1984; McGrath, 1984; Morgan et al., 1985; Salas et al., 1992). As demonstrated below, through an examination of general team functions, the specific coordinated team member efforts that the leader needs to influence were identified.

Goodman, Ravlin and Argote (1986) have noted that team models of effectiveness share more emphases in common than those on which they differ. The authors attributed this to the large amount of research that has been conducted on team variables over the last four decades, to the influence of a few dominant models of team functioning (e.g., McGrath, 1984), and to the common theoretical training of the researcher "architects." The similarities Goodman and colleagues identified across the models they examined (e.g., Gladstein, 1984; Hackman, 1983; Kolodny & Kiggundu, 1980; Nieva et al., 1978) were similar levels of analysis – specifically, individual, group, and organization; the attributed importance of antecedent and environmental variables; the emphasis on group process variables; and the definition of group effectiveness. While a number of these team models might have been included in this study, in the interest of brevity, only those that formed the foundation of the adopted taxonomy were reviewed.

The team behavior model adopted in this study was chosen based on its fit with the functional leadership approach (Hackman & Walton, 1986) and the leadership processes

(Fleishman et al., 1991) that support leader efforts. The team functions were then related to the functions of team leadership identified in the background research for this study (Antonucci & Merritt, 1996).

While a number of behavioral models might have been used in this study, Fleishman and Zaccaro's (1992) model was adopted because it built on findings from previous research, namely McGrath (1964) and Nieva et al. (1978) and involved extensive research efforts to develop, refine, and validate a taxonomy of team functions. This taxonomic approach fit particularly well with the emphasis in this study on team leadership functions. As noted above, the purpose was not to evaluate the teams or team leaders over time or in different types of situations, but rather to understand and describe general facets of team leader functioning.

McGrath (1984) and Nieva et al.'s (1978) models have been used as the premise of other integrative examinations of team models (i.e., Goodman et al., 1986; Salas et al., 1992), and therefore Fleishman and Zaccaro's (1992) taxonomy built on a common foundation with other team research. Their model identified seven team functions: orientation, resource distribution, timing, response coordination, motivational, systems monitoring, and procedure maintenance. The development of this taxonomy is briefly reviewed below and then compared to the team leadership functions identified in background research.

Fleishman and Zaccaro (1992) argued that previous classification efforts (Hackman & Morris, 1975; McGrath, 1984; Steiner, 1972) were useful for understanding broad domains of group performance but were not specific enough to address the coordinated activities that group members engage in. In their research and taxonomy, they defined team performance as "the goal-directed behaviors/activities/functions accomplished by the team in performing the task" (Nieva et al., 1978, p. 54). They drew from the group task categories included in McGrath's

(1984) taxonomy and integrated them with four categories of team performance functions outlined by Neiva et al. (1978).

To develop and validate their resulting taxonomy, Fleishman and Zaccaro (1992) drew from the classification principles of Fleishman and Quaintance (1984): domain definition, identification of the causal variables, and evaluation of the classification based on validity evidence. The classification system fit the purpose of the present study because the aim was three-fold: (a) to expose knowledge gaps – in this case, the relation between team and leader literature in a model of team leader functioning; (b) to generalize results to new tasks – the high-tech product manufacturing area; and (c) to assist in theory development – an integration of two literatures that informs a third literature, team leadership, and an empirical validation of the related team leader functions. After several experimental and observational studies (Shiflett, Eisner, Price, & Schemmer, 1982; Cooper, Shiflett, Korotkin, & Fleishman, 1984), the authors defined seven general functions of team performance that were specific enough to offer measurable behavioral information but not so specific that only certain team tasks, situations, timing, and phases of team development can be explained by the functions.

## Final Team Taxonomy Functions

As a result of these validation efforts, Fleishman and Zaccaro's (1992) final taxonomy included seven functions, outlined in Table 3 (Fleishman & Zaccaro, 1992, p. 51). The *orientation* function addressed activities associated with team planning and with ongoing information, feedback, and action about team resources, goals and priorities, and environments. The *resource distribution* function referred to the process of assigning and balancing resources, particularly member resources. The third function was *timing* which was concerned with the timeliness of task completion and involved pacing team activities both in the planning and implementation phases. The *response coordination* function referred to the process of

coordinating, sequencing, and integrating team member activities in an order that was intended to increase efficient and smooth responses and reduce member conflict. The *motivational function* was the fifth function and addressed processes by which team objectives were defined and members were motivated to accomplish the objectives. This included the development and acceptance of performance norms, creation of performance-reward linkages, a balance between team and individual goals, shared commitment among members, and the resolution of conflicts among members. The sixth function was *systems monitoring* and referred to error detection in both the nature and timing of activities. Both general team activity and individual activity were monitored, resulting in adjustments when errors occur. *Procedure maintenance* was the final function and was the process of behavior monitoring to ensure performance standards were adhered to in both standard and non-standard procedure-based work.

Benefits and Limitations of Team Taxonomy

There were several reasons this taxonomy was appropriate as support for the present study. The taxonomy represented a well-defined and empirically tested model of team performance. This type of team model was essential for the present research because the functional leadership approach required clearly and completely described functions for the accomplishment of team effectiveness. Furthermore, this taxonomy was appropriate because it built on a review of two seminal team models (i.e. McGrath, 1984; Nieva et al., 1978) recognized in a number of studies as important foundations for the examination of team performance. Fleishman and Zaccaro drew from a plethora of team literature, previous findings, validity evidence, and iterative refinements of the taxonomy. They were both specific and comprehensive in identifying the behavioral aspects of the taxonomy, and they based their classification on rigorous steps of taxonomic development used in a number of past studies (e.g.,

Table 3

Taxonomy of Team Functions

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I. Orientation Functions

- A. Information exchange regarding member resources and constraints
- B. Information exchange regarding team task and goals/mission
- C. Information exchange regarding environmental characteristics and constraints
- D. Priority assignment among tasks

II. Resource Distribution Functions

- A. Matching member resources to task requirements
- B. Load balancing

III. Timing Functions (Activity Pacing)

- A. General activity pacing
- B. Individually oriented activity pacing

IV. Response Coordination Functions

- A. Response sequencing
- B. Time and position coordination of responses

V. Motivational Functions

- A. Development of team performance norms
- B. Generating acceptance of team performance norms
- C. Establishing team-level performance-rewards linkages
- D. Reinforcement of task orientation
- E. Balancing team orientation with individual competition
- F. Resolution of performance-relevant conflicts

Table 3 (continued)

| |
|---|
| VI. Systems Monitoring Functions |
| A. General activity monitoring |
| B. Individual activity monitoring |
| C. Adjustment of team and member activities in response to errors and omissions |
| VII. Procedure Maintenance Functions |
| A. Monitoring of general procedural-based activities |
| B. Monitoring of individual procedural-based activities |
| C. Adjustments of nonstandard activities |

Fleishman et al., 1991; Fleishman & Mumford, 1988; Fleishman & Quaintance, 1984; Theologus & Fleishman, 1973).

Moreover, the four leadership processes previously identified (Fleishman et al., 1991) were complementary to the underlying processes observed in empirical validation efforts (Shiflett et al., 1982) for the team taxonomy. Fleishman and Zaccaro (1992) defined the functions as behavioral performance episodes, and upon observation of team performance in the field, they identified each function in terms of three processes: information processing, action implementation, and monitoring and feedback. It was noteworthy that these three dimensions were very similar to three of the leadership processes that Fleishman et al. (1991) identified: information search and structuring, problem solving, and maintaining resources. These similarities indicated that the foundation of the leader and team taxonomies that were integrated in this study identified parallel underlying processes. This dovetailing of the leadership and team literatures was a unique foundation and strength of the present study. Given the current

study's focus on identifying related functions of team leadership, the specificity, comprehensiveness, and empirical validity of the team model were important building blocks on which to propose the team leadership functions. Finally, the findings in the present study may offer further insights about the generalizability of Flcishman and Zaccaro's team performance functions and provide further revisions to their taxonomy in the future.

As with any model, there were also limitations to the adoption of Fleishman and Zaccaro's taxonomy for the current research. The most outstanding limitation was that this team model was adopted in order to substantiate previous research, the seven team leader functions that had already been identified in the background research. The fact that the literature for this study was reviewed to complement the existing seven team leader functions was likely to narrow the vista of theories that were considered and adopted. Background research for this study drove the emphasis toward behavioral functions and built on the premise of functional leadership. Both of these influences affected the leadership literature and the team literature that were reviewed. However, the recognition of these influences did not change the fit between the team leader functions and the literatures that were reviewed. Furthermore, some methodological and theoretical approaches such as grounded theory (Strauss & Corbin, 1990) have argued that there should be an iterative interchange between theory development and data gathering. This was the approach used in this study – i.e., literature was reviewed and the seven team leadership functions were developed in background research and in this study, further literature substantiation was offered and validity evidence for the seven functions was gathered.

Another potential limitation of Fleishman and Zaccaro's taxonomy was that its development was based on an examination of military teams. The present study addressed manufacturing work in the high-tech industry. However, if the team taxonomy is found to have the generalizability that Fleishman and Zaccaro (1992) purported, the task focus and integrative

nature of team functioning should be appropriate in not only the military and manufacturing settings, but in a variety of other settings as well.

An additional bias that should be noted was a reliance in this study on work by Fleishman and his colleagues. While taxonomic efforts follow prescribed steps, it was likely that a research stream coming from a particular set of authors was likely to have unique methodological and theoretical biases. Because of the breadth of literatures and methodologies that Fleishman's work was built on, it was decided that this caveat did not outweigh the benefits of using Fleishman's approach in the present study.

Finally, the team leadership functions from this study's background research did not indicate a perfect one-to-one correspondence with the team taxonomy. These differences were to be expected, however, given the different settings and development purposes. The relationship between the team taxonomy and the team leadership functions is examined below.

## Integration of Team Taxonomy and Team Leadership Functions

The ultimate purpose in the identification of a team taxonomy in this study was twofold: first, to identify the areas where team leaders can intervene for team accomplishment, as identified by team performance functions in the Fleishman and Zaccaro model; and second, to compare those team functions with the team leader functions identified in the background research of Antonucci and Merritt (1996). This section identifies the correspondence between the specific functions in the two models.

Table 4 demonstrates which of the team leader functions (Antonucci & Merritt, 1996) was most closely associated with each team function (Fleishman & Zaccaro, 1992). In a couple of cases, the team leader function appeared to be most closely related to one team function, but a second team function was also considered relevant. Therefore, Table 4 has three columns: the first identifies the team leader function, the second includes the team function that was most

closely related to the team leader function, and the third identifies other team functions that were similar to the team leadership function.

The Production Process team leader function (Antonucci & Merritt, 1996) was paired with the Systems Monitoring team function (Fleishman & Zaccaro, 1992) because the content of each function dealt with manufacturing processes and systems – technical aspects of team work. The Systems Monitoring team function addressed task error detection, and the team leader Production Process function focused on monitoring "production processes and systems," monitoring "manufacturing cycle time," and monitoring "measurements of production performance." Each of these facets of monitoring related to error detection. The relationship between Production Process and Systems Monitoring was the most obvious for integration; however, another possible relationship was also identified. The Procedure Maintenance team function also had aspects compatible with the Production Process team leader function. This type of "secondary" relationship will be outlined following the identification of each of the primary relationships.

The Material Resources team leader function (Antonucci & Merritt, 1996) dealt with equipment availability, a technological aspect of work. The Resource Distribution team function (Fleishman & Zaccaro, 1992) was divided into "people" and "materials" because the wording of the function addressed the assignment of both member and material resources for task accomplishment and therefore seemed to relate to two different team leader functions. Resource Distribution – Materials team function was most compatible with the team leader Material Resources function because the former addressed the distribution of resources for task assignment and the latter similarly included terms such as "ensure the availability of machines, equipment, and materials to meet ...requirements and ...needs" and "help the team obtain and allocate materials."

Table 4

Integration of Team Leader and Team Functions

| TEAM LEADER FUNCTION | PRIMARY RELATED TEAM FUNCTION | SECONDARY RELATED FUNCTION |
|---|---|---|
| Production Process | Systems Monitoring | Procedure Maintenance |
| Material Resources | Resource distribution – materials | |
| Team Relationships | Orientation | Response Coordination/Motivational |
| Human Resources | Resource distribution – people | Orientation/Motivational |
| External Relationships | Response Coordination | Orientation |
| Motivating to Excellence | Motivational | |
| Continuous Improvement | Procedure Maintenance | |

Human Resources team leader function and Resource Distribution – People team function were also paired because both addressed planning the human facets of team work. Resource Distribution included assigning members to tasks, developing resource plans, and changing assignments according to changes in both internal and external conditions. Correspondingly, three parallel activities from the Human Resources team function included "identify and plan for team human resource requirements," "assess and meet team and individual training and development requirements," and "make recommendations for ...hiring, reward, reassignment, and removal based on company standards, legal requirements, team needs."

External Relationships team leader function and Response Coordination team function both addressed the coordination of team member interpersonal interactions. Response Coordination aimed to achieve a smooth coordination in efforts and to avoid conflict. This included creating changes in response sequences corresponding to changes in both environmental and team conditions. Although Fleishman and Zaccaro (1992) did not specifically identify relations beyond the team as a focus of team work, the attention to external conditions and the understanding of the importance of team efforts in coordination with the larger context implied the importance of actions beyond the team. The team leader function, External Relationships, explicitly discussed building working relationships beyond the team and the importance of effective communication. This matching of functions was perhaps the most tenuous of any that was proposed. While there was some evidence of correspondence, the relationships were implied rather than explicit. The Orientation team function was also considered somewhat compatible with External Relationships, and this correspondence is discussed in more depth later.

Perhaps the most obvious correspondence between function categories was the Motivating to Excellence team leader function and the Motivational team function. Not only

were the terms similar but the content was as well. Both dealt with the manner in which team members become enthused and directed in order to complete and excel in their work. The Motivational team function included activities for the development and acceptance of team norms. Likewise, a Motivating to Excellence activity was identifying excellence as a goal (a norm) and "encouraging team members to motivate each other." Another activity of Motivational function addressed the "resolution of... interpersonal conflicts," and Motivating to Excellence included an activity to "resolve conflicts." Finally, the team motivation function addressed the need to balance the overall team orientation with individual goals. In a similar vein, the team leader motivation function included a focus on coordinating and aligning the activities of the team with that of the larger organization.

The Continuous Improvement function of team leadership corresponded to the Procedure Maintenance team function. Both are described in terms of ensuring compliance with performance standards. Compatibilities in the two functions were indicated by the attention to evaluating and monitoring "procedural-based activities" and adjusting "nonstandard activities" in the case of Procedure Maintenance, and to the general emphasis on monitoring and improvement in all processes in the Continuous Improvement team leader function.

As noted above, the correspondence between these two classification systems was supported by examining one-to-one and exclusive relationships between functions. However, there were a number of activities in the team functions that supported the content of several other team leader functions besides that with which they were "primarily" matched. These secondary relationships included Procedure Maintenance team function corresponding to the Production Process team leader function, in addition to Procedure Maintenance's relation to the Continuous Improvement team leader function. In particular, task monitoring to ensure performance standards in the Procedure Maintenance team function was also evident in the team leader

Production Process activity and its corresponding emphasis on development and monitoring of production processes. Also, the focus on ensuring "product quality" and "meeting customer specifications and business requirements" might be considered performance standards, as in Procedure Maintenance.

In addition to the Orientation team function, the Response Coordination and Motivational functions also supported the Team Relationships team leader function. Response Coordination focused on integrating team activities and avoiding and solving conflicts. Similarly, Team Relationships included a focus on problem-solving and decision-making on the team – efforts that were often made in planning and integrating activities, as well as in resolving difficulties and conflicts. Additionally, the Motivational function discussed team norm development and acceptance which was related to the Team Relationship team leadership activity of creating an environment of encouraging and supporting change. Furthermore, reinforcement of task orientation and balancing of team and individual orientations in the Motivation team function was also identified in the Team Relationship team leader function addressing problem-solving and decision-making.

The Human Resources team leader function was already associated with the Response Distribution team function. The Orientation function also supported this team leader function (Human Resources) in its focus on ensuring team resources were discussed and that individuals were given task assignments. The Human Resources function dealt in general with ensuring that member resources were well-allocated and in particular with identifying and planning for those resources, including task assignments. Furthermore, the Motivational team function included two activities that emphasized performance-reward linkages. These activities supported the Human Resource activities that dealt with providing feedback on performance and making recommendations for member rewards.

The final secondary relationship that was explored was the correspondence between the team leader External Relationships function and the team Orientation function. This integration again was problematic because nothing in the team taxonomy directly corresponded with the team leader function's focus on relationships beyond the immediate team. Support for this focus is offered more extensively in the team leadership literature section that follows. However, the Orientation function did correspond to External Relations because of Orientation's focus on "environmental characteristics and constraints," a description that may apply to the team's customers and other members of the organization.

Discussion of Integration of Approaches

Although there was not a perfect one-to-one correspondence between these two sets of team and team leader functions, it was obvious that the two sets were compatible, despite the fact that they were developed through different methodologies, for different purposes, with different teams, and by different authors. Every team leader function was associated with a team function. In general, the purposes of the two sets of overarching functions were compatible. In several cases, more than one team function was related to a team leader function. However, these secondary relationships related to specific activities that fall under a function rather than to the general meaning of the overall function.

Based on this integration, additional theoretical support was offered for the background research that created the team leader functions. Through the present study, these team leader functions were further validated based on support from the team taxonomy and, in turn, more validity evidence was demonstrated for Fleishman and Zaccaro's (1992) team taxonomy. The data from the present study might also be used to refine the team functions, as well as the team leader functions. Conversely, to the degree that the team leader functions were validated, this also offered further validity evidence for the team taxonomy. However, it should be noted that

the primary purpose of Studies 1 and 2 in this research was to validate the team leadership functions identified in background research, not Fleishman and Zaccaro's team taxonomy.

In addition to the demonstrated relationship between team leadership functions and the team taxonomy, the leadership dimensions previously outlined were also informative for an integration of background research and the team taxonomy. As noted above, similar underlying processes were identified for team functions and for the leadership dimensions related to functional leadership. These processes were information processing, action implementation, and monitoring and feedback (Shiflett et al., 1982) in the identification of team functions, and information search and structuring, problem solving, and maintaining resources in the identification of leadership dimensions (Fleishman et al., 1991). Leaders were responsible for information search and structuring, a process that was similar to information processing in the team function processes. Additionally, leader problem solving seemed to parallel the team behavior process of action implementation. Finally, maintaining human and physical resources required monitoring and feedback to ensure all resources were available. The similarities in the three underlying processes of the leadership dimensions and team functions offered further evidence of the complementary relationship between the leadership and team dimensions adopted as the foundation for the present research.

Furthermore, the team leadership functions also addressed these three general processes in many of the functions and in the general content of the functions. For example, in Function 1 Production Process the team "interpret[s] process flow " appeared to be related to information processing. Similarly, "address problems that arise" and "improve overall production processes" related to action implementation. And "develop and monitor measurements" was related to monitoring and feedback. The three processes were also obvious throughout Function 4 Human Resources: information processing in "identify and plan for team human resource

requirements;" action implementation in "assess and meet team and individual training and development requirements;" and monitor and feedback in "assess and provide feedback on performance." Therefore, another compatibility between team leader functions and both the leadership dimensions and team taxonomy was evident. Further substantiation for the team leader functions is now examined.

## Team Leadership Studies Applied to Team Leader Functions

The purpose of this section is to compare other studies that identified team leader roles to the seven behavioral functions considered in this study. Fleishman and Quaintance (1984) have suggested an examination of the literature to identify overlap between a proposed system and an alternative descriptive system. Only team leadership literature that addressed several team leader roles and that explicitly discussed the leader's functioning was considered. Other authors (e.g., Cannon-Bowers, Tannenbaum, Salas, & Volpe, 1995; Hitchcock, 1990; Kozlowski et al., 1996; Sayles, 1993; Shonk, 1992) have proposed team leader roles but were not included in this review because they only focused on a limited number of facets of team leader functioning, such as only team relations, development of trust, or task direction under stressful situations. Additionally, some team models implied roles that team leaders might play but the roles were not made explicit (e.g., Dickinson et al., 1992). These studies were also excluded from consideration here.

The literature that was included drew from studies that were created based on different methods and samples and for different reasons. The purpose of this section is not to review each of these works or to detail the specific manner in which they supported the seven functions and twenty activities proposed here. The purpose was simply to demonstrate that a variety of independent authors converged on a similar identification of team leader functions.

The emphases of researchers in this area were varied. Hackman's line of research (Hackman & Walton, 1986; Hackman, 1986, 1990) was noted above in relation to the functional leadership approach. In addition to that work, Hackman and Walton (1986) built on their functional leader premise and the work of McGrath (1962, 1984) to propose functions of group leadership as well. Both the Hackman and McGrath lines of research addressed group leaders and both proposed general taxonomies rather than empirically validated models. Ruggeberg (1996), unlike most other team leadership authors, empirically developed a classification system of team leadership. Jessup (1990), like Ruggeberg, specifically studied team leaders, while many others (Katzenback & Smith, 1993; Carr, 1992; Larson & LaFasto, 1989; Wellins, Byham, & Wilson, 1991; Wilson, Wellins, & Byham, 1994) placed primary emphasis on team-based companies and then offered supplementary propositions about the roles of team leaders. Other authors focused specifically on team leadership but with attention to a particular type of team, i.e. autonomous and semi-autonomous work teams (Fisher, 1993, 1994; Manz & Sims, 1984, 1987, 1993; Orsburn, Moran, Musselwhite, & Zenger, 1990; Zenger, Musselwhite, Hurson, & Rerrin, 1994). And Mohrmans' and Cohen's lines of research (Cohen, 1991; Mohrman et al., 1995) were even more specific in their focus by studying semi-autonomous work groups that dealt with knowledge work. Parker (1994) also addressed team leadership in relation to a specific type of team, cross-functional work teams. Table 5 below displays the team leader functions examined in this study and which specific lines of research address each of the seven functions.

As seen in Table 5, despite varying types of teams, organizations, methodologies and research purposes, considerable overlap was demonstrated across the studies and in relation to the seven team leadership functions from the background research for this study. Four lines of research (Carr, 1992; Hackman, 1986, 1990, Hackman & Walton, 1986; Cohen, 1991, Mohrman

et al., 1995; Orsburn et al., 1990, Zenger et al., 1994) proposed team leader roles that supported each of the seven team leader functions in this study. And all thirteen lines of research supported a majority of the functions, with four authors supporting six of the seven functions. Relative to other functions, less support was demonstrated for Function 2 - Material Resources, which was included by only six of the thirteen authors. This omission may have been due to an assumption among authors that availability of materials and equipment was a sub-set of the function related to Production Process (Function 1) and other technical work of the team. Or, in contrast to the assumption in the present study, other researchers may have believed that ensuring that physical resources were available was not a leadership role. This latter explanation was unlikely, however, because the necessity to ensure that material resources were available was substantiated in both the leadership processes review (Fleishman et al., 1991), as well as in the taxonomy of team effectiveness (Fleishman & Zaccaro, 1992).

Other functions received more support across researchers. Human Resources and Motivating to Excellence were the only two functions identified by every author. These may be considered the most traditional domains of leadership – identifying and developing personnel and motivating individuals to reach for higher standards. It was notable that External Relations and Continuous Improvement functions were included by twelve of the thirteen lines of research. External Relations addressed the approach to boundary spanning reflected in many studies, but extended that to also include helping the team see other teams and organizational members as internal customers. In the same way, Continuous Improvement referred to both the motivational aspects of helping a team strive for higher standards but also focused on the less traditional view of recognizing every effort in the workplace as a process to be constantly assessed and improved.

Table 5

Overlap between Team Leader Functions and General Literature

| FUNCTIONS OF TEAM LEADERSHIP | SUPPORTING AUTHORS* | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| Function 1: Leadership related to Production Process | X | X | X | X | X | | X | X | X | X | X | X | |
| Function 2: Leadership related to Availability of Machines, Equipment, Material Availability | X | | X | | | | | X | X | X | X | | |
| Function 3: Leadership related to Work Relationships within the Team | X | X | X | X | X | X | X | | X | X | X | X | X |
| Function 4: Leadership related to Human Resources | X | X | X | X | X | X | X | X | X | X | X | X | X |

Table 5 (continued)

| FUNCTIONS OF TEAM LEADERSHIP | SUPPORTING AUTHORS* | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| Function 5: Leadership related to Linkages beyond the Team | X | X | X | X | X | | X | X | X | X | X | X | X |
| Function 6: Creating an Environment of Excellence | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Function 7: Leadership related to Continuous Improvement | X | X | X | X | X | X | X | X | X | X | | | X |

Note. 1 = Carr, 1992; 2 = Fisher, 1993, 1994; 1991; 3 = Hackman, 1986, 1990; Hackman & Walton, 1986; 4 = Jessup, 1990; 5 = Katzenback & Smith, 1993; 6 = Larson & LaFasto, 1989; 7 = Manz & Sims, 1993; Stewart & Manz, 1994; 8 = McGrath, 1962, 1984; 9 = Mohrman, Cohen, & Mohrman, 1995; Cohen, 1992; 10 = Orsburn, Moran, Musselwhite, & Zenger, 1990; Zenger, Musselwhite, Hurson, & Rerrin, 1994; 11 = Parker, 1994; 12 = Ruggeberg, 1996; 13 = Wellins, Byham, Wilson, 1991; Wilson, Wellins, & Byham, 1994.

Function 1 - Production Process related directly to the taskwork of the team and therefore might be considered by some researchers as the primary reason leaders exist. It was interesting that two authors did not, however, specifically include this function in their propositions. Similarly, Function 3 - Team Relations was identified by eleven of the thirteen authors. While the reason was not clear, it might be noted that Wellins and colleagues' (Wellins, et al., 1991; Wilson et al., 1994) research did not include either of these functions. Again, considerable overlap was shown across different lines of research in relation to the team leadership functions. The specific parameters of the present approach to team leadership is now outlined.

## Team Parameters in this Study

Goodman (1986) argued that our aim as a science should be to move away from heuristic models to more fine-grained analyses in order to uncover interesting, non-obvious relationships, to sharpen the specification of constructs, and to increase the ability to confirm and disconfirm proposed models. In an attempt to offer more fine-grained analyses, the present study incorporated leadership dimensions and team functions to substantiate and explore the identification of seven functions and twenty activities of leadership in specific types of teams.

The themes of flexibility, quality, customer service, and innovation are particularly important to successful companies in the 1990s. The high-tech industry represents the upper-end of industries across the world in attaining these hallmarks of successful organizations. The electronics industry is different than other industries, such as insurance, textiles, and agriculture, which do not historically face the same demands for fast adaptation capabilities, a rapid pace, and cutting-edge innovation (Warrick, 1990). Electronics companies are often touted as models for how work should be organized, how products should be developed, and how employees should be treated (Antonucci & Tannenbaum, 1995; Kravetz, 1988). They also are increasingly

included in financial listings and stock market indicators of successful companies (e.g., Fortune 500 companies and NASDAQ averages). As a result, the high-tech industry represents one important domain in which to examine team leadership.

A large percentage of electronics jobs are found in front-line manufacturing, and the use of teams is common (Antonucci & Tannenbaum, 1995; Warrick, 1990). In keeping with the ongoing research effort, the type of teams examined in this study were high-tech, permanent, front-line manufacturing production teams. While many types of teams might have been studied, for example, quality circles, task forces, or special committees, by carefully choosing a specific setting and type of team, the necessary set of behaviors required of team leaders could be more clearly identified and the relationship between team leadership and other organizational variables more systematically explored (Dunphy & Bryant, 1996). The type of team examined in this study was similar to that suggested by previous research findings on production- and service-oriented teams (e.g., Sundstrom & Altman, 1989; Yanushefski, 1995). By working with this type of team, it was possible to examine teams having the following sets of characteristics: (1) members with interdependent goals, (2) high demands for work coordination and a highly developed system of interactions; (3) an identifiable leader offering specific guidance and coordination; and (4) permanency, i.e., a long-term working relationship among members who knew they would continue to work together and would have a shared history. It was in this context that the construct validation efforts were pursued.

## Construct Validation Approach in Studies 1 and 2

The team leader functions identified in the background research appeared to fit an integrated theoretical and empirical framework of leadership and teams within a specific context of the high-tech industry. Study 1 was an effort to demonstrate the content validity of these seven team leader functions and twenty related activities. Study 1 examined the importance of

these functions and the prevalence of their performance across the industry, as well as the degree to which the functions fit a single confirmatory model. The second part of the research, Study 2, examined the organizational context to determine whether team leadership related to other parts of organizational functioning in a reasonable manner. Study 2, thus, explored criterion-related, convergent, and discriminant validity evidence of the functions and activities.

Construct validity is the degree to which one can make "generalizations about higher-order constructs from research operations" (Cook & Campbell, 1979, p. 38) and can not be fully established with a single measure or by a single study. Construct validation is a cumulative process of gathering evidence with a variety of means, that may include content, criterion-related, convergent, and/or discriminant validation processes. This research examined preliminary evidence derived from construct validation of team leadership functions, drawing on all four of these validation processes. The higher-order construct of interest for this research was team leadership as demonstrated in high-tech manufacturing companies by the seven team leader functions. This section briefly describes each of the relevant aspects of validity and outlines how the complementary validity evidence for team leadership was examined in Studies 1 and 2.

Construct validation implies the existence of a nomological net, a pattern of relationships among the variables predicted based on the existence of a hypothesized construct (Cronbach & Meehl, 1955; Nunnally, 1978) and a thorough knowledge of interrelations from many investigations (Cascio, 1991). In their seminal paper on the subject, Campbell and Fiske (1959) stated that in order to predict a pattern of relationships among variables to verify the existence of a construct, it should be demonstrated that certain variables that should logically relate to one another actually do (convergent validity), and that other variables that should not relate to one another do not (discriminant validity). By testing these patterns of relationships across several measures and several traits, construct validity can be inferred through a corresponding fit of data.

While Campbell and Fiske (1959) presented a multi-trait, multi-method matrix as the best means of assessing this fit, more recent evidence (e.g., Bagozzi, Yi, & Phillips, 1991) outlined the relative advantages of using confirmatory analysis and the direct product model over the correlation matrices proposed by Campbell and Fiske. Although the present research was not comprehensive enough to utilize these tools completely, the data gathered here was an important building block for future studies that may draw on those statistical methods.

The first and primary evidence of construct validity explored in the present research was a content validation of the functions of team leadership in the high-tech industry, examined in Study 1. Study 2 investigated other types of validity evidence. As Ebel (1977, p. 153) stated, content validation is the "only basic foundation for any type of validity." Content validation involves sampling representative domains of the construct, using appropriate methods of test construction (Nunnally, 1978), and sampling in a meaningful way, with a precise process, that enables one to judge whether the universe was sampled adequately (Cascio, 1991). Evidence of content validity has also been offered when a moderate level of internal consistency has been found, demonstrating that the items measure something in common (Nunnally, 1978). A continuum of content to construct validity evidence exists, ranging from a focus on content to process, from test development to construct inference, and from the concrete to the abstract (Cascio, 1991). Validation is not an all-or-none process – it is a matter of degree (Nunnally, 1978), and it is based on a series of investigations (Cascio, 1991). This research was expected to be one in a series of such investigations.

## Study 1 Propositions: Content Validity

Based on the literature review and previous background research (outlined in the Methods section below), two general research propositions were set forth in Study 1 to explore the content validity of the seven team leadership functions. The substantiation of these

propositions was used to evaluate the suitability of exploring the criterion-related, convergent, and discriminant validity of the team leader functions in Study 2. The first proposition had two parts and addressed the domain representativeness of the team leader functions being validated.

*Proposition 1A:* Each activity in each function was expected to be performed by a majority of the team leader respondents.

*Proposition 1B:* For each activity, the average importance rating across the sample was proposed to be 3.0 or greater [on a 5-point scale; 0 = not performed, 1 = performed and of little importance, 4 = performed and extremely important]. This average rating would indicate that the activity was considered important or extremely important across respondents.

The second proposition for Study 1 examined the fit among the proposed seven team leadership functions and their associated activities and performance indicators. No previous empirical research had been done to determine whether the 20 activities group under their 7 related functions and whether performance indicators grouped under their associated activities.

A confirmatory model fit was proposed to test the rigorous assumption of the relatedness of all items in the team leader measure – i.e., the proposition that all seven functions would be confirmed in a model test and that each associated activity and performance indicator would be grouped with its related function. It was decided in advance that if the confirmatory approach did not indicate an appropriate fit, an exploratory analysis would be conducted to determine whether another fit among the functions, activities, and performance indicators was appropriate. Therefore, the following research proposition was examined.

*Proposition 2:* A confirmatory model was proposed to demonstrate that the items in the measure were best represented by the set of seven functions, with corresponding activities and performance indicators loading onto each associated function. A good

**model fit (0.90 or higher) was expected on the Goodness of Fit and Comparative Fit Indices and a Root Mean Square Residual less than 0.08 was expected.**

# CHAPTER II

## METHODS: STUDY 1

This study attempted to redress several deficiencies common in the study of team leadership. Many studies have used *ad hoc* and contrived teams in non-naturalistic settings (Pratt & Jiambalvo, 1981; Ruggeberg, 1996). A multi-organizational, multi-team study that focuses on teams with common elements (i.e., manufacturing in the electronics industry) can increase the generalizability of the results of the study to other similar teams, while clearly defining the domain of interest. The present research addressed this issue.

As noted previously, the survey measure of the functions was developed for use in a larger research project and the data were collected prior to the writing of this particular study. This study drew on archival data for validity evidence of team leadership in high-tech industry settings. However, the development of research propositions for this study, and for Study 2, occurred in parallel with the collection of data and substantially influenced measure construction. The survey passed through several iterations and was pilot tested before being administered to the sample described here. Extensive efforts were made to ensure that the content validation addressed the appropriate content and sample. The next section outlines the background research for this effort, followed by a complete description of the measure validated in this study.

### Background of the Present Research

As noted above, the AEA participated in a U.S. Department of Labor effort to strengthen the skills of the high-tech workforce and define the critical facets of manufacturing team leaders' work (Antonucci & Merritt, 1996). Extensive background research was conducted to create the final instrument, the manufacturing specialist team leader survey, before this stage of the study.

Each of these previous stages of data collection and refinement of the team leader functions is outlined here.

## Advisory Committee

From the outset of this line of research, a method of content validation that had been used in other nationwide studies was employed. The process was guided by an advisory committee of over 55 industry and technical experts from more than 45 companies. Additionally, current literature on team leadership was examined to ensure that the appropriate constructs were being considered for inclusion in the measure (see Antonucci & Merritt, 1996).

## Phone interviews

Next, human resource representatives from several leading high-tech firms – AT&T, IBM, FSI International, Silicon Graphics, Cray Research, Grass Valley Group, and Raytech – participated in telephone interviews. The interviewees described the nature of the work of manufacturing specialist team leaders in their organizations. Respondents were asked the following questions:

1. What are the principal job roles and titles for the manufacturing team leader?
2. Describe the nature of the work performed. In other words, what are the most important activities they perform?
3. Is this job role changing? If yes, describe how.
4. Do people in this occupation work under continuous, frequent, or infrequent supervision?
5. How are people selected into the manufacturing specialist team leader role?
6. How are they trained?
7. Are the numbers of manufacturing specialist team leaders increasing, decreasing, or staying stable?
8. Do people in these occupations change jobs frequently within companies or across companies?
9. Once in the high-tech industry, do they tend to seek mobility within the industry or outside it?

The information gathered from these interviews was used in the next phase of the research to define and understand the role of team leaders in high-tech companies.

Expert Panels: Identification of Functions, Activities, and Performance Indicators

The use of expert panels was the next step in the development of the survey. At this step, panels were asked to define the components of the measure and the corresponding activities of team leadership. An invitation packet introducing recipients to the project and requesting participation from individuals in their companies was sent to a targeted American Electronics Association mailing list. In order for subject matter experts to participate in this stage of the research, they had to be identified as either the best manufacturing specialist team leaders in their companies or the immediate supervisors of such team leaders. Companies provided the names of individuals who were qualified to participate, and these workers were sent materials explaining the project and their role in the expert panels. Experts from across the country in Texas, Illinois, Washington, and the California participated in the process.

First Round of Expert Panels

Expert panels were initially conducted in Seattle, Washington, Austin, Texas, and Santa Clara, California. Across the panels, 22 participants were team leaders and 5 represented other occupations, such as upper level supervisors. The demographics of participants closely resembled those of the respondents included later in the present validation study. Each panel participated in full-day sessions to define the work of team leaders. These sessions resulted in the first draft of the key purpose, functions, and activities for the manufacturing specialist team leader role.

The first step for expert panels was to develop a key purpose statement for the manufacturing specialist team leader role. A work role's key purpose was a general outcome statement summarizing the goals of the work role. It was similar to a mission statement for an organization and was a critical step in the overall process because all other statements (i.e., functions, activities, and performance indicators) were generated from this statement.

Identification of the key purpose was accomplished through a facilitated process using small groups. Each group of experts presented and debated various options during the construction of the key purpose statement before reaching consensus and proceeding. The key purpose for the manufacturing specialist team leader was eventually described as "enable the team to meet or exceed customer needs and business requirements through the continuous improvement of processes, the ongoing improvement of team performance, and the coordination of team activities and goals with those of the larger organization, customer, and others" (Antonucci et al., 1995).

During the second step of the panelists' work, participants were asked: What needs to happen for this key purpose to be achieved? Based on the methodology used for the development of three prior sets of occupational standards (Antonucci & Tannenbaum, 1995), the goal of the panelists at this stage was to identify the three to seven major functions that must be performed in order to accomplish the key purpose of the manufacturing specialist team leader role. This approach of three to seven functions was adopted because the purpose was to first identify the broadest, most general categories of activities that comprised the work role. More specific activities were outlined later after these major functions had been identified and agreed upon.

Once again, the panels used their experiences to identify functions, then discussed and revised them before reaching consensus and proceeding. This step resulted in the identification of six of the seven functions of team leadership. The seventh function was identified during the industry and technical review process outlined later.

Next, for each function, the experts addressed the following question: What needs to happen for this function to be achieved? A list of activities for each function was generated. The major characteristics of the functions and activities were that they should:

- Relate to realistic work practice
- Be capable of demonstration
- Be expressed as outcomes
- Not contain evaluative statements

Technical experts reviewed results of the first round of panels to ensure they conformed to these characteristics and that they were clustered in the most understandable manner possible. At this point, the process yielded an outline or a map of the purpose and critical work areas of the occupation. This outline included the functions and activities that needed to be performed by a worker for him or her to be considered fully competent in the manufacturing specialist team leader role.

Second Round of Expert Panels

Another expert panel met in Chicago to review the work completed thus far and to develop the performance indicators. During a two-day session, participants were asked to carefully review the key purpose, functions, and activities developed by the expert panel participants in round one. Their review was designed to determine accuracy, appropriateness, and relevance. Participants suggested several revisions.

The participants then concentrated on developing performance indicators to judge the successful completion of activities. Respondents were informed that the performance indicators should be:

- Significant or critical aspects of carrying out an activity that indicate whether it has been performed successfully;
- Related to either the product or outcome of the activity or the way the activity is carried out;
- Directly observable; and
- Precise and explicit.

For each activity listed under the major functions, the participants answered the question: How do I know an activity has been performed well? Individuals and small groups proposed performance indicators, compared them to the criteria above, discussed their relevance across companies, and modified the indicators as needed. As a result of these sessions, at least three performance indicators were developed for each of the activities.

## Refinement of Draft Standards

The performance indicator information was analyzed and integrated with the expert panel information collected in round one. At this point, a draft measure of the standards for the manufacturing specialist team leader role, resulting from rounds one and two, was ready for a series of reviews. An iterative process was used to review the draft standards. First, the technical experts who facilitated the expert panels revised the draft standards, based on the input from the participants in round two. After these revisions were made, the drafts were reviewed and revised by members of the advisory committee.

## Site Visits

The next step in the development process consisted of site visits. Several technical and industry experts visited three well-known and successful electronics companies in different parts of the country. The purpose of their visits was to confirm or modify the standards already drafted and to gain a better understanding of the manufacturing team leadership role.

The experts toured the plants and spent forty-five minutes to an hour recording observations about the work of manufacturing teams and of manufacturing specialist team leaders. They then led structured interviews with three to five job incumbents, one to two supervisors of manufacturing specialist team leaders, and other people who were knowledgeable about the roles and responsibilities of team leaders. The interviews lasted approximately an hour to an hour and a half each and were conducted both individually and in larger groups. Where

possible, the researchers also collected written statements, such as job descriptions, that could offer additional insights about the work of manufacturing specialist team leaders.

In the interviews, respondents were asked to identify the key purpose and functions of the manufacturing specialist team leader role. They were then presented with the standards that had been generated by expert panels and asked to confirm or modify them using worksheets provided. Additional research questions included:

1. Given a continuum of managers-supervisors-team leaders, what are the differences (distinguishing factors) in their roles and responsibilities?
   a. What are the overlaps?
   b. What is the level of responsibility generally associated with each?
2. What are the job titles in your locations for team leaders (individuals who function in a team leader capacity within a manufacturing environment)?
3. Are there differences in concepts and working styles of "teams" vs. "work groups?"
4. Are manufacturing teams organized around core processes or quality?
5. How are team leaders selected? And reviewed?
6. How are people compensated for being team leaders, especially if they are in a "revolving role?"
7. Do team leaders "lead" per se or facilitate?
8. Do team leaders consciously carry out mentoring and/or training roles?
9. What role does the team leader play in selecting new team members?
   a. Appraising the performance of its members?
   b. Disciplining its members?
10. Do unionized sites view team leaders differently than non-unionized shops?

The observations and interviews yielded information used for further refinement of the standards.

## Technical and Industry Reviews

Next, the technical experts revised the standards based on the outcomes of the on-site validation efforts. Following the revisions, members of the advisory committee also reviewed the standards, giving feedback to the technical experts. Then technical experts held individual structured telephone interviews with eight human resource experts, including vice presidents and directors of human resource departments, from Tellabs, Solectron, XEL Communications, Motorola, Siemens Corporation, AT&T, and Quantum Corporation. These interviews were

based on five general content questions, five specific content questions, eight questions about wording, and two probes, when time allowed. The results of these structured interviews elicited suggestions that led to further revisions of the measure, including the addition of a seventh function.

Next, four advisory committee members, representing both business and education, reviewed in advance this most recent version of the functions, activities, and performance indicators and then gave comments in a telephone conference call. Committee members reacted very positively to this version of the standards and offered several improvements that were useful later in the survey development. Additionally, these subject matter experts offered guidance on appropriate questions for the human resource survey used for gathering information about company production and financial performance, pertinent to Study 2.

Communications experts and the technical team then reviewed the standards several more times to make them more user-friendly and understandable to various potential users who were not part of the development process. As a final check, the revised standards were presented to the full advisory committee who endorsed the measure without any further revisions.

It should also be noted that extensive discussion occurred about whether lie or bogus items should be included to reduce demand characteristics and method bias. Despite the psychometric arguments in favor of this, no such items were included for two reasons. First, trust on the part of individual respondents and companies was essential in order to ensure the most accurate responses. There were concerns that bogus items would have caused respondents to question the intent of the experimenters and the general purpose of the study. Secondly, other content validation studies (e.g., Ford & Wroten, 1984) included only items that were expected to be important.

## Pilot Testing

As part of a pilot test, eight team leaders from four different companies completed a draft version of the measure. An additional company agreed to participate but did not return their two pilot surveys. The eight respondents commented on the ease of completing the survey, the clarity of the instructions and rating scales, and whether any aspects were confusing or unclear. Respondents were generally very positive about the survey, and several minor revisions were made as a result of their feedback.

## Recruitment of Companies and Identification of Sample Participants for this Study

With the background research completed, a nationwide validation of the survey was initiated for the present research. Over 500 participants from 95 high-tech manufacturing companies agreed to participate and were sent surveys for inclusion in the study. The participants were leaders of permanent manufacturing work teams. The 95 companies were contacts of the American Electronics Association, identified through membership lists, industry-wide resource lists, contacts from previous participants in AEA projects, and respondents to an invitation to participate sent out in two AEA publications. Company contacts, usually directors of human resources, faxed back a form indicating their interest in participation and noting the number of potential manufacturing specialist team leader survey respondents from their company who would be participating. In several cases, early respondents were faxed a letter informing them that the survey had been delayed for two months to increase participant availability.

The team leaders were chosen based on their full competence in the job, as judged by the human resource contact or supervisor within the company who asked them to participate in the study. "Full competence" was used as a criterion because the purpose of this research was to identify the team leader functions as standards toward which all team leaders should strive, those

functions most indicative of the highest levels of team and organizational effectiveness. No industry or association lists existed that identified such individuals, so company contacts were enlisted to identify appropriate survey respondents. More specific characteristics of the participants were gathered in the survey's demographic questionnaire.

## Survey Administration

After receiving participation agreement forms from contacts at the 95 companies and following up by telephone for any incomplete information, company contacts were mailed a thank-you note for volunteering to participate, a cover letter about administering the surveys, a list of commonly asked questions about administering surveys, an address correction form, the requisite number of surveys, two envelopes, and a return label. Survey packages also included a six-page faxback survey to be completed by an upper-level human resource contact within the company. The company contact faxback survey was included to gather further information about high performance company practices and to gather company-wide demographic and financial information. This form is described in further detail in Study 2. See Appendix A for these survey package materials.

Twelve of the ninety-five companies expressing interest in the research dropped out of the study prior to administering the surveys. All of those 12 companies were contacted and asked why they would not be participating. Most companies reported that specific business concerns precluded their participation, including downsizing, going out of business, and increases in business that rendered them too busy to participate. Finally, 83 companies agreed to participate, requested surveys, and, to the best of the researcher's knowledge, administered the surveys. Of those companies, 66 returned manufacturing specialist team leader surveys.

## Materials

### Manufacturing Specialist Team Leader Survey

After final revisions based on the pilot testing and review process, surveys with 7 functions, 20 activities, and 97 performance indicators were created and are included in Appendix A. Definitions for potentially ambiguous phrases (e.g., "customer" referring to both internal and external customers) were footnoted. Each activity was listed under its respective function and each performance indicator under its respective activity. For each of the 20 activities, respondents were asked to answer the following question:

How important is the following activity to your job?

(0) not performed

(1) of little importance

(2) somewhat important

(3) important

(4) extremely important

Respondents were to mark a "0" if they did not perform the activity. Therefore, responses of 1 to 4 for the importance ratings also indicated that the activity was performed by the respondent. Therefore, the importance ratings offered information about both the performance and the importance of the activity.

Additionally, for each of the activities they performed, respondents were asked to rate related performance indicators regarding performance and importance. For example:

When you perform this activity, how important is it that *information on continuous improvement processes is obtained by team?* (The italicized part of the question was the performance indicator):

(0) not performed

(1) of little importance

(2) somewhat important

(3) important

(4) extremely important

## Procedure

Surveys were administered by the company contact. Based on the pilot study, it was expected that the surveys would require 45 minutes to 1 hour for completion. Team leaders completed them during work hours and returned them anonymously to the company contact, who then mailed all the surveys back to the experimenter. Company contacts were sent letters and were telephoned to remind them to return surveys and human resource forms. Additionally, all requirements were met for protection of human subject participants in research.

# CHAPTER III

## RESULTS: STUDY 1

### Response Rates and Participant Sample

Of the 555 team leader surveys administered at 83 companies, 337 surveys from 66 companies were returned. See Appendix B for a list of participating companies. Therefore, the response rate for manufacturing specialist team leaders returning their surveys was 60.7% of the sample.

Approximately one-third of the sample was women (109 respondents). Additionally, over three-quarters of the sample described themselves as white (263 respondents). The second largest ethnic group was Asian-American/Pacific Islanders (11.2%, 37 respondents). Six respondents (1.8%) identified themselves as African-American and three (0.9%) as Native Americans.

### Proposition 1: Importance Ratings and Percentage Performed

In support of Proposition 1A, a large majority of team leaders performed the activities and performance indicators in the survey. Proposition 1B also received overwhelming support – the activities and performance indicators were rated as important or extremely important by respondents. In the sections below, the specific findings regarding Proposition 1 are outlined.

#### Percent Performing Each Activity

Despite variation in demographics across respondents, all activities were performed by the vast majority of the sample. In fact, 17 of the 20 activities were performed by at least 90% of the respondents, offering overwhelming support for Proposition 1A. The three activities not performed by at least 90% of respondents were: Help team communicate effectively with customers (performed by 78.7%); Help team identify and plan for human resource requirements

(88.7%); and Help team with hiring, reward, reassignment, and removal (78.4%). Even these activities were performed by over 75% of the sample.

The high percentage of respondents performing all the activities provided the first piece of evidence of the content validity of the team leader standards. This demonstrated that the activities and performance indicators reflected the work performed by top-performing manufacturing specialist team leaders.

## Importance Ratings for Activities

Support was also demonstrated for Proposition 1B. Across respondents, only one of the 20 activities was rated below 3.0 (1 = of little importance, 4 = extremely important). Thus, in comparison to the proposition that 100% of the activities would be rated above 3.0, 95% of the activities were rated 3.0 or above, with two-thirds rated at 3.25 or above. See Table 6.

Table 6

Distribution of Mean Importance Ratings for Activities

| Mean Rating | Number of Activities | Percent of Responses |
|---|---|---|
| 3.5 and above | 2 | 10 |
| 3.25 - 3.49 | 11 | 55 |
| 3.00 - 3.24 | 6 | 30 |
| 1.00 - 2.99 | 1 | 5 |
| Total | 20 | 100% |

Table 7 includes the mean ratings and standard deviations for the 20 activities. The table also includes the percent of the sample performing each activity.

Table 7

Activity Importance Ratings – Means and Standard Deviations

| Function/Activity | M | SD | Percen-. Performing |
|---|---|---|---|
| Function 1: Production Process | | | |
| Help team to interpret process flow instructions and monitor manufacturing cycle time. | 3.12 | 0.76 | 95.0% |
| Help team to develop and monitor measurements of production performance and address problems that arise. | 3.33 | 0.72 | 96.7% |
| Help team to improve overall production processes to ensure product quality, and to meet customer specifications and business requirements. | 3.60 | 0.56 | 98.2% |
| Function 2: Material Resources | | | |
| Help team to ensure the availability and maintenance of machines and equipment | 3.33 | 0.74 | 92.3% |
| Help team to obtain and allocate materials to meet business requirements and customer needs. | 3.32 | 0.74 | 90.8% |
| Function 3: Team Relationships | | | |
| Help team to improve communications within team. | 3.43 | 0.67 | 99.4% |
| Help team to create an environment that encourages and supports change. | 3.43 | 0.64 | 98.8% |
| Help train and encourage team in problem-solving and decision-making. | 3.36 | 0.64 | 99.1% |

Table 7 (continued)

| Function/Activity | M | SD | Percent Performing |
|---|---|---|---|
| Function 4: Human Resources | | | |
| Help team to identify and plan for team human resource requirements and customer needs. | 3.09 | 0.73 | 89.0% |
| Help team to assess and meet team and individual training and development requirements. | 3.23 | 0.71 | 96.3% |
| Help team to assess and provide feedback on performance. | 3.16 | 0.77 | 96.7% |
| Help team to make recommendations for team hiring, reward, reassignment, and removal based on company standards, legal requirements, team needs, and other key considerations. | 2.84 | 0.89 | 78.9% |
| Function 5: External Relationships | | | |
| Help team to build productive working relationships beyond the team. | 3.10 | 0.75 | 98.5% |
| Help team to communicate effectively with customers. | 3.02 | 0.85 | 79.2% |
| Function 6: Motivating to Excellence | | | |
| Help team to coordinate and align its activities and goals with the mission, values, and business strategy of the larger organization. | 3.29 | 0.71 | 90.8% |
| Motivate fellow team members to excel and encourage team members to motivate each other. | 3.49 | 0.63 | 97.6% |
| Resolve conflicts, make decisions when team is unable to do so on its own. | 3.48 | 0.63 | 97.0% |

Table 7 (continued)

| Function/Activity | M | SD | Percent Performing |
|---|---|---|---|
| Function 7: Continuous Improvement | | | |
| Ensure the team understands the continuous improvement processes. | 3.52 | 0.59 | 97.9% |
| Ensure the team understands customer needs and business requirements in making continuous improvements. | 3.49 | 0.67 | 97.3% |
| Help team to make continuous improvements based on customer needs and business requirements. | 3.44 | 0.59 | 98.2% |

Note. Missing data were not included in the computation of the means.

## Importance Ratings for Performance Indicators

Proposition 1B stated that all 97 performance indicators would have a mean rating of 3.0 and above. In fact, 86.6% of the performance indicators were rated 3.0 or above. It should be noted that none of these means was below 2.75. See Table 8.

## Comprehensiveness

Finally, after completing the importance ratings, respondents were asked whether any other activities or performance indicators were not mentioned in the survey. Approximately 9% of respondents included a comment here. Four participants indicated that the survey had covered the domain completely, and a fifth commended the survey for covering the "key areas" of quality, safety, motivation, training and planning. The remaining 32 respondents offered specific content additions they thought should be made. Although there was no redundancy in suggestions, the areas most focused on were leadership skills, communication, and coordination

beyond the team. Additionally, several respondents criticized the survey's length and clarity. These comments are included in Appendix C.

Table 8

Distribution of Mean Importance Ratings for Performance Indicators

| Rating | Number of Performance Indicators | Percent of Responses From Individual Participants |
|---|---|---|
| 3.5 and above | 3 | 3.1 |
| 3.25 - 3.49 | 40 | 41.2 |
| 3.00 - 3.24 | 41 | 42.3 |
| 2.75 - 2.99 | 13 | 13.4 |
| Less than 2.75 | 0 | 0 |
| Total | 97 | 100% |

### Proposition 2: Confirmatory Analysis of Model Fit

The results from Proposition 2 related to the model fit of the seven functions of leadership. To determine the appropriateness of this seven-factor model, a LISREL confirmatory factor analysis (Joreskog & Sorbom, 1993) was employed in this study. Joreskog and Sorbom (1989) stated that the confirmatory approach, in contrast to an exploratory analysis, was based on theory and a structure specified in advance, drawing from a classification design for related items and sub-tests. Because this was the first empirical test of these functions, a decision was made in advance that if the confirmatory analysis did not demonstrate an adequate

fit, an exploratory factor analysis would be conducted to determine whether another structure was more appropriate.

In the confirmatory factory analysis, the seven functions were identified as the latent variables in the model. The activities and performance indicators associated with each function in the background research were entered in the confirmatory analysis as indicators of each of the associated latent variables. The results and goodness of fit statistics did not indicate an adequate fit: Goodness of Fit Index = 0.45 and Comparative Fit Index = 0.57. Acceptable fit is indicated by statistics over 0.9 on these two indices (Bagozzi & Yi, 1988). Additionally, the Root Mean Square Residual was 0.098. The residual error should be 0.08 or less to ensure the model did not have an over-abundance of error (Bagozzi & Yi, 1988).

The poor model fit indicated that Proposition 2 was not upheld. An appropriate model fit based on seven latent functions was not found. The limited sample size very likely contributed to the lack of goodness of fit. Fewer than four subjects were available per item. However, the only conclusion that could be drawn based on this analysis was that model fit was not confirmed and it was likely that another structure that fit the data better. Other methodological limitations are also considered in the discussion below.

The purpose of Proposition 2 was to test the fit of these seven specific factors and this fit was not found. Empirical validation had not been previously conducted on this measure or on these functions. Because of this, it was decided rather than modifying or revising the model and capitalizing on chance by running modified analyses, an exploratory analysis should be conducted to identify an alternative model of relationships among functions.

## Exploratory Analysis

To determine whether another structure besides the seven-function model would emerge from the activities and performance indicators, a principal axis exploratory analysis, allowing for

shared and unique variance among correlated variables (Harris, 1985), was performed. The proposed plan was to conduct an exploratory analysis on a random half of the sample, find out whether interpretable factors emerged, and create scales from these factors. A second-order factor analysis would then be conducted on the second half of the sample to see whether a simple structure similar to the seven proposed functions emerged.

The initial analysis could not be run because the resulting matrix for the first random half of the sample was not positive definite for the principal axis analysis. It was likely that there were not enough subjects per item (with only 168 subjects for the half sample). Therefore, two alternatives were considered. The first approach was a substitution process for the missing data – if an individual did not complete the item, it might be assumed this missing data could be interpreted as "Does not perform." That is, all missing data could be replaced with 0's. This increased the interpretable data points and an exploratory factor analysis could be conducted. Rather than making these assumptions about responses, however, a more conservative approach was adopted. This latter approach required that the second half of the analysis – testing the nested factors in a second-order factor analysis – could not be pursued. Therefore, a principal axis factor analysis on the entire database, without a replacement of missing data, was run.

Principal axis factor analysis, in contrast to principal components, attempted to investigate both the unique variance accounted for by each factor as well as their shared variance (Harris, 1985). This approach was adopted because the team leadership factors were expected to be highly correlated. The rotated factor matrix offered the information most interpretable for understanding the unique variance of each of the factors. Using a varimax rotation, the analysis resulted in 23 factors, 16 with eigenvalues over 1.0. In contrast to the expectation that 7 functions would be identified through the factor analysis, these 16 factors roughly corresponded

to the 20 activities and their related performance indicators identified in the background research.

The identifying items for each factor had factor loadings of 0.30 or higher and were associated with the factor on which it had the highest loading. An off-factor loading rule was adopted in which items that loaded on more than one factor at over 0.30 might be dropped from inclusion in a scale. However, the number of off-factor loadings over 0.30 was very low. Only six items related to factors that were included in Study 2 had off-factor loadings over 0.30. In each case, the higher factor loading determined the scale with which the item was included.

See Table 9 for the rotated factors, their eigenvalues, and related descriptions. See Appendix D for a listing of all factors, identifying items, and off-factor loadings over 0.30. The interpretation of these rotated factors provided the scales for Study 2.

Average Factor Scores – Exploratory Factor Analysis

The factors found in Study 1 were examined for inclusion in Study 2. The expectation had been that the seven functions and twenty activities identified in background research would form the foundation for Study 2, and the factors that fell out in Study 1 analysis were closely related to the activities that were proposed to make up the seven functions.

The factors were averaged into scales. These scales were created for analysis in Study 2 of relationships to other team leader variables to demonstrate criterion-related, convergent, and discriminant validation. A number of scale criteria, including scale reliabilities and descriptive statistics, were examined to determine their scale quality, the justification for including each of their items, and the appropriateness of the scale's inclusion in Study 2. Not all factors and

Table 9

Principal Axis Factor Analysis Varimax Rotation: Factor Statistics and Eigenvalues

| Variable | Description | Factor | Eigenvalue | % Var. Acctd. for |
|---|---|---|---|---|
| Actvt5.2 | Communication with Customers | 1 | 8.20498 | 10.0258 |
| Actvt4.2 | Training and Development Needs | 2 | 6.63927 | 8.1127 |
| Actvt3.2&3.3 | Supportive Environment/Problem-Solving | 3 | 6.56205 | 8.0183 |
| Actvt1.2&1 3 | Monitor and Improve Production | 4 | 5.03196 | 6.1487 |
| Actvt4.4 | Personnel Decisions | 5 | 4.98876 | 6.0959 |
| Actvt6.2 | Motivate to Excel | 6 | 4.86246 | 5.9415 |
| Actvt2.1 | Equipment Availability and Machines | 7 | 4.56897 | 5.5829 |
| Actvt2.2 | Obtain and Allocate Materials | 8 | 4.14934 | 5.0702 |
| Actvt5.1 | Improve Relations beyond Team | 9 | 3.89367 | 4.7578 |
| Actvt6.3 | Resolve Conflicts | 10 | 3.72518 | 4.5519 |
| Actvt6.1 | Align with Organizational Mission/Values | 11 | 3.41200 | 4.1692 |
| Actvt7.2 | Understand Business/Customer Needs | 12 | 3.34464 | 4.0869 |
| Actvt1.1 | Interpret Process/Monitor Cycle Time | 13 | 3.10731 | 3.7969 |
| Actvt7.1 | Understand Continuous Improvement | 14 | 3.05001 | 3.7269 |
| Actvt4.3 | Performance Assessment | 15 | 2.88568 | 3.5261 |
| Actvt3.1 | Communication Improvement | 16 | 2.69391 | 3.2917 |

corresponding scales were included in Study 2, only those that met the following criteria:

- eigenvalues over 1.0 in the principal axis analysis – un-rotated factor structure

- eigenvalues over 1.0 in the principal axis analysis – rotated factor structure
- theoretically relevant identifying items in the varimax rotation
- coefficient alpha reliabilities over 0.80
- theoretical rationale for the scales as representative of the functional areas outlined in Study 1

Each of the factors met the first three criteria: eigenvalues greater than 1.0 for rotated and un-rotated matrices and theoretically relevant varimax rotated factor loadings. The next criterion examined was the reliability of each of the factors. Every scale's alpha coefficient exceeded 0.80 demonstrating appropriate reliability levels. See Table 10. In only one case did an item on a scale lower the reliability. In Factor 13, the reliability was 0.87 when Performance Indicator 1.1a was deleted, compared to 0.85 with the item included. Because this factor was not eventually included in Study 2, no decision was made about the item's inclusion.

Other general descriptive statistics were examined for each of the scales. It was demonstrated, as seen in Table 10, that the means, SDs, and sample size, along with the reliabilities, were not radically different across the scales. It should be noted that the "0" or "not performed" responses were not included in the computation of average scores. The related percentage performance data for activities, based on those who do *not* respond with a "0," was recorded in Table 7 above. Because they were based on closely related variables, this data in Table 7 reflected similar percentages of the sample performing the factors listed in Table 10. The percent performing these factors did not vary widely across the sample, with 17 of the 20 activities performed by over 90% of the sample.

Table 10

Scale Descriptive Statistics

| Factor/Scales | Descriptor | M | SD | N | Alpha | No. of items |
|---|---|---|---|---|---|---|
| 1. Actvt5.2 | Communication with Customers* | 2.29 | 1.28 | 332 | .95 | 9 |
| 2. Actvt4.2 | Training and Development Needs* | 2.87 | .90 | 333 | .91 | 8 |
| 3. Actvt3.2&3.3 | Supportive Environment/Problem-Solving* | 3.31 | .50 | 336 | .89 | 12 |
| 4. Actvt1.2&1.3 | Monitor and Improve Production* | 3.25 | .70 | 337 | .89 | 10 |
| 5. Actvt4.4 | Personnel Decisions* | 2.39 | 1.35 | 333 | .94 | 5 |
| 6. Actvt6.2 | Motivating to Excellence* | 3.24 | .79 | 332 | .91 | 7 |
| 7. Actvt2.1 | Equipment Availability and Machines | 2.95 | 1.06 | 329 | .90 | 6 |
| 8. Actvt2.2 | Obtain and Allocate Materials* | 3.09 | 1.13 | 333 | .92 | 5 |
| 9. Actvt5.1 | Improve Relations beyond Team | 2.93 | .76 | 334 | .88 | 6 |
| 10. Actvt6.3 | Resolve Conflicts | 3.17 | .78 | 334 | .86 | 5 |
| 11. Actvt6.1 | Align with Organizational Mission/Values* | 2.81 | 1.08 | 334 | .91 | 5 |
| 12. Actvt7.2 | Understand Business/Customer Needs* | 3.27 | .74 | 337 | .89 | 5 |
| 13. Actvt1.1 | Interpret Process/Monitor Cycle Time | 2.75 | .93 | 335 | .85 | 5 |
| 14. Actvt7.1 | Understand Continuous Improvement | 3.30 | .73 | 332 | .85 | 4 |
| 15. Actvt4.3 | Performance Assessment | 2.88 | .88 | 332 | .88 | 6 |
| 16. Actvt3.1 | Communication Improvement | 2.86 | .82 | 332 | .84 | 4 |

Note. Means were based on responses of "0", not performed, and therefore were deflated; N represented number of subjects for calculating Ms and SDs. Alpha statistics were based on slightly smaller sample sizes. Scales with * were included in Study 2.

In addition to this empirical evidence, it was also imperative to examine the theoretical rationale for inclusion of particular scales in Study 2. In addition to adequate reliability and

descriptive statistics, the content representativeness of each scale in relation to the previously reviewed team leadership domain also had to be demonstrated. The criterion for inclusion was that the meaning of the included factors covered as complete a domain of the initially proposed functions as possible while also only including those with acceptable empirical results. The most theoretically relevant and domain representative scales were associated with the previously identified team leader functions as shown in Table 10. These scales represented the content areas of production monitoring and improvement, material allocation, team environment of support and problem-solving, training and development needs, personnel decisions, customer communication, alignment with organizational mission, motivate to excel, and understanding of customer and business needs.

## Discussion of Study 1 Results

A construct validation of the roles of team leadership was the fundamental purpose of this research. From the outset of this research, construct validity evidence was expected from four sources of data: content validity, criterion-related validity, convergent validity, and discriminant validity. The content validity evidence, examined in Study 1, was proposed as the foundation for the latter three sources, to be examined in Study 2. It was therefore necessary to identify the most critical aspects of the content validation effort as represented in Propositions 1 and 2 and determine whether a basis of validity was justified for propositions in Study 2. While the content validity results in Proposition 1 indicated that team leaders did perform the proposed functions of team leadership and that they did consider them important, the results did not uphold Proposition 2's seven-factor confirmatory model.

### Proposition 1: Importance Ratings and Performance of Team Leader Activities

Content validity evidence was strongly demonstrated by the results of Proposition 1. Not only were the vast majority of activities and performance indicators rated as "important" or

"extremely important," most were performed by over 90% of respondents as well. This substantiation of Proposition 1 lent the most credence to the domain of representativeness of the items that were selected. Those activities and performance indicators that were included in the survey were considered both important and were frequently performed by the participants.

While all the activities were performed by the majority of respondents, three activities were not performed by at least 90% of respondents. These activities were: Help team communicate effectively with customers (performed by 78.7%); Help team identify and plan for human resource requirements (88.7%); and Help team with hiring, reward, reassignment, and removal (78.4%).

It may have been that these activities fell outside the traditional roles of team leaders. Communicating with customers may have been the role that areas other than manufacturing were perceived to play or it may have been seen as a function of a supervisor at a higher level vs. the front-line manufacturing team leader. In support of this interpretation, it should be noted that this activity received the second lowest average importance rating (3.02). Similarly, making personnel decisions has been more traditionally associated with personnel office roles and supervisors outside the team. Additionally, "help team with hiring, reward, reassignment, and removal" was rated 2.84 (between somewhat important and important), the only activity with an average rating below 3.0 (important). Given these role norms, it was interesting that even these three activities were performed by over three-quarters of the sample and were not rated as being of low importance. Furthermore, the content representativeness of the activities for the previously explored functions appeared to make them reasonable choices for inclusion. Furthermore, respondents' comments, additions, and criticisms of the survey appeared to substantiate the comprehensiveness of the survey and did not appear to fundamentally alter the content or approach. Future efforts should, however, consider the additions that were suggested

for performance indicators and consider respondents' criticisms of the survey, included in Appendix C.

## Proposition 2: Factor Analysis

In contrast to the content validity evidence substantiated in Proposition 1, Proposition 2's model of seven functions represented by seven factors was not upheld. Sample size was clearly a limiting factor, and there was not enough empirical evidence to pursue the confirmatory approach further. It was therefore necessary to determine whether adequate content validity could be demonstrated by other analyses to justify pursuing further validity evidence in Study 2.

The premise of content validity was that a sampling of items adequately represented the domain of interest (Cascio, 1991). It was Proposition 1 rather than Proposition 2 that most directly addressed that question. And, as noted, Proposition 1 was substantiated. Proposition 2 sought to further describe the domain of interest by proposing a specific structure. The seven-factor structure that was proposed appeared justified based on the background research and the literature review. However, the fact that this model was not supported empirically did not indicate a lack of representativeness of the domain. Rather, it demonstrated a mis-specified model. This was not a small issue because the most parsimonious model possible was preferred for theory-building and for further empirical research. However, the lack of model fit did not indicate that content validity was inadequate for further exploration in Study 2.

An alternative structure, described below, still represented the domain of interest and was both theoretically and empirically adequate for the purposes of content validity and for further validity exploration. Further research will be necessary to determine whether the alternative structure was a more appropriate model than the seven functions originally proposed. The sample size limitations in this study were severe enough to limit the exploration here. Therefore, future studies might build on the results of this research, refine the measure, draw

from a larger sample, and compare the appropriateness of the seven-function model and the alternative model suggested by the exploratory analysis.

## Scales for Study 2

In contrast to the confirmatory analysis that did not support the seven factors, the exploratory factor analysis resulted in 16 interpretable factors. The resulting model was similar to the 20 activities, the sub-sets of the 7 functions, that were identified in the background research and that were examined in the literature review. The identifying items of the 16 factors were averaged into scales to evaluate them for inclusion in Study 2.

Only nine scales that met both theoretical and empirical criteria were included in Study 2. The scales were chosen based on five criteria: eigenvalues over 1.0 in the principal axis analysis un-rotated, eigenvalues over 1.0 after the varimax rotation, theoretically relevant factor loadings in the varimax rotation, coefficient alpha reliabilities over 0.80, and a theoretical rationale for the scales representativeness in relation to the seven functions of team leadership identified in the literature review.

The factor results, along with the content validity evidence related to performance and importance of activities in Proposition 1, provided justification for these nine representative and reliable scales. The scales represented team leadership in nine content areas: Production Monitoring and Improvement (Activities 1.1 and 1.2), Material Allocation (Activity 2.2), Team Environment of Support and Problem-solving (Activities 3.2 and 3.3), Training and Development Needs (Activity 4.2), Personnel Decisions (Activity 4.4), Customer Communication (Activity 5.2), Alignment with Organizational Mission (Activity 6.1), Motivate to Excel (Activity 6.2), and Understanding of Customer and Business Needs in relation to Continuous Improvement (Activity 7.2). These nine scales were associated with eleven

activities and represented much of the content of the seven functions that was discussed in the literature review.

It should be noted however that there were limitations to the adoption of these factors: items did not all group on factors as expected; not all activities were represented as factors; and seven functions were not demonstrated. As a result of this third limitation, the integration with Fleishman and Zaccaro's (1992) model was not fully substantiated.

Regarding the first concern, not every related performance indicator was an identifying item for the activity factor it was expected to relate to in the survey. Therefore, there also were identifying items that did not load on the activity they were related to in the background research. For example, the Supportive Environment/Problem Solving scale (Activities 3.2 and 3.3) was related to the previously identified Team Relations (Function 3). The scale included two performance indicators from the activity related to team communication (Activity 3.3). The scale also included two performance indicators from the activity related to interpreting production process (Activity 1.3). However, in each case, the content of the wording in those four performance indicators appeared to be related to the Supportive Environment/Problem Solving scale they loaded on. Therefore, although the items were not originally grouped with the factor in the background research and literature review, the meaning of the items was logical for grouping them with the factor.

Similarly, in the scale Monitor and Improve Production (Activities 1.2 and 1.3), several performance indicators that had been expected to load on this factor loaded more highly on another factor. Again, these differences seemed reasonable when the content of the items was examined. The empirical rule that the highest loading determined the identifying items was adopted. That rule dictated the creation of the scales rather than the associations from the background research. Additionally, the off-factor loading rule ensured that items were not

loading on more than one scale. These criteria were adopted because their conservative approach meant that Study 2's scales and analyses were not likely to be as affected by chance or experimenter bias.

It also should be noted that while 18 of the original 20 team leader activities were represented in the 16 rotated factors, the other 2 activities did not fall out as factors with eigenvalues over 1.0. Items related to Activity 7.3 (Make Continuous Improvements) and Activity 4.1 (Activity 4.1 Plan Human Resource Requirements) did all load on two identifiable factors but they did not have eigenvalues over 1.0. The descriptive statistics, means, variance, and frequency of performance, related to these factors did not differ markedly from other factors. However, it was obvious that the items related to these two activities did not account for enough variance to be included as separate scales. The results indicated that despite the fact that they did not justify the creation of scales, the content should be included in future research because it appeared likely that other content areas adequately covered the domain related to the activity – e.g., Understanding Business Needs (Activity 7.2) and Making Continuous Improvements (Activity 7.3) included many items related to the team's understanding of continuous improvement (Activity 7.1). Similarly, items related to planning human resource requirements (Activity 4.1) loaded on other factors such as aligning team goals with organizational mission (Activity 6.1), and therefore this content was also adequately represented in the factors that were included in Study 2.

While the literature review focused on seven functions, the twenty activities were considered and included in the review of the literature and the creation of the functions. The seven functions related directly to the twenty activities. The nine scales that were adopted for Study 2 directly represented eleven of those twenty activities and components of the original seven functions. When examining the inclusion of activities in the leadership literature and the

team leadership literature, it was determined that the leadership processes (see Table 2) were appropriately represented in these nine scales. That is, information search, problem-solving, managing personnel resources, and managing material resources were processes that were represented in the nine scales. The seven functions identified by Fleishman and Zaccaro (1992; see Table 3) were also adequately related to the content areas in the nine scales adopted for Study 2. The nine activities not included in Study 2 did not significantly change the general representativeness that Fleishman and Zaccaro's model lent to the theoretical substantiation of this study. Furthermore, the team leadership studies that were identified (see Table 5) included content in their studies that related directly to these eleven activities because of the activities' correspondence to the seven functions. While including all twenty activities in Study 2 would have been the more comprehensive alternative, given the adopted nine scales' appropriateness in relation to the literature review, that did not seem necessary.

This was the first study of its type and the validation of these nine scales represented a substantial contribution to the literature. Not only was the content validity evidence gathered, but other criteria might be used to consider the contributions of this study. First, the response rate for team leaders was over 60%, one that was considerably higher than many field studies of its kind. Additionally, this high response rate was even more notable because it involved over 60 different companies. The voluntary involvement of so many electronics companies and so many team leaders, whose time is very limited is a reflection of the worth of the study. Finally, the fact that this study was part of an ongoing research effort guaranteed that its findings would be part of further efforts to refine and develop the related constructs.

## Methodological Limitations

A number of methodological limitations that impeded the exploration of the content validity of the team leadership roles proposed in this study were also considered. The range of

responses to the survey was likely restricted by several factors. First, only superior performers were asked to participate in this study. This selection criterion was based on the assumption that better team leaders performed the most appropriate activities and were therefore most appropriate and able to rate the importance of activities and performance indicators. Mediocre or poor performers might have perceived that a team leader function was important that was not. Similarly, poorer performers might have been more likely to perform activities that were not as critical for success or to leave out activities that were important. To the degree that this working assumption was correct, better data were gathered. Given the homogeneity of a sample including only competent performers, restriction of range was likely to result. Additionally, because of this range restriction, true correlations may have been under-estimated, predictive potential may have been diminished, and sensitivity may have been reduced. Future studies could offer more generalizable information about the team leader roles by including samples with diverse types of respondents.

Several demand characteristics were also apparent in the methodology. Respondents were informed in the survey instructions that many or all of the activities and performance indicators may have been important. This was included to keep respondents from second-guessing the purpose of the survey or from assuming that the survey was created with intentionally bogus, un-related items. As noted in the Methods chapter, the decision not to include un-related items was made after extensive deliberation among the technical experts and test developers. It was determined that bogus items may confuse or anger respondents and lead to poorer results. However, this may have led participants to indiscriminately rate all items as important. This demand characteristic also may have been enhanced because respondents were informed that they were selected because of their superior performance. This stated criterion may have led them to feel they should justify their inclusion by rating all items as important.

The effect of this demand characteristic can not be fully examined in this study. However, because a reasonable amount of variance was demonstrated in responses to items, both between items and within respondents' answers, it did not seem that these demand characteristics completely hindered candid examination of items and appropriate variability in responses. In a future study, the survey might also include bogus items, might not include the instructions that all items may be important, and might not inform participants of the selection criterion. Additionally, theoretically related activities and performance indicators might be distributed across the survey rather than being grouped together, as this offered another potential source of method bias.

In sum, evidence of content validity was strongly demonstrated in Study 1. The importance and performance ratings indicated that the team leadership roles were represented accurately. What was not supported was the identification of seven overarching functions of team leaders. However, scales that represented closely related constructs were substantiated and proposed for inclusion in Study 2.

In the first study of its kind, the results in Study 1 upheld propositions from background research about the most critical facets of team leadership in the manufacturing high-tech industry. Previous researchers have argued that essential facets of team leadership include an effort to meet and exceed both internal and external customers' expectations, an integration of the team around work processes, empowered team decision-making, a reduction in conflict among members, an appreciation of creativity, a commitment to a shared organizational vision, an energized quest for quality, and a climate of learning, contribution and self-direction (e.g., Campion, Papper, & Medsker, 1996; Carr, 1992; Graham & LeBaron, 1994; Mohrman et al., 1995). The scales that were validated in Study 1 thus reflected the facets of leadership proposed by these and other researchers. The scales were therefore included in Study 2 to examine

relationships between these team leader roles and other organizational variables. The relationships were explored through an examination of criterion-related, convergent, and discriminant validity evidence.

# CHAPTER IV

## STUDY 2: LITERATURE REVIEW FOR TEAM LEADER CRITERION-RELATED, CONVERGENT, AND DISCRIMINANT VALIDITY EVIDENCE

The purpose of Study 2 was to investigate further validity evidence of the functions of team leadership in the manufacturing high-tech industry. This chapter outlines the criterion-related, convergent, and discriminant validity propositions explored in Study 2. A model of organizational design (Cummings & Worley, 1993) is introduced as a context for understanding how team leadership related to other organizational variables. The nine team leadership scales identified by content validation in Study 1 were correlated with model variables to provide further evidence of the construct validity of the team leader functions.

This chapter introduces the organizational model that was adopted, followed by the specific propositions relating team leadership to other organizational variables. Three questions were addressed in Study 2:

- How do the functions of team leadership relate to and predict other organizational variables (criterion-related validity)?
- Do the functions of team leadership relate to other conceptually similar variables (convergent validity)?
- Are the functions of team leadership un-related to organizational variables that should be conceptually distinct from team leadership (discriminant validity)?

### Organizational Design Model

Theories guide research investigations by making propositions that relate constructs to one another and by positing testable propositions (Bacharach, 1989). Conceptual models are graphical representations that facilitate communication about theories, their constructs, proposed relationships, and potential analytic techniques (Hausser, 1980; Porras & Robertson, 1992). A

number of organizational models were reviewed for adoption of a theoretical framework for this study. The purpose was to provide a context in which the relationship between team leadership and other organizational variables could be identified, examined, and explained. Specific criteria were adopted in Study 2 for the theoretical model that framed the validation of team leadership in the high-tech industry. These were an integration of existing organizational theories (Porras & Robertson, 1992; Woodman, 1989); an open system, contingency theory approach to organizational functioning (Hausser, 1980; Lawler, 1992; Morgan, 1986; Perrow, 1967); a focus on different levels of organizational performance (Hausser, 1980); and parsimony (Bacharach, 1989).

A review of a number of models resulted in the adoption of the Cummings and Worley's model (1993) for the present study. Several models addressed a single level of the organization, including the individual level (e.g., Campbell, Dunnette, Lawler, & Weick, 1970; Porter, Lawler, & Hackman, 1975), the group level (e.g., Hackman & Morris, 1975; Likert, 1967) and the organizational level (e.g., Galbraith, 1977; Lawrence & Lorsch, 1967; Morgan, 1986; Pheysey, Payne & Pugh, 1971). Other models included multiple levels of the organization (e.g.. James & Jones, 1974) but were not as comprehensive or integrative in their examination of relationships and variables as others (e.g., Kotter, 1978; Nadler & Tushman, 1977; Weisbord, 1976).

Cummings and Worley (1993) developed their model based on the work of Kotter (1978), Nadler and Tushman (1977), and Weisbord (1976). These three models were based on a diagnostic implementation theory of organizational development, created as guides for practitioners to identify areas for intervention (Porras & Robertson, 1992). They included more feedback and multi-directional relationships than other organization development theories and emphasized the interrelated nature of organizational variables. Kotter's model (1978) demonstrated the interactions among the sub-systems of the environment, organizational

structure, organizing processes, the social system, technology, and organizational outcomes but did not include anything about an organizational vision, purpose, or guiding strategy. Nadler and Tushman (1977) included many of the same elements: environment, strategy, organizational structure, task technology, and organizational outputs, but also did not address organizational vision and did not consider the role of organizational processes. Weisbord (1976) included organizational vision in his model, along with environment, structure, rewards, and social factors including leadership, but did not include technology, organizational outcomes, or strategy. Cummings and Worley (1993), see Figure 2, integrated the elements of these three models, basing their model on the theoretical underpinnings of contingency theory and presenting a multiple-level examination of organizational functioning.

To investigate team leadership in relation to organizational functioning, this study focused on the organizational and group levels of analysis. See Figure 3. Team leadership functions (see Table 1; Antonucci et al., 1995) were included in the group task structure in the model and were based on the content validity evidence explored in Study 1. The other model components will be reviewed below, followed by the related Study 2 propositions.

The complete model in Figure 2 was not tested. Cummings and Worley's (1993) full model was presented because the background research was originally created to test additional variables in the model and because it was expected that future studies building on this line of research would be based upon this theoretical model. Clearly, it would have been ideal to examine all levels of analyses and all components of the model to the fullest extent. However, no single study could accomplish this and for the purposes of this study and its specific propositions, the modified model in Figure 3 appeared reasonable. Additionally, the original intent of the study was to test several other model components, including organizational input

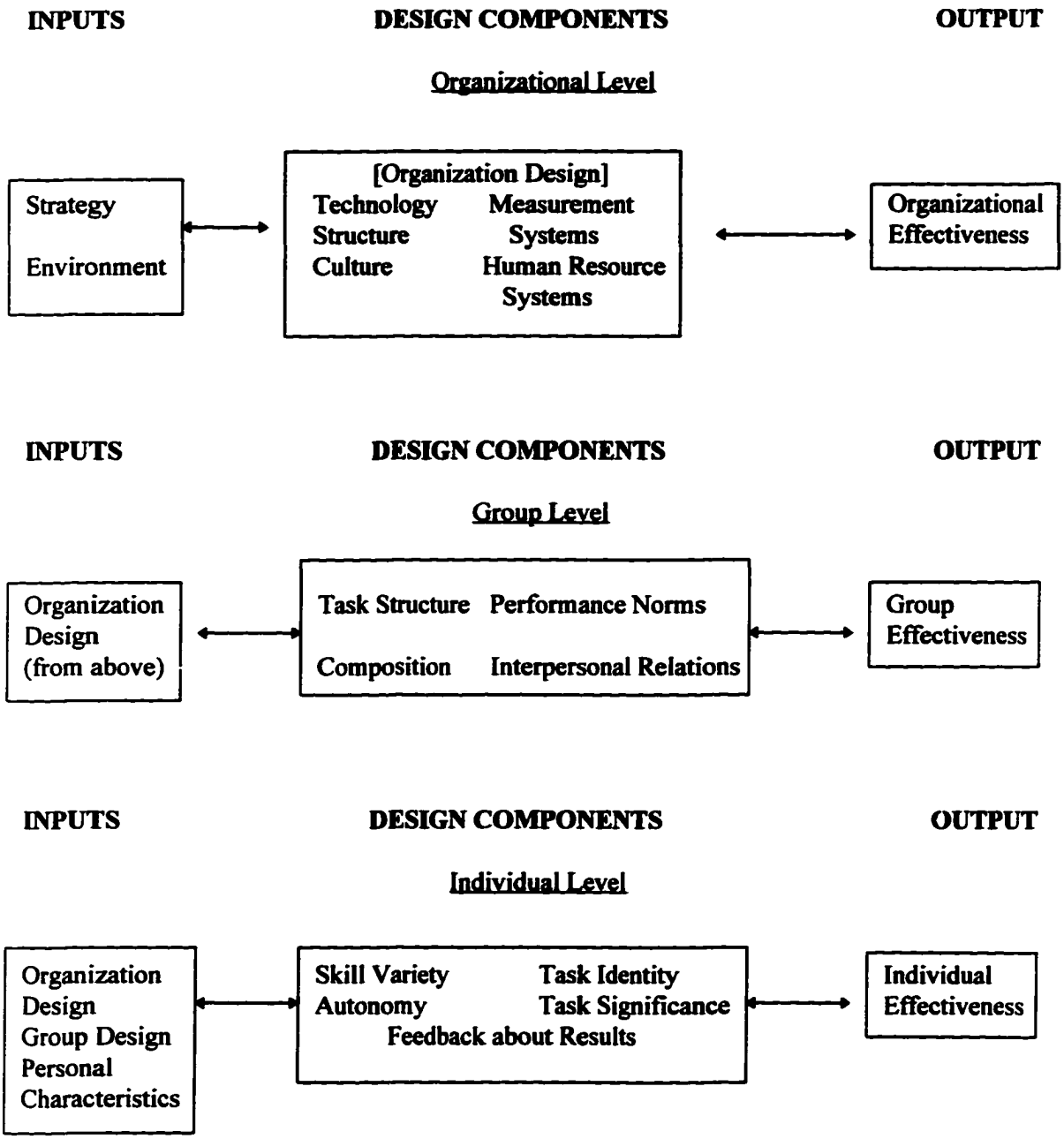


Figure 2. Complete organizational model (Cummings & Worley, 1993, p. 90).

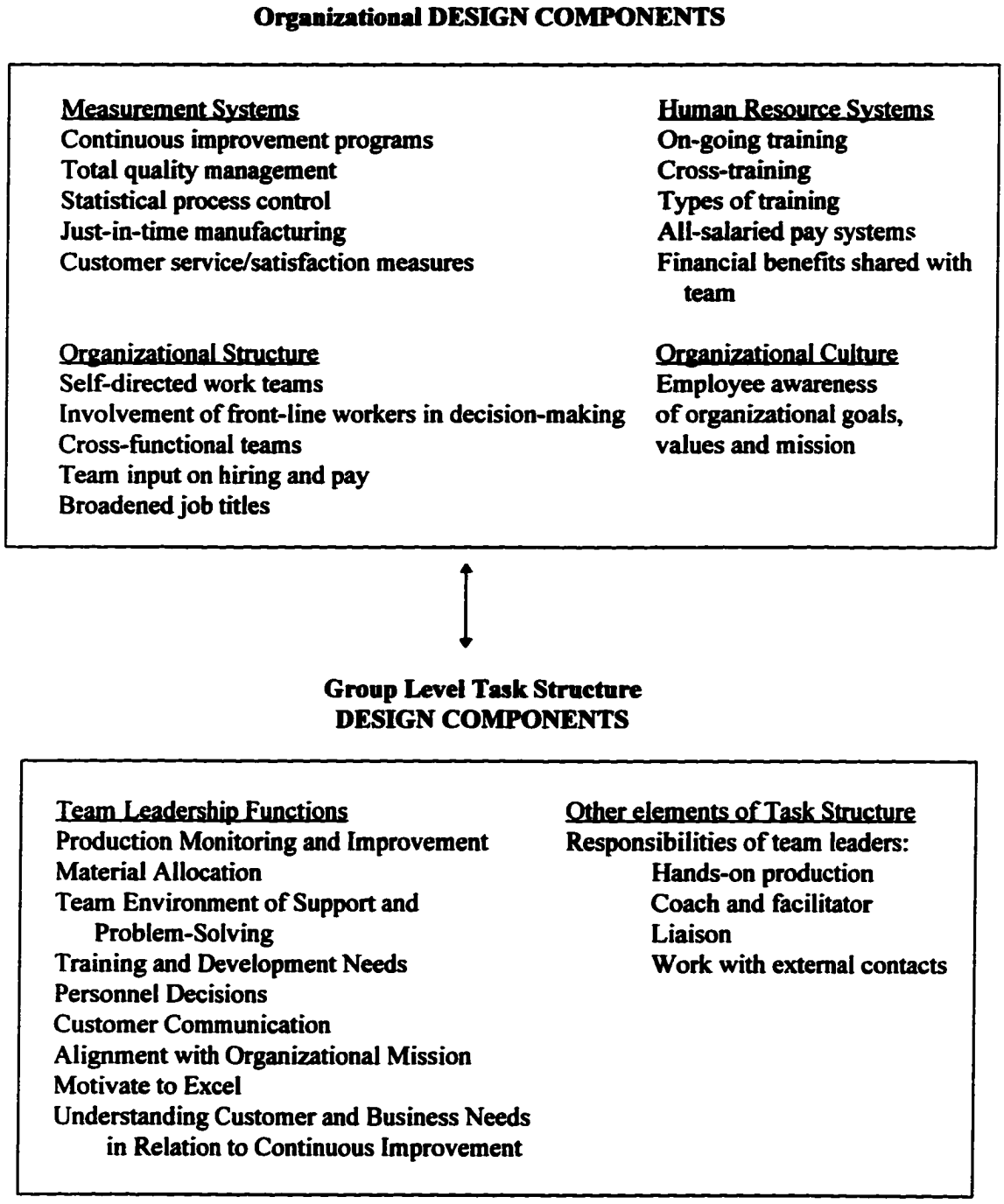


Figure 3. Modified organizational model used in present study (based upon Cummings & Worley, 1993).

and output variables, as well as group-level performance norms. However, the sample size for the instrument designed for that purpose did not result in enough power to test the propositions related to these variables. Therefore, they were not included in the propositions and analyses. It should be noted, however, that the organization practices and group design elements that were included in Study 2, in Figure 3, addressed a large number of organizational components in comparison to many other studies.

## Organizational Design Components

This section includes an overview of each of the organizational practices that comprised the organizational design in the Figure 3 model (i.e., modified Cummings & Worley model). Many of these practices were related to high performance and reflected important organizational practices for company success in the current marketplace (Walton & Hackman, 1986). The assumption was that in companies where team leadership was important and performed widely, other innovative organizational practices would also be implemented and that these practices would relate in a logical manner to the team leadership nomological net.

Several comprehensive studies and reviews of organizational functioning and high performance practices were drawn from to examine these practices and were referenced in the reviews below of a number of different practices (e.g., Graham & LeBaron, 1994; Korte & Nash, 1994; Kravetz, 1988; Mavrinac & Jones, 1995, Pfeffer, 1995; Risher & Fay, 1995; USDOL, 1992). However, a comprehensive review of each practice was not included. An effort was made only to present a general definition of the practice, its relationship to high performance, and research results about the practices' relationships to organizational success.

Following the review of the model components, the specific propositions for Study 2 will be outlined and justified. The propositions for criterion-related, convergent, and discriminant validity included variables from different components of the organizational model.

It should be noted that the expectation was not that every variable in the organizational model would be related to every function of team leadership. Briefly, the criterion-related validity propositions included relationships between particular functions of team leadership and organizational design components related to human resources, measurement systems, structure, and culture (see Table 11). Convergent validity evidence was investigated by examining the relationships between the different scales of team leadership and their relationship to self-directed work teams. Additionally, other facets of group functioning were proposed to relate to team leadership in the convergent validity propositions (see Table 12). Finally, discriminant validity propositions were tested by examining relationships with variables that were not included in the organizational model. Again, every team leadership function was not expected to relate to every organizational component in Tables 11 and 12. The specific propositions will be outlined and explained later.

Table 11

Organizational Model Components – Criterion-Related Validity

| |
|---|
| Human Resource Systems |
| • On-going training and amount of training received |
| • Cross-training |
| • All-salaried pay systems |
| • Financial benefits shared with team |
| Measurement Systems |
| • Continuous improvement programs |
| • Total quality management |
| • Statistical process control |
| • Just-in-time manufacturing |
| • Customer service/satisfaction measures |
| Organizational Structure |
| • Front-line decision-making and/or problem-solving |
| • Cross-functional teams |
| • Team input on hiring and pay |
| • Broadened job titles |
| Organizational Culture |
| • Employee awareness of organizational goals, values and mission |

Table 12

Group Design/Task Structure Components – Convergent Validity

| |
|---|
| Team Leadership Functions |
| • Production Monitoring and Improvement |
| • Material Allocation |
| • Team Environment of Support and Problem-Solving |
| • Training and Development Needs |
| • Personnel Decisions |
| • Customer Communication |
| • Motivate to Excel |
| • Alignment with Organizational Mission |
| • Understanding Customer and Business Needs in relation to Continuous Improvement |
| Other Task Structure Elements |
| • Self-directed work teams |
| • Responsibilities of team leaders in hands-on production |
| • Responsibilities of team leaders as a coach and facilitator |
| • Responsibilities of team leaders as liaison |
| • Responsibilities of team leaders with outside contacts |

Human Resource Systems

The Cummings and Worley model included human resource systems as one component of organizational design. Two sub-sets of human resource systems were included in the present study for consideration in the criterion-related validity propositions. The sub-sets were training

and compensation. The practices associated with training were on-going training for all front-line workers, cross-training, and the amount of training received across a variety of training opportunities. Compensation practices included all-salaried pay systems and financial benefits shared with the team. It was not argued that this was a comprehensive representation of all associated practices, but rather a sampling of important organizational practices that represented the human resources systems. Additionally, the practices that were included in the model were rated both on the extent to which they were implemented and the effectiveness of their implementation.

On-going training for front-line workers. The U.S. Department of Labor (USDOL, 1992) has stated that one mark of a successful company is that the executives see the workforce as an investment rather than as a cost to be controlled. Therefore, training and employee development, both on-the-job and in more formal off-the-job settings, have been viewed as investments in promoting organizational effectiveness (National Center on Education and Economy (NCEE), 1993; Pfeffer, 1995; Rogers & Ferketish, 1992). Also supporting that position, the Malcolm Baldridge Quality award (1995), a widely recognized award for successful innovative companies, has included a company's emphasis on continuous learning and development as one of its criteria. Likewise, Korte and Nash (1994) defined employee enrichment as a facet of a high performance workplace. They stated that training fostered job security through the acquisition of advanced skills, in addition to making workers more valuable to the organization. Lawler and colleagues (Lawler, 1992; Lawler, Mohrman, & Ledford, 1992) also have stated that training provided workers with knowledge critical for empowerment, an advantage for both the individual and the company.

Carnevale and colleagues (Carnevale, 1986; Carnevale, Gainer, & Villet, 1990) have indicated that approximately one in every eight American workers receives formal training each

year. They suggested that because training was a prevalent organizational practice, companies should consider this practice in their strategic planning efforts. Others have likewise argued that when organizations invest in training as an integral part of their business strategy, such training is accompanied by overall organizational effectiveness (Bassi, 1993; Geber, 1995; NCEE, 1993; Pfeffer, 1995; Risher & Fay, 1995; Rogers & Ferketish, 1992; USDOL, 1992, 1993). For example, in Holzer's (1990) nationwide survey, hours of worker training was positively related to productivity and this was true across a number of different industries. Similarly, Mavrinac and Jones (1995) found that for every dollar that a successful company invested in employee training, they earned a return of thirty dollars. The relationship between on-going training and team leadership will be explored in a later section.

Cross-training. Cross-training has been viewed as a means of enabling employees to acquire skills that facilitate team work and the accomplishment of larger tasks without sole reliance on one individual's skills and without any individual's employment or assignment being tied to only one job they could perform. Pfeffer (1995) argued that sustainable competitive advantage is furthered by the use of teams, cross-utilization, and cross-training. Risher and Fay (1995) made the same argument, adding multi-skill training. Although some authors (e.g., Korte & Nash, 1994; Rogers & Ferketish, 1992) did not use the term "cross-training" explicitly, the large number of training programs they suggested for employees imply cross-training in multiple skills.

Cross-training has been related to organizational effectiveness (e.g., Pfeffer, 1995; Risher & Fay, 1995). The USDOL (1993) offered specific evidence of its effect in reducing fatigue, absenteeism, and turnover, and in improving job satisfaction. Additionally, time to market was reduced by the use of cross-training in Japan's mainframe computer industry (Mavrinac & Jones, 1995).

All-salaried pay systems. As with ongoing training, the importance of all-salaried pay systems in an empowering work environment has been related to the viewpoint that workers are motivated by being recognized as worthwhile contributors of organizational effectiveness and as more than the sum of their existing skills, a static job title, or an hourly pay scheme. In the American Electronics Association review (Sinn & Antonucci, 1995), all-salaried pay, that is, everyone in the workforce receiving a salary as opposed to being paid on an hourly basis, was considered an appropriate reward structure for a high-involvement or high performance company. Risher and Fay (1995) included all-salaried workforce and alternative reward systems as part of the effective organizational functioning. Similarly, Pfeffer (1995) proposed symbolic egalitarianism, wage compression, and incentive pay as part of his paradigm for competitive advantage.

In his investigation of the positive impact of flexible work practices, Osterman (1994) included the use of innovative pay systems as one facet of high performance. Similarly, Mavrinac and Jones (1995) concluded that "more progressive management and reward systems" led to higher rates of growth in profit, sales, and earnings per share at XEROX. Although these authors did not refer explicitly to "all-salaried pay systems," it seemed reasonable to assume that it might be considered such an innovative, progressive practice.

Financial benefits and profits shared by team. Sharing financial benefits among team members and with those who have contributed to the efforts has been proposed as one means of enhancing team motivation and effectiveness (Lawler, 1992). Compensation systems that were linked to individual, team, and corporate performance in order to foster long-term commitment of employees to the organization has been seen as one aspect of high performance organizations. Korte and Nash (1994) stated that gain-sharing, employee stock ownership, profit-sharing, team-based pay, and skill-based pay are all part of successful, innovative organizations' reward

structures. High performing companies have been presented as providing equitable rewards and recognition in a manner that reinforces employee values and motivates them to maximize their potential and that rewards employees equitably, sharing profits and fostering ownership.

In a comprehensive list of indicators of employee involvement and high involvement, Sinn and Antonucci (1995) included profit sharing, gainsharing, and stock ownership as means of achieving appropriate rewards in a high performance situation as did several other authors (Delta Consulting Group, 1990; Pfeffer, 1995: Risher & Fay, 1995). Likewise, Parker (1994) stated that for effective integration of high performance work practices, emphasis should be placed on collaborative efforts and shared team rewards.

Following a review of a number of company case studies, Mavrinac and Jones (1995) concluded that risk-sharing compensation programs (e.g., stock option programs) were drivers of improved workplace and customer outcomes, and ultimately of financial performance. Lawler et al. (1992) reported that over 30% of *Fortune 1000* companies had employee stock option programs (ESOPs) with over 10,000 in existence in 1990, covering 11.5 million employees, controlling assets of more than four billion dollars. Overall, Lawler and colleagues concluded that ESOPs brought significant positive market responses and financial returns to companies.

In a study of profit sharing, 91% of the surveyed companies reported positive correlations between profit-sharing and productivity, as a measure of sales per employee (Kruse, 1990). These relationships were found both within companies before and after implementation (3-5% increase) and between comparable companies that did and did not adopt profit-sharing practices. Bradley, Estrin, and Taylor (1990) found that one of Britain's most prestigious employee-owned firms enjoyed significant economic advantage as a result of their profit-sharing and employee-ownership plan. Similarly, Cooke (1993) found that group-based pay was associated with positive performance in union firms and had an even more positive impact in

non-union firms. Moreover, in non-union companies, employee participation efforts had a negative impact on performance *unless* combined with group-based pay.

Measurement Systems

As with human resources systems, the Cummings and Worley (1993) model included measurement systems as a component of organizational design. Literature on the measurement systems included in criterion-related validity propositions are examined below. The quality movement as reflected in successful company practices has focused to a large degree on measurement systems and has spawned such specific practices as continuous improvement programs, total quality management, statistical process control, just-in-time manufacturing, and customer service and satisfaction surveys. Therefore, each of these practices is reviewed below.

Continuous improvement. High performance companies have sought high customer satisfaction levels through a focus on continuous improvement in the quality of their goods and services (USDOL, 1992). Continuous improvement has been integral to the definition of high performance of several other authors as well (e.g., Korte & Nash, 1994; Malcolm Baldridge National Quality Award, 1995; Risher & Fay, 1995). Across different theorists, continuous improvement included a customer service focus, long term improvement in all organizational processes, development of progress measures, achievement of increases in organizational outputs, and the full involvement of the entire workforce in improving quality.

Several organizational outcomes related to human resources, productivity, and the bottom-line have been linked to the use of continuous improvement. For example, the General Accounting Office (1991) found a positive relationship between the use of continuous quality efforts in a sample of Baldridge National Quality Award finalists and the companies' outcomes, including employee relations, effectiveness of operating procedures, customer satisfaction, market share, return on assets, and return on sales.

Total quality management. Total quality management (TQM), originating with Deming (1986), set out to assess quality by specific measurements of organizational processes. In his approach to TQM, Juran (1989) focused on quality process planning, control, and improvement that used statistical techniques to point to means of eliminating defects; and Crosby (1979) emphasized improving quality as a means of reducing costs. Several common features of TQM have been identified across theorists, including an emphasis on customer satisfaction, both for internal and external customers; factual information gathering; employee empowerment; and ongoing evaluation of organizational performance through quality and control checks (Korte & Nash, 1994; Mavrinac & Jones, 1995).

TQM techniques have been implemented by a large proportion of manufacturing firms (Lawler et al., 1992; Osterman, 1994). Across industries, as many as 85% of companies reported that they have adopted TQM approaches (Lawler et al., 1992). After their review of 100 academic papers, Mavrinac and Jones (1995) determined that TQM was associated with positive outcomes in both financial and non-financial areas of workplace performance. Specifically, they concluded that higher product quality was associated with better financial outcomes. TQM techniques such as quality tools, customer focus, and proactive quality versus reactive inspection were among the practices that impacted company performance. Process improvement methods, including process value analysis, process simplification, and process cycle analysis had a universally positive impact on company bottom-line regardless of the previous level of performance of a company (Ernst & Young, 1992).

Statistical process control. The practice of statistical process control (SPC) arose as part of the quality movement. Deming (1986) appeared to view SPC as a subset of TQM, a set of management principles and techniques revolving around quality, while Juran (1989) placed more emphasis on the use of statistical techniques. In this study, SPC was examined as a measurement

system separate from TQM but with a recognition that the two practices were likely to be used together in many organizations. This assumption was reflected in the criterion-related validity propositions in which TQM and SPC were related to the same team leader functions.

Regardless of particular authors' approaches, several facets of high performance workplaces have been related to statistical process control, including ongoing evaluation of company performance, quality focus, and systems/process focus (Korte & Nash, 1994). These practices require companies to keep accurate performance documentation using quality and control checks, to seek and monitor feedback on system functions in order to maintain and increase performance, and to build quality standards into product and service developments as well as into delivery systems. Additionally, for successful statistical process control, Korte and Nash (1994) advocated the integration of systems, operations, and processes so that services and products are created in a high quality and time-efficient manner.

The use of SPC has been related to organizational effectiveness. Customer-driven quality, continuous improvement and learning, and design quality and prevention were criteria of successful companies (Malcolm Baldridge National Quality Award, 1995). Additionally, Risher and Fay (1995) stated that SPC training was a lever for change toward high performance. And Ittner and Larcker (1994) found industry differences (computer vs. automotive) in the profitability and productivity results from the use of process management, cycle time analysis, and statistical analyses. Interestingly for the present study because of its emphasis on the high-tech industry, Ittner and Larcker found that SPC and process capability were positively related to return on assets for companies in the computer, but not the auto, industry.

Just-in-time manufacturing. Just-in-time delivery and inventory systems have been identified as action levers for high performance organizations associated with total quality management (Risher & Fay, 1995) and with a lean production system (Applebaum & Batt,

1993). Korte and Nash's (1994) have described just-in-time manufacturing in terms of "the organization produc[ing] the quantity of products and services it needs immediately without defects in quality. Suppliers deliver the materials on time and the organization produces and disseminates products on time" and "a continuous communication link is established between the supplier and the organization" (p. 26).

Drawing from evidence across a number of studies, Mavrinac and Jones (1995) concluded that just-in-time manufacturing (JIT) led to improved workplace results, including increased inventory turnover and decreased manufacturing overhead. Based on a review of several studies (e.g., Ittner & Larcker, 1994; Flynn, 1994), they concluded, however, that there were mixed findings regarding the effect of JIT on financial outcomes. For instance, Ittner and Larcker (1994) found that JIT had a positive impact on firm performance only when it was coupled with other human resource practices; and given that condition, companies using JIT methods had higher return on assets than those that did not. While not explored in this study, it was also likely that these differences arose not only from the mix of practices within an organization but also as a result of the complexity of relationships between vendor and supplier organizations.

Customer service/satisfaction measures. The Delta Consulting Group (1990) included customer service, effectively responding to customer requirements, and customer focus as design principles in their definition of high performance work systems. USDOL (1992) similarly noted that the focus on customer satisfaction was integral to high performing organizations, as did Graham and LeBaron (1994). Likewise, Rogers and Ferketish (1992) included customer service in the common values of high-involvement culture, to be attained through empowered employees who focused on the satisfaction of both internal and external customers. Customer-driven quality was also one of the criteria for the Malcolm Baldridge National Quality Award (1995).

Similarly, characteristics of high performance workplaces as proposed by Korte and Nash (1994) included customer feedback that was valued and sought by the organization, employees focused on meeting customer needs, and customer recommendations about products or service improvements that were incorporated into decisions made by the organization. Additionally, work operations and organizational processes should be aligned to achieve customer-focused corporate goals. A focus on both external and internal customers also were included as aspects of organizational change levers by Risher and Fay (1995). This review indicated that attention to customer service may have been one marker of successful companies.

Focusing on the customer has led to positive results in different types of companies. Continuous training in customer relationships, visits to customers, and use of internal customers' complaints to improve the organization were means of assisting low performing companies to positively affect organizational performance, while higher performing companies benefited from customer-relationship training and from empowering employees to associate with the customers (Ernst & Young, 1992). Customer satisfaction appeared to act as a mediating link between product quality and profitability in one study (Mavrinac & Jones, 1995). However, there were mixed results regarding the impact of customer satisfaction on market share.

Organizational Culture

Another facet of organizational design examined in this study was organizational culture. While there were a multitude of ways that culture might have been depicted, due to length, only one measure was selected – an emphasis on employee awareness of organizational vision and values. This measure was included in several criterion-related validity propositions, outlined later.

Employee awareness of organization values, goals, missions. Korte and Nash (1994) outlined high performance practices that derive from employee awareness of the organization's

mission, goals, and values. These included information sharing, leadership with clear vision and commitment, articulation of a long-term strategic direction, and a sense of collective ownership and purpose. They also stated that an organization incorporating these practices shares information widely regarding corporate priorities, business outcomes, and strategic plans with workers; workers' ideas and concerns are communicated throughout the organization; and leaders outline their vision for the future and provide an atmosphere that engages workers in contributing to that vision (Korte & Nash, 1994).

Risher and Fay (1995) proposed that the derivation, delineation, and reinforcement of core values and fundamental goals through open communications and employee forums were examples of means for improving workforce effectiveness. Additionally, supplying clear direction and goals to employees was presented as one of the design principles for high performance work systems; and the Delta Consulting Group (1990) has stated that, in designing high involvement systems, organizations should ensure that teams set objectives based on the company vision and values. Each of these perspectives contributed to the adoption of the practice of employee awareness of organizational goals in this study.

Organizational Structure

Several facets of organizational structure will be reviewed below and then later related to team leader scales in the criterion-related and convergent validity propositions. These, like other components of the model, were included in Figure 3.

Self-directed work teams. Self-directed or self-managed teams have been described as facets of successful organizations by many authors (Manz & Sims, 1987, 1993; Osterman, 1994; Pfeffer, 1995; Risher & Fay, 1995; Stewart & Manz, 1994). Manz and Sims (1993) described self-managed teams as the backbone of high-performing companies. In their definitions of high-performance workplaces, Korte and Nash (1994) described self-directed teams as teams formed

to span traditional workplace boundaries and to capitalize on the expertise of each team member in product development and problem solving. The implementation of self-directed work teams was examined in this study and was expected to be closely related to the team leader scales.

Self-directed work teams have been defined as groups of employees organized to perform a "whole" piece of work (Sinn, 1994). Characteristics included relatively small numbers of members, but enough to perform the whole task (Pearce & Ravlin, 1987); responsibility for day-to-day activities within the team, including handling job assignments, planning and scheduling work, making production-related decisions, and taking actions on work-related problems; minimum direct supervision (Wellins et al., 1991); multi-skilled workers capable of performing most work tasks (Pearce & Ravlin, 1987); one member of the team as the leader; and a duration of two to five years for a team to become fully responsible and self-directed (Wellins et al., 1991).

Wellins and colleagues (1991) described the implementation self-directed teams as a means of moving an organization toward a team-based, high performance organization, as did Graham and LeBaron (1994) and Rosen (1989). Likewise, self-managed teams were among the characteristics of workplace transformation in high-involvement, "team production" systems proposed by Applebaum and Batt (1993). And Lawler et al. (1992) argued that self-managing work teams were a necessary component for workers to have appropriate power in a high performance organization.

According to Mohrman and colleagues (1995), the keys to self-directed team effectiveness, particularly teams involved in "knowledge work," were the accomplishment of their own mission and a consideration of consequences to members, customers, and other business units. These authors concluded that team effectiveness was positively related to team internal task management (e.g., planning, goal setting, performance review, improvement of

methods and approaches) and was negatively related to the amount of external integration required of team members. Effective teams had minimal meeting time with more time allotted for individual tasks. Self-managed teams required some connection to management, but also needed as much authority as possible kept within the team, involved members in leadership role performance, had lateral integration of teams and the organization when possible, and had management roles to link the team to the larger environment. Because of similarities between this approach and the team leader scales outlined in Study 1, the scales were expected to relate positively to self-managed work team implementation and effectiveness.

Involvement of front-line workers in decision-making and problem-solving. A plethora of information was available on the subject of employee involvement, but only a sampling of that research most relevant to this study was included. In Korte and Nash's effort (1994) to identify characteristics of high-performance workplaces, they included information sharing, employee involvement and participation, a flexible open culture, a decentralized structure, and an emphasis on problem-solving. Each of these facets was examined to help define employee involvement in this research. Information sharing was defined as:

> "Information is shared quickly in the organization through top-down and bottom-up channels using integrated information systems and technologies. The organization shares information such as corporate priorities, business outcomes, and strategic plans with workers, and the workers' ideas and concerns are communicated throughout the organization" (p. 23).

And employee participation in decisions meant:

> "Employees' ideas and opinions are solicited from the organization to gain their input on decisions that affect work and production. The organization acknowledges, rewards, and acts on information and decisions made by the workers" (p. 23).

While a flexible culture and openness to change existed when:

> "Systematic workplace changes are made to support an integrated and complementary approach to workplace practices. Feedback from workers and customers about products and services is quickly acknowledged and workers are directly involved in decision-making to bring about change" (p. 23).

Decentralized organizational structure was found where:

> "The structure of the organization is flat with few levels of management hierarchy. Workers are much closer to the pulse of information regarding the organizations' processes and performance. There is rapid transmittal of information from the organization to the workers about product changes and market demands" (p. 24).

And emphasis on problem-solving was shown when:

> "The organization encourages workers to engage in active problem solving and involves employees in activities that require their input regarding workplace problems" (p. 25).

Each of these facets was included in the examination of employee participation with input to decision-making and problem-solving in this study. Numerous other authors repeatedly have tied front-line involvement in decision-making to high performance work structures and to worker effectiveness (e.g., Bowen & Lawler, 1992; Malcolm Baldridge Quality Award, 1995; NCEE, 1993; Pfeffer, 1995; Risher & Fay, 1995; Rogers & Ferketish, 1992; Sinn & Antonucci, 1995; USDOL, 1992).

In relation to employee involvement and organizational bottom-line, the USDOL (1993) stated that decentralization, and therefore involvement of front-line employees in more critical decisions, resulted in better decisions because it involved those with the most information and elicited commitment from those employees. Levine and Tyson (1990) concluded, after finding mixed results for workplace participation's impact on productivity, that employee decision-

making created significant, long-lasting increases in productivity when front-line workers were involved in shop floor decisions. Kelley (1992) demonstrated that 1,000 firms using computer-controlled technology experienced a decrease in production time when shop-floor workers wrote their own control programs, estimating that continued use could increase productivity by 9%. This involvement of employees in the development of their own technologies was central to the idea of employee involvement. It should be noted, however, that for union companies. it was unclear whether problem-solving committees were related to productivity, but in non-union companies, they found the committees actually reduced productivity. In a comprehensive review (Ernst & Young, 1992), results showed that practices such as empowerment had incremental, cumulative effects and that they impacted performance dimensions differently. For low performing companies, participation in problem-solving training was effective while for medium performers, improvement teams as well as training workers in problem-solving appeared to enhance organizational outcomes.

Other successful implementation using front-line decision-making included the use of employee problem-solving groups in a set of manufacturing companies' innovative work practices that resulted in organizational effectiveness (Osterman, 1994). And in an investigation of 694 U.S. manufacturing companies, 35% of private sector with 50+ employees made substantial use of flexible work practices in 1992, including employee problem-solving groups (Osterman, 1994). Similarly, Ichniowski, Shaw, and Prennushi (1993) included problem-solving skills training and problem-solving teams in their study of practices associated with higher productivity. MacDuffie and Krafcik (1992) also examined problem-solving groups in their study of the combined impact of practices on increased company productivity.

Offering other evidence, a study of a XEROX primary manufacturing facility from 1984 to 1987 compared traditional to non-traditional labor relations. The latter was described as

relationships with less conflict, quicker conflict resolution, many problem-solving efforts, substantial worker autonomy, frequent feedback, and common worker-initiated changes in work design – all associated with successful employee involvement. Their findings demonstrated that when non-traditional labor relations existed within work groups there was significantly less time lost to scrap, and higher productivity and lower costs resulted (Cutcher-Gershenfeld, 1991). Likewise, the Japanese firms that adopted practices with employee participation in decision-making as part of their "lean" production practices lowered overhead costs in manufacturing (Ittner & MacDuffie, 1994). In the General Accounting Office study (1991) of Malcolm Baldridge National Quality Award finalists, companies implementing comprehensive changes in work practices, including employee-involvement, had better operating procedures, higher customer satisfaction, improved employee relations, and enhanced operating results. Lawler et al. (1992) examined "Fortune 1000" firms and found that 85% of them implemented employee involvement. The Mavrinac and Jones (1995) study, in reviewing Lawler's work, noted that there was a need for more research in this area, including level of implementation and effectiveness. The present study addressed both of these needs.

Team input on hiring and pay decision. Worker input on decisions regarding promotion has been included in one list of indicators of high involvement (Sinn & Antonucci, 1995). This inclusion of workers in significant decisions that affect the company's human resources was closely related to the more general participative decision-making described previously. Lawler (1992) posited that workers should have information about how much fellow employees are paid. For organizational practices to truly support efforts to increase workers' power, information, rewards, and knowledge (Lawler, 1992), hiring and promotion decisions might be based partly on employee input. These principles would appear to be even more critical in a team setting, one characterized by interdependencies and open, shared objectives. In support of this, Rogers and

Ferketish (1992) stated that teams in high-involvement organizations should be able to make and implement decisions. Pay- and promotion-related team decisions fit this decision-making role.

Cross-functional work teams. Cross-utilization and cross-training were among the practices Pfeffer (1995) suggested would lead to competitive advantage. These facets were closely related to the use of cross-functional teams and might be used jointly in many companies. The use of cross-functional teams appeared to be an effective means of helping low performing organizations achieve better outcomes of profitability, productivity, and quality, according to Ernst and Young (1992). An examination of the practices associated with high performance companies led to the proposition in this study that teams comprised of multi-skilled workers and that can work across functions in the organization are an asset to the company, might contribute to positive bottom-line results, and should be related to other similar organizational variables.

Broadened job titles and classes. Rather than adopting narrow job descriptions to categorize employees' work in the modern organization, many companies have adopted broadened job titles and classifications. This has allowed employees more flexibility and latitude in the performance of their job (Cascio, 1995). Risher and Fay (1995) included multi-skill or generic job classifications in their levers for organizational change, and Osterman (1994) suggested that new work organization models should include broad job definitions as part of their practices. Keefe and Katz (1990) also argued that broadened job titles gave companies more latitude with regard to pay classification and employment security conditions.

The use of broadened job titles has also been linked to organizational performance. Ichniowski and colleagues (Ichniowski, 1990; Ichniowski et al., 1993) demonstrated that higher productivity was associated with more innovative human resource systems, including innovative job classifications. Broadened job titles and classes appeared to fit this description. Similarly, Keefe and Katz (1990) found that classification reductions predicted plant modernization, a

construct likely to be highly related to the implementation of other high performance practices. These authors also demonstrated that plant performance was improved with the introduction of broadened job titles, although only slightly. Their results also indicated that increased labor efficiency and product quality resulted from reductions in the number of job classifications for skilled trade jobs, but not by large amounts, and there was no similar reduction resulting from changed classifications in assembly-line positions.

While not using the term "broadened job titles," the NCEE (1993) came out in favor of high performance work characteristics that might best be achieved by such means, including re-integration of work into whole jobs, direct workers handling many indirect functions that do not traditionally fall in their job descriptions, and job flexibility. And the Delta Consulting Group (1990) included the creation of enriched and shared jobs in their design of high performance work systems. Given these perspectives, it was expected that broadened job titles would fit into this larger model of relationships with team leadership.

### Criterion-Related Validity Propositions

Based on the literature outlined above, a number of logical relationships were proposed between team leader scales and other organizational variables for criterion-related evidence. This section outlines those propositions and their theoretical justification. The specific propositions were based on relations between team leader scales and human resource systems, measurement systems, organizational structure, and organizational culture. As noted, these relationships were explored to offer further evidence of the construct validity of team leadership in the high-tech industry.

Figure 3, presented earlier, provided a picture of the origin of these propositions. The guiding overall proposition was that in organizations where these team leader roles were enacted and were considered important, other innovative, high performance organizational practices were

likely to be implemented and were likely to be related to the team leader scales. One example of a criterion-related validity proposition was between the team leader's role in the production process (Scale 1; task structure in group design) and the involvement of front line workers in decision-making (organizational structure in organizational design). While the team leader's specific contribution to the production process in relation to team decision-making was not included in previous literature, an emphasis on this team leader role (e.g., Gladstein, 1984) combined with the well-researched relationship between team production and participation in decision-making (e.g., Campion et al., 1993; Guzzo & Salas, 1995; Kravetz, 1988) made the proposition a logical extension of previous literature.

For each scale and its related team leadership facet, an overview paragraph of the proposed relationships and a table with the specific propositions are included below. As a reminder, the team leader scales addressed nine major facets: Scale 1 - Production Monitoring and Improvement, Scale 2 - Material Allocation, Scale 3 - Team Environment of Support and Problem-Solving, Scale 4 - Training and Development Needs, Scale 5 - Personnel Decisions, Scale 6 - Customer Communication, Scale 7 - Alignment with Organizational Mission, Scale 8 - Motivate to Excel, and Scale 9 - Understanding Customer and Business Needs in Relation to Continuous Improvement.

Scale 1 - Production Monitoring and Improvement

In order to most effectively monitor and improve the production goals of a team, the team should have a number of measurement practices in place to objectively determine whether goals have been met and how current efforts can be improved (Cohen, Ledford, & Spreitzer, 1996; Dunphy & Bryant, 1996; Fry & Slocum, 1984; Grimes & Klein, 1973; Hooijberg, 1996; Kravetz, 1988; Quinn, 1988; Rosen, 1989). It was proposed that total quality management, statistical process control, just-in-time management, continuous improvement, customer service

practices would all lead to the achievement of these goals (Graham & LeBaron, 1994; Lawler et al., 1992; Mavrinac & Jones, 1995). The most effective production techniques and outcomes were expected to be accomplished when these practices were used, and were used effectively. On-going training also was proposed to enrich employee skills and contribute to the ability to improve organizational efforts (e.g., Bassi, 1993; Geber, 1995). Front-line decision-making was also considered essential for production monitoring and improvement (Campion et al., 1993; Campion et al., 1996; Dunphy & Bryant, 1996; Graham & LeBaron, 1994; Guzzo & Salas, 1995; Kravetz, 1988; Lawler et al., 1992; Rosen, 1989) and was thus expected to be positively related to this facet of team leadership. Another facet of organizational structure that was expected to relate to team leadership of production was the use of broadened job titles (Kravetz, 1988). This expanded mode of employee work with additional job responsibilities was repeatedly related in the literature to team effectiveness (Dunphy & Bryant, 1996; Hackman & Oldham, 1980; McIntyre & Salas, 1995). Table 13 includes each of these components and Figure 3 pictures each.

Table 13

Criterion-Related Proposed Relationships – Scale 1: Production Monitoring and Improvement

| |
|---|
| Measurement Systems |
| • Total quality management |
| • Statistical process control |
| • Just in time manufacturing |
| • Continuous improvement programs |
| • Customer service/satisfaction |
| Human Resource Systems |
| • On-going training |
| • Amount of training received |
| Organizational Structure |
| • Front-line decision-making and/or problem solving |
| • Broadened job titles |

## Scale 2 - Material Allocation

As with the production process, obtaining and allocating machinery was considered a standard part of a manufacturing team's success, namely ensuring that all necessary resources were available to the team (Cannon-Bowers et al., 1995; Gladstein, 1984; Klimoski & Jones, 1995; Kravetz, 1988). However, the involvement of team members in this process and the proactive, quality-focused approach captured by this variable would be unusual for the status quo manufacturing team. Therefore, the relationships between this and other team practices were expected to mirror the quality focus (Graham & LeBaron, 1994; Fry & Slocum, 1984; Grimes &

Klein, 1973; Hooijberg, 1996; Quinn, 1988; Rosen, 1989). In order to ensure that the team had the appropriate equipment, the effective use of JIT, SPC, TQM, and continuous improvement techniques should have been related to team leaders recognizing the importance of this facet of leadership for effective team functioning. JIT was designed to address immediate availability of materials; and TQM, SPC, and continuous improvement each incorporated the focus on excellent quality and maintaining and surpassing standards. Each of these processes focused on updating systems and ensuring immediate quality and should have related, therefore, to the team leader's focus on ensuring this activity was carried out as an effective part of the team's work (Dunphy & Bryant, 1996; Graham & LeBaron, 1994). See Table 14 for an overview of these elements and proposed relationships.

Table 14

Criterion-Related Proposed Relationships – Scale 2: Material Allocation

| Measurement Systems |
| --- |
| • Just in time manufacturing |
| • Total quality management |
| • Statistical process control |
| • Continuous improvement programs |

Scale 3 - Team Environment of Support and Problem-Solving

Relationships among team members have been viewed as critical in every type of team, and it followed that the most effective cross-functional teams would be those that fostered an atmosphere of support and coordinated problem-solving (e.g., Hooijberg, 1996; Kravetz, 1988; McIntyre & Salas, 1995; Quinn, 1988). In cross-functional teams, numerous difficulties have

arisen when individuals who came from different settings had to work together. Therefore, it was proposed that the effectiveness of cross-functional teams would be positively related to this facet's emphasis on improving the team environment and efforts (Campion et al., 1993; Campion et al., 1996; Graham & LeBaron, 1994). Furthermore, if team members supported one another and solved problems effectively, it was more likely that members would have effective input on hiring and pay decisions (Campion et al., 1993; Cohen et al., 1996; Guzzo & Salas, 1995; Lawler, 1992) and would be more effectively involved in front-line decision-making (Dunphy & Bryant, 1996; Hooijberg, 1996; Kravetz, 1988; Rosen, 1989). Therefore, a positive relationship between the ratings of this scale and the use and effectiveness of team input on human resource issues and front-line involvement was proposed. Furthermore, when team members received on-going training to improve these efforts, this should also have been positively related to the improved team environment and effective efforts (Risher & Fay, 1995; Rogers & Ferketish, 1992). Additionally, a positive relationship was proposed between the organizational practices to increase employee awareness of the organizational mission and the degree to which the team made efforts to improve team relations and decision-making to meet those larger organizational goals. See Table 15 for an outline of these components and propositions.

Table 15

Criterion-Related Proposed Relationships – Scale 3: Team Environment of Support

| |
|---|
| Human Resource Systems |
| • On-going training |
| • Amount of training received |
| Organizational Structure |
| • Front-line decision-making and/or problem solving |
| • Cross-functional teams |
| • Team input on hiring and pay |
| Organizational Culture |
| • Employee awareness of organizational goals, values and mission |

Scale 4 - Training and Development Needs

The degree to which a team leader finds training and development important was likely to be related to a number of factors associated with training. As reviewed above, effective training has been emphasized as a critical facet of organizational functioning. A large amount of literature has focused on training practices that were included in these propositions (e.g., Klimoski & Jones, 1995; Kravetz, 1988; Lawler, 1992; Mavrinac & Jones, 1995). Therefore, positive relationships were proposed between this facet of team leadership and the existence of on-going training for front-line workers, the amount of cross-training that was availabie within the company, the cross-functional team efforts that existed, and the amount of training that a team leader had (e.g., Campion et al., 1993; Graham & LeBaron, 1994; Kravetz, 1988; McIntyre

& Salas, 1995). See Table 16 for a complete outline of these components and proposed relationships.

Table 16

Criterion-Related Proposed Relationships – Scale 4: Training and Development Needs

| |
|---|
| Human Resource Systems |
| • Cross-training |
| • Ongoing training |
| • Amount of training received |
| Organizational Structure |
| • Cross-functional teams |

Scale 5 - Personnel Decisions

This scale related to the personnel decisions of the team – hiring, reward, reassignment, and removal. Decision-making about such critical aspects of team resources represented an empowered and involved level of team participation (Klimoski & Jones, 1995; Manz & Sims, 1993). The function itself implied that team input was likely to be solicited from the members on hiring and pay decisions. This approach was also expected to be more prevalent in organizations that had innovative practices such as all-salaried pay systems and financial benefits that were shared within the team. Therefore, each of these organizational practices was proposed to relate positively to this team leader function. Moreover, if the team was doing this high-level planning and had this level of input, front-line decision-making also was likely to be practiced (Campion et al., 1993; Cohen et al., 1996; Guzzo & Salas, 1995; Hooijberg, 1988; Rosen, 1989).

Broadened job titles also were likely to be used because the level of involvement implied by this facet of team leadership and membership was higher than one might have expected in more traditional settings with narrow job roles (Campion et al., 1993; Dunphy & Bryant, 1996; Graham & LeBaron, 1994; Hackman & Oldham, 1980). Additionally, increasing awareness of company needs, an organizational culture variable, was expected to positively relate to this scale because the personnel decision-making process was likely to be related to an awareness of the larger organization's business needs and because, as team members assessed in light of the personnel decisions how much and in what manner individual members could contribute to organizational objectives, they needed to be aware of the larger organizational mission and goals (Campion et al., 1996; Kravetz, 1988). Finally, for reasons already outlined, on-going training was likely to positively related to a number of team member efforts. See Table 17 for a complete outline of these components and propositions.

Table 17

Criterion-Related Proposed Relationships – Scale 5: Personnel Decisions

| |
|---|
| Human Resource Systems |
| • Team input on hiring and pay decisions |
| • All-salaried pay systems |
| • Financial benefits shared with team members |
| • On-going training |
| • Amount of training received |
| Organizational Structure |
| • Front-line decision-making and/or problem solving |
| • Broadened job titles |
| Organizational Culture |
| • Employee awareness of organizational goals |

Scale 6 - Customer Communication

If a team effectively communicated with customers, they were likely to be found in companies that gathered information about their customer service and satisfaction and used continuous improvement programs to increase their customer satisfaction (Graham & LeBaron, 1994). Additionally, it seemed likely that team leaders would see customers as more important if employees in the company were more aware of larger organizational goals and values, values frequently related to customers and customer service (Campion et al., 1993; Graham & LeBaron, 1994; Kravetz, 1988). Finally, if a team leader considered it important for team members to work effectively beyond the team with customers, this was proposed to relate positively to the

use of front-line decision-making as a mode of empowerment for all employees (Campion et al., 1993; Graham & LeBaron, 1994; Guzzo & Salas, 1995; Lawler, 1992; Rosen, 1989). See Table 18 below for an outline of these relationships.

Table 18

Criterion-Related Proposed Relationships – Scale 6: Customer Communication

| |
|---|
| Measurement Systems |
| • Customer service/satisfaction measure |
| • Continuous improvement programs |
| Organizational Structure |
| • Front-line decision-making and/or problem solving |
| Organizational Culture |
| • Employee awareness of organizational goals |
| Organizational Structure |
| • Front-line decision-making and/or problem solving |

Scale 7 - Alignment with Organizational Mission

Guiding principles of excellent leadership have included inspiring members toward a larger organizational vision (Cohen et al., 1996; Dunphy & Bryant, 1996; Klimoski & Jones, 1995; Kravetz, 1988). This facet of leadership has been seen as markedly different from traditional supervisory roles. It was proposed that a positive relationship would exist between involvement in front-line decision-making and problem-solving and a team leader's importance rating of this scale because a climate of empowerment would also be likely to exist in both cases (Campion et al., 1993; Cohen et al., 1996; Dunphy & Bryant, 1996; Guzzo & Salas, 1995;

Kravetz, 1988; Rosen, 1989). Additionally, as team leaders related the team's mission to the larger organization's, this was viewed as commensurate with the philosophy of TQM and continuous improvement which argued that striving toward a higher standard of organizational performance and quality was necessary (Fry & Slocum, 1984; Graham & LeBaron, 1994; Grimes & Klein, 1973). Furthermore, employee awareness of organizational goals and mission was proposed to be related to team leaders inspiring the team to understand the company's larger vision as inferred from the transformational leadership literature (Bass, 1990; Conger & Kanungo, 1987) as well as the team literature (Campion et al., 1993; Dunphy & Bryant, 1996; Gladstein, 1984; Graham & LeBaron, 1994). Finally, on-going training of team members was likely to be related to this facet of understanding the organizational mission and how an individual's efforts might relate to that larger vision. See Table 19 below for an overview of these elements and proposed relationships.

Table 19

Criterion-Related Proposed Relationships – Scale 7: Alignment with Organizational Mission

| |
|---|
| Measurement Systems |
| • Total quality management |
| • Continuous improvement programs |
| Human Resource Systems |
| • On-going training |
| • Amount of training received |
| Organizational Structure |
| • Front-line decision-making and/or problem solving |
| Organizational Culture |
| • Employee awareness of organizational goals |

Scale 8 - Motivate to Excel

A central aspect of being an effective leader has commonly been seen as motivating team members to excel (e.g., Hooijberg, 1996; Quinn, 1988), a point also substantiated in the traditional leadership literature (e.g., Yukl, 1989; Yukl & Van Fleet, 1992). The related scale was proposed to have a positive relationship with involvement in front-line decision-making and problem-solving and with on-going training of team members (Campion et al., 1993; Graham & LeBaron, 1994; Guzzo & Salas, 1995; Kravetz, 1988). Additionally, employee awareness of organizational goals and mission was expected to relate to this scale because the leaders' role includes making standards for excellence more explicit, as outlined in the team literature (e.g., Campion et al., 1996), the leadership literature (e.g., House, 1977), and the organizational

development literature (e.g., Kravetz, 1988). See Table 20 below for an overview of these elements.

Table 20

Criterion-Related Proposed Relationships – Scale 8: Motivate to Excel

| |
|---|
| Human Resource Systems |
| • On-going training |
| • Amount of training received |
| Organizational Structure |
| • Front-line decision-making and/or problem solving |
| Organizational Culture |
| • Employee awareness of organizational goals |

Scale 9 - Understanding Customer and Business Needs in Relation to Continuous Improvement

The effectiveness of organizational continuous improvement programs was proposed to relate positively to the team leader's emphasis on integrating quality and an understanding of business needs into all team processes, and it was likely that as employees had more complete awareness of the organizational goals, they would be able to contribute more effectively to continuous improvement efforts and to meeting their customer's goals (Campion et al., 1993; Graham & LeBaron, 1994; Kravetz, 1988). It was also likely that the perceived importance of this facet increased as the involvement of front-line decision-makers also increased (Guzzo & Salas, 1995; Rosen, 1989) and as team leaders received more training (Geber, 1995; NCEE, 1993). Furthermore, it was expected that when team leaders ensured that teams made continuous improvements to meet customer and business needs, attention to customer service would be

higher and, therefore, customer satisfaction measures would be used more effectively. Finally, this focus on improvement and standards was also expected to relate positively to the use of TQM and SPC practices (Cohen et al., 1996; Dunphy & Bryant, 1996; Graham & LeBaron, 1994; Kravetz, 1988; Rosen, 1989). See Table 21 below for an outline of these components and proposed relationships. Additionally, Table 22 contains all proposed criterion-related validity propositions.

Table 21

Criterion-Related Proposed Relationships – Scale 9: Understanding Customer & Business Needs

| |
|---|
| Measurement Systems |
| • Continuous improvement programs |
| • Customer service/satisfaction measure |
| • Statistical process control |
| • Total quality management |
| Human Resource Systems |
| • On-going training |
| • Amount of training received |
| Organizational Structure |
| • Front-line decision-making and/or problem solving |
| Organizational Culture |
| • Employee awareness of organizational goals |

Table 22

Criterion-Related Validity Propositions

| Team Leader Function | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| On-going training | X | | X | X | X | | X | X | X |
| Amount of training received | X | | X | X | X | | X | X | X |
| Cross-training | | | | X | | | | | |
| All-salaried pay systems | | | | | X | | | | |
| Financial benefits shared | | | | | X | | | | |
| Continuous improvement | X | X | | | | X | X | | X |
| Total quality management | X | X | | | | X | | X | |
| Statistical process control | X | X | | | | | | | X |
| Just in time manufacturing | X | X | | | | | | | |
| Customer service/satisfaction | X | | | | | X | | | X |
| Front-line decision-making | X | | X | | X | X | X | X | X |
| Cross-functional work teams | | | X | X | | | | | |
| Team input on hiring and pay | | | X | | X | | | | |

Table 22 (continued)

| Team Leader Function | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Broadened job titles | X | | | | X | | | | |
| Employee awareness of organization values/mission | | | X | | X | X | X | X | X |

Note. X represented proposed relationships. Team Leader Functions were 1 = Production Monitoring and Improvement; 2 = Material Allocation; 3 = Environment of Support/Problem-Solving; 4 = Training and Development; 5 = Personnel Decisions; 6 = Customer Communication; 7 = Alignment with Organizational Mission; 8 = Motivate to Excel; 9 = Understand Customer and Business Needs in Relation to Continuous Improvement

## Convergent Validity Propositions

Further evidence of the construct validation of team leadership functions was investigated through the convergent validity propositions. In this section, these propositions are discussed. For each facet of team leadership, an overview of the proposed relationships is provided, and Table 23 gives a specific listing of each variable that is expected to relate to the team leader functions. Because in several cases, the team leader scales were expected to relate to the same variables in each case, these are outlined separately and also are included in Table 23.

The specific propositions were based on several classes of relationships between team leadership scales and other organizational components, including other facets of group task structure, self-directed work teams, and the team leader's role as coach and facilitator. As with the criterion-related propositions, it was necessary to draw upon literature that related to team functioning and effectiveness, literature that sometimes did not make the leader's role explicit. However, because the leader functions were defined in terms of enabling team behavior and team effectiveness, the inferences from team effectiveness to team leader effectiveness were justifiable. For example, it was proposed that different elements of team task structure related to one another. As an example, one specific proposition was that the importance of teams communicating with customers (Scale 6) related to leader involvement with outside contacts (e.g., Graham & LeBaron, 1994).

This section outlines the variables and related propositions that were common across all nine scales. The relation between every scale and the role of coaching and facilitating (e.g., Manz & Sims, 1987, 1993) was examined, as was each in relation to the use of self-directed work teams (e.g., Cohen et al., 1996), and the inter-relatedness of all nine team leader scales (e.g., Gladstein, 1984).

Coaching and facilitation was clearly an integral component of the team leadership activities as they were operationalized in this research. The team leader scale items included wording that reflected the leader acting as a helper rather than in the traditional command-control role of heavy-handed supervisor. Therefore, the nine facets of team leadership were expected to relate to the percentage of time the team leader spent acting as coach and facilitator, assisting team members to complete their work effectively (Campion et al., 1993; Campion et al., 1996; Cohen et al., 1996; Graham & LeBaron, 1994; Hooijberg, 1996; Manz & Sims, 1993; Ruggeberg, 1996). While it was recognized that "percentage of time spent" did not necessarily relate to the quality of that time and while rare but important events may take very little time, it was expected that "percentage of time spent" offered at least one measure of the prevalence of these leadership roles.

Self-directed work teams were presented in the literature review as one measure of an advanced level of team functioning and incorporated many of the facets of team leadership represented in the nine scales (Beekun, 1989; Campion et al., 1993; Campion et al., 1996; Cohen et al., 1996; Dunphy & Bryant, 1996; Guzzo, Jette, & Katzell, 1985; Manz & Sims, 1993; Rosen, 1989). SDWTs were expected to relate to the rated importance of the team leadership scales. The scales in the measure did not present the team leader as *doing* all parts of the work but as enabling the team to do the work well; therefore, self-direction of the team was expected to fit well with these facets.

Finally, because the individual scales were all assumed to fall under a larger umbrella of team leadership, the inter-correlations among the scales were also examined as convergent validity evidence. The roles they addressed were expected to be related to one another and to be part of a larger system, not independent entities removed from a larger context (Campion et al., 1996; Cummings & Worley, 1993; Gladstein, 1984; Hooijberg, 1996; Lawler, 1992; Quinn,

1988). The following sections briefly review other proposed relationships. These are outlined in Table 23.

Table 23

Convergent Relationships – Scales and Relationships to other Team Leadership Variables

| | |
|---|---|
| All scales: | Self-directed work teams |
| | Percentage of time team leaders spend on activities related to coach/facilitator |
| | Each of the other team leadership functions |
| Other relationships: | |
| Scale 1: Production Monitoring and Improvement | Percentage of time team leaders spend on hands-on production. |
| Scale 2: Material Allocation | Percentage of time team leaders spend on hands-on production. |
| Scale 6: Customer Communication | Percentage of time team leaders spend on activities related to liaison and activities with outside contacts. |
| Scale 7: Alignment w/ Organizational Mission | Percentage of time team leaders spend on activities related to liaison and activities with outside contacts. |
| Scale 9: Understanding Customer & Business Needs in Relation to Continuous Imp. | Percentage of time team leaders spend on activities related to liaison and activities with outside contacts. |

Scale 1 - Production Monitoring and Improvement

Although the production process was seen as central to any manufacturing team's success, this scale was created to make it clear that the team leader was there to guide and direct, to assist the team to reach for higher, broader goals than traditional teams have sought. Given the focus of this scale, it was likely that the more time a team leader spent in hands-on production work, the more able he or she would be to carry out the activities of helping the team in the production process (Graham & LeBaron, 1994; Kravetz, 1988). Therefore, a relationship was proposed between the amount of time a team leader spent on production and the importance of this scale. Furthermore, as noted above, because of the high degree of empowerment implied by each of these team leader scales, the scale was expected to relate positively to the use and effectiveness of SDWTs (e.g., Manz & Sims, 1993), to the coaching role (Graham & LeBaron, 1994), and to all other team leader scales (e.g., Campion et al., 1996). See Table 23 for an outline of these components and those of propositions for each of the other scales outlined in further sections.

Scale 2 - Material Allocation

As with the production process, obtaining and allocating materials, machinery, and equipment was presented as a standard part of a manufacturing team's success. Therefore, it was expected that team leader ratings of this scale would relate to the amount of time spent in hands-on production (Graham & LeBaron, 1994; Kravetz, 1988). And, as with the other scales, it was proposed that the scales related positively to time spent as a coach and as a facilitator (e.g., Graham & LeBaron, 1994), as well as with the use of self-directed work teams (e.g., Guzzo et al., 1985) and the other team leader scales (e.g., Gladstein, 1984). Table 23 provides an overview of these elements.

Scale 3 - Team Environment of Support and Problem-Solving

Ensuring supportive team relationships was included in the team leadership scales as critical for successful team functioning. Assisting the team to encourage one another and to solve problems on its own were described as developmental activities typical of a facilitative leader rather than a traditional supervisory manager. Therefore, this scale was expected to be positively related to the amount of time the leader spent as a coach and facilitator (Manz & Sims, 1993), using more progressive, empowering management styles. Moreover, it was proposed that self-directed work teams would relate to each of the team leadership scales (Campion et al., 1993; Cohen et al., 1996). Finally, the scale was expected to relate to the other scales of team leadership (Hooijberg, 1996; Lawler, 1992). See Table 23 for an outline of these components.

Scale 4 - Training and Development Needs

To offer assessments of team member development and meet the team's training and development needs, a leader was likely to have to play the role of facilitator, meeting the team needs and helping it to meet its own. This scale was expected, therefore, to relate to the amount of time the team leader spent as a coach and facilitator (Graham & LeBaron, 1994). And, as with the other scales, it was proposed to relate to self-directed work teams (Guzzo et al., 1985) and to all other team leader scales (Campion et al., 1996). See Table 23 for a complete outline of these components.

Scale 5 - Personnel Decisions

The making of personnel decisions related to team resources was identified as one critical component of effective team leadership. It involved the examination of team member contributions and deficiencies and making recommendations to the appropriate people with regard to hiring, reassignments, rewards, and removals. Because a lot of sensitivity and guidance would be required to successfully complete this facet of team leadership, this scale was

expected to relate to the amount of time the team leader spent as a coach and facilitator (Graham & LeBaron, 1994). And, as with the other scales, it was proposed to relate to self-directed work teams (Cohen et al., 1996; Manz, 1986; Manz & Sims, 1984, 1987, 1993) and to all other team leader scales (Graham & LeBaron, 1994). See Table 23 for a complete outline of these components.

Scale 6 - Customer Communication

Because it clearly related to exchanges with external contacts, the importance of the Customer Communication scale was expected to relate to the percentage of time that the leader spent as liaison and with outside contacts (Gladstein, 1984; Graham & LeBaron, 1994; Kravetz, 1988; Ruggeberg, 1996). It was also proposed to relate to coaching and facilitation (Graham & LeBaron, 1994; Ruggeberg, 1996), to self-directed work teams (Manz & Sims, 1993), and to other scales (Campion et al., 1993). Table 23 includes these components.

Scale 7 - Alignment with Organizational Mission

Being aware of the goals, values, and mission of the larger organization was proposed to require that the team leader spent time interacting with contacts outside the team, in addition to the roles of coach and of facilitator. Therefore, it was proposed that this scale would relate positively to the amount of time a leader spent as liaison, as contact beyond the team, and as coach (Gladstein, 1984; Graham & LeBaron, 1994; Kravetz, 1988). And, again, it was expected to relate to SDWTs (Manz & Sims, 1993) and to other team leader scales (Campion et al., 1996). See Table 23 for an overview of these elements.

Scale 8 - Motivate to Excel

Helping to create an environment of excellence requires an empowering approach on the part of a leader, requiring actions different from a controlling supervisory approach (Hackman & Walton, 1986; Hooijberg, 1996; Larson & LaFasto, 1989; Quinn, 1988). Therefore, it was

proposed that this scale would relate positively to the amount of time a leader spent as coach and facilitator (Fisher, 1993; Zenger et al., 1994). And, again, it was expected to relate to SDWTs (Manz & Sims, 1987, 1993) and other team leader scales (Gladstein, 1984; Graham & LeBaron, 1994). See Table 23 for an overview of these elements.

Scale 9 - Understanding Customer and Business Needs in Relation to Continuous Improvement

Because assessing customer and business needs was associated with working with contacts outside the team, it was expected that this scale of team leadership would relate positively to the amount of time the team leader spent as a liaison and with external contacts (Graham & LeBaron, 1994; Kravetz, 1988). As with other facets of team leadership, it was also proposed that this scale would relate to time spent as coach and as facilitator (Graham & LeBaron, 1994), to SDWTs (Manz, 1986), and to other team leader scales (Gladstein, 1984). See Table 23 for an overview of these elements.

## Discriminant Validity Propositions

Discriminant validity evidence was presented as another component of construct validation. This section outlines variables that were not expected to relate to other facets of the high-tech manufacturing industry or team leadership (Campbell & Fiske, 1955). Variables that were proposed to be included in a general examination of organizations but were expected to be distinct from team leadership variables and its nomological net of team leadership were examined and the relationships with team leadership functions were expected to be negligible. This information was explored to provide trends in validity evidence that would contribute to overall construct validity evidence. The support of these discriminant validity propositions was also expected to help rule out method bias as an explanation for the expected relationships. Table 24 outlines the variables included in the discriminant validity propositions.

Team leadership constructs were not expected to relate strongly to the length of time one has been in the high-tech industry (Hooijberg, 1996), the number of work teams the leader currently leads, or how many people were on the leader's primary work team. The scales also were not expected to relate strongly to whether the team leader has participated in previous projects sponsored by the sponsoring organization. Moreover, individual team leader demographic characteristics, such as ethnicity and gender (Hooijberg, 1996), education level, and geographical region also were not expected to relate significantly to team leadership scales. Each of these variables was tested to demonstrate a weak or non-existent relationship with the team leader functions.

Table 24

Discriminant Relationships – All Team Leader Scales

- Tenure in the high-tech industry
- Number of work teams that the leaders leads
- Number of people in the leader's primary work team
- Whether team leader has participated in AEA projects before
- Ethnicity
- Gender
- Education level
- Geographical region of the country

## Summary of Propositions for Study 2

Based on the findings from Study 1, the criterion-related, convergent, and discriminant validity evidence was derived from the relationships between the nine scales and other facets of the organizational model in Figure 3. This section outlines the propositions and related analyses.

*Proposition 1: Criterion-Related Validity.* The criterion-related validity propositions were outlined in Tables 13 through 22. Significant, positive correlations were expected between the mean of the scale score and the mean of the related organizational variable ratings. No previous research existed that offered empirical estimates of the expected strength of these specific correlations; however, other studies of team effectiveness that examined similar variables (e.g., Campion et al., 1993; Campion et al., 1996) found correlations ranging from 0.18 to 0.64 with many averaging around 0.20.

*Proposition 2: Convergent Validity.* For the convergent validity propositions, it was expected that significant positive correlations would be found between team leader scales and variables that were expected to be conceptually similar. As in criterion-related research, no previous research existed that offers empirical estimates of the expected strength of the correlations; however, a correlation of 0.30 and above seemed to be of reasonably moderate strength to demonstrate evidence of convergent validity. These proposed relationships were outlined in Table 23.

*Proposition 3: Discriminant Validity.* Discriminant validity evidence was expected to be demonstrated when the relationships between team leader scales and the variables outlined in Table 24 were found to be non-significant. Analyses of variance were calculated to examine these discriminant validity relationships because the related organizational variables were categorical.

# CHAPTER V

## METHODS: STUDY 2

The method for Study 2 was very similar to that for Study 1 (see Chapter II) as the data were collected at the same time. The items for variables in Study 2 were included in the second half of the survey package used in Study 1. This second half of the package was a 63-item survey for team leaders containing questions about aspects of their work and their team other than the team leadership functions. A 54-item survey completed by human resource contacts regarding company practices and outcomes was also distributed at the same time. However, the low response rate for this survey precluded this data from being included.

### Materials

#### Manufacturing Specialist Team Leader Survey

Items were included in the latter half of the team leader survey to measure the organizational model proposed (see Figure 3), to measure for the discriminant validity propositions, and to offer descriptive information about the sample participants (Antonucci & Merritt, 1996). The complete survey found in Appendix A included each of these items in addition to the items regarding team leader functions and importance analyzed in Study 1.

Respondents were asked a series of 63 questions that were used for the criterion-related, convergent, and discriminant validity propositions. These included questions about their length of employment in the industry and in their current job, their education level, gender, and ethnicity, as well as questions about the respondent's work location, including company size, product produced, and geographic location. Further questions asked about various aspects of the manufacturing specialist team leader functions, for example, types of training received as a manufacturing specialist team leader and the percentage of time leaders spend on different activities such as coaching and facilitation. In addition, respondents were asked to indicate the

extent to which their organization used several progressive work practices, if they did, and the degree to which they were effectively implemented. These practices were central to the organizational model in Figure 3 tested in this study. The practices included in the survey and Study 2 were:

- Involvement of front-line workers in decision-making and/or problem solving
- Self-directed work teams
- Total quality management program
- Ongoing training for front-line workers
- Employee awareness of organization values, goals, and mission
- Just-in-time manufacturing
- Statistical process control
- Broadened job titles/classes
- Cross-training
- Cross-functional work teams
- Continuous improvement programs
- Team input on hiring and pay decisions
- Customer service/satisfaction measurement
- All-salaried pay systems
- Financial benefits and profits created by team are shared with individual employees

Subject matter experts reviewed and revised this survey several times as noted in the Study 1 Methods chapter, identifying the most important questions and wording them appropriately. This survey was also pilot tested along with the team leader functions cutlined in Study 1.

## Procedure

The entire team leader manufacturing specialist survey took approximately 45 minutes, and team leaders returned them anonymously to the company contact, who then mailed them back to the experimenter. Company contacts were sent letters and were telephoned and faxed to remind them to return surveys and human resource forms. All human subjects research requirements were met.

# CHAPTER VI

## RESULTS: STUDY 2

The response rates and participant sample were the same as those in Study 1. See Chapter III for this information.

### Proposition 1: Criterion-Related Validity Evidence

Table 10 above includes general descriptive statistics for the nine scales included in Study 2. Appendix E includes the descriptive statistics of each of the other variables in the criterion-related propositions along with the results of all propositions. Separate tables are included below for each team leader scale and its related propositions. Additionally, Table 25 below outlines the number and percentage of significant relationships for all scales, along with ranges and means of their related correlations. In support of Proposition 1, Table 25 demonstrates generally positive trends in findings across the different scales for the criterion-related validity relationships.

For two scales, Alignment with Organizational Mission and Motivate to Excel, 100% of the proposed relationships were upheld, i.e., all hypothesized correlations were both positive and significant. See Table 25 above. While the majority of propositions were substantiated in five other team leader functions, ranging from 73% to 87% of the propositions, it was notable that only 25% of the relationships were upheld for Material Allocation and only 50% for Customer Communication. The descriptive statistics in Appendix E did not demonstrate any marked differences in these two scales compared to the other seven. However, it was noted in Study 1 that Customer Communication had one of the lowest importance ratings and percentage of the sample of team leaders performing them. The same was not true for the Material Allocations scale. Finally, while the majority of correlations across all nine scales were positive, they were of modest to moderate strength, averaging around 0.20.

Table 25

Trends Across Criterion-Related Propositions

| Scale | Number of significant correlations | Percent of significant correlations | Range of significant correlations | Average correlation |
|---|---|---|---|---|
| 1 Production Monitoring & Improvement | 13/17 | 76% | .15-.33 | .23 |
| 2 Material Allocation | 2/8 | 25% | .16-.18 | .17 |
| 3 Environment of Support/Problem-Solving | 9/11 | 82% | .14-.31 | .21 |
| 4 Training and Development | 6/7 | 86% | .13-.28 | .20 |
| 5 Personnel Decisions | 13/15 | 87% | .12-.41 | .22 |
| 6 Customer Communication | 4/8 | 50% | .12-.26 | .20 |
| 7 Alignment with Organizational Mission | 11/11 | 100% | .14-.26 | .20 |
| 8 Motivate to Excel | 7/7 | 100% | .16-.25 | .20 |
| 9 Understand Customer & Business Needs | 11/15 | 73% | .14-.28 | .19 |

The relationships found for specific team leader scales demonstrated slightly different trends across scales in the practices they were related to. Table 26 includes only those relationships investigated for Production Monitoring and Improvement. This scale was positively and significantly related to both the extent of use and effectiveness of on-going training, amount of training, continuous improvement programs, TQM, SPC, customer service measures, and front-line decision-making. The range of correlation sizes was 0.15 to 0.33 with an average correlation of 0.23 (see Table 25). However, this team leader scale was not

significantly related to the organizational practices of JIT manufacturing or broadened job titles. Overall, 13 of the 17 proposed relationships (76%) were substantiated.

Table 26

Production Monitoring and Improvement: Criterion-Related Validity Correlations

| Organizational Practice | Extent of Use | N | Effectiveness | N |
|---|---|---|---|---|
| On-going training | .20** | 223 | .24** | 218 |
| Amount of training received | .27** | 298 | ---- | ---- |
| Continuous improvement | .33** | 234 | .26** | 227 |
| Total quality management | .21** | 220 | .30** | 207 |
| Statistical process control | .17** | 222 | .23** | 207 |
| Just in time manufacturing | .11 | 217 | .04 | 195 |
| Customer service/satisfaction | .20** | 217 | .28** | 203 |
| Front-line decision-making | .17** | 228 | .15* | 217 |
| Broadened job titles | .10 | 202 | .04 | 169 |

Note. * = significant at the .05 level; ** = significant at the .01 level. All correlations were corrected for attenuation. ---- indicates that no relationship was explored.

In contrast to the previous scale, only 25% of the eight proposed relationships were found for the Material Allocation scale. Positive relationships were demonstrated between Material Allocation and continuous improvement programs (i.e., extent of use, $r = 0.18$ and effectiveness, $r = 0.16$) but not with TQM, SPC, or JIT. See Table 27 below.

Table 27

Material Allocation: Criterion-Related Validity Correlations

| Organizational Practice | Extent of Use | N | Effectiveness | N |
|---|---|---|---|---|
| Continuous improvement | .18** | 233 | .16** | 226 |
| Total quality management | .03 | 219 | .09 | 206 |
| Statistical process control | -.01 | 222 | .01 | 207 |
| Just in time manufacturing | .04 | 217 | -.05 | 195 |

Note. * = significant at the .05 level; ** = significant at the .01 level; All correlations were corrected for attenuation.

For the Environment of Support and Problem-Solving team leader scale, 9 of 11 posited relationships were found, i.e. extent of use and effectiveness of on-going training and amount of training, front-line decision-making, and employee awareness of organizational goals. Positive relationships were also demonstrated between this team leader function and the effectiveness of cross-functional work teams and team input on hiring and pay, but the corresponding extent of use relationships were not significant. Therefore, 82% of the proposed relationships were upheld as noted in Table 25. Correlation sizes ranged from 0.14 to 0.31 with an average relationship of 0.21. Table 28 below included only relationships for this scale.

Table 28

Environment of Support and Problem-Solving: Criterion-Related Validity Correlations

| Organizational Practice | Extent of Use | N | Effectiveness | N |
|---|---|---|---|---|
| On-going training | .17** | 223 | .31** | 218 |
| Amount of training received | .20** | 297 | --- | --- |
| Front-line decision-making | .21** | 228 | .24** | 217 |
| Cross-functional work teams | .04 | 224 | .19** | 208 |
| Team input on hiring and pay | .00 | 203 | .19* | 139 |
| Employee awareness of org. values | .14* | 228 | .24** | 223 |

Note. * = significant at the .05 level; ** = significant at the .01 level. All correlations were corrected for attenuation.

The functional area of Training and Development Needs related positively to six of the seven proposed relationships. This scale was positively and significantly related to the extent of use and the effectiveness of the organizational practices of on-going training, amount of training, and cross-training. It was also positively related to the effectiveness, but not the extent of use, of cross-functional teams. As demonstrated in Tables 25 and 29, the correlations ranged in size from 0.13 to 0.28, and the average correlation was 0.20.

Table 29

Training and Development Needs: Criterion-Related Validity Correlations

| Organizational Practice | Extent of Use | N | Effectiveness | N |
|---|---|---|---|---|
| On-going training | .26** | 221 | .28** | 216 |
| Amount of training received | .18** | 294 | --- | --- |
| Cross-training | .21** | 232 | .13* | 224 |
| Cross-functional work teams | .09 | 222 | .14* | 206 |

Note. * = significant at the .05 level; ** = significant at the .01 level. All correlations were corrected for attenuation.

The Personnel Decisions scale positively correlated with amount of training and the extent of use and the effectiveness of on-going training practices, front-line decision-making, team input on hiring and pay, broadened job titles, financial benefits shared by the team, and all-salaried pay systems. See Table 30. This represented 87% of the proposed relationships. A significant relationship was not demonstrated between this scale and the extent of use or the effectiveness of the practice of increasing employee awareness of the organizational mission. These relationships varied in size from 0.12 to 0.41 with an average correlation of 0.22.

Table 30

Personnel Decisions: Criterion-Related Validity Correlations

| Organizational Practice | Extent of Use | N | Effectiveness | N |
|---|---|---|---|---|
| On-going training | .14* | 222 | .14* | 217 |
| Amount of training received | .12* | 295 | --- | --- |
| Front-line decision-making | .14* | 227 | .15* | 216 |
| Team input on hiring and pay | .32** | 202 | .26** | 138 |
| Broadened job titles | .23** | 201 | .26** | 168 |
| Employee awareness of org. values | .04 | 227 | .09 | 222 |
| Financial benefits shared | .22** | 205 | .16* | 152 |
| All-salaried pay systems | .25** | 151 | .41** | 90 |

Note. * = significant at the .05 level; ** = significant at the .01 level. All correlations were corrected for attenuation.

In contrast to the previous two scales, only 50% of the proposed relationships were demonstrated for Customer Communication. As demonstrated in Table 31, while this scale was positively related to continuous improvement programs and the effectiveness of front-line decision-making and employee awareness of organizational goals, it was not related to customer service and satisfaction measures or the extent to which front-line decision-making or employee awareness were implemented. The positive relationships average 0.20 and ranged in size from 0.12 to 0.26.

Table 31

Customer Communication: Criterion-Related Validity Correlations

| Organizational Practice | Extent of Use | N | Effectiveness | N |
|---|---|---|---|---|
| Continuous improvement | .26** | 233 | .20** | 226 |
| Customer service/satisfaction | .01 | 216 | .02 | 202 |
| Front-line decision-making | .07 | 227 | .20** | 216 |
| Employee awareness of org. values | .00 | 227 | .12* | 222 |

Note. * = significant at the .05 level; ** = significant at the .01 level. All correlations were corrected for attenuation.

In the two scales related to broader aspects of leading the team, Alignment with Organizational Mission and Motivate to Excel, 100% of the proposed relationships were positive and significant. The former was significantly associated with on-going training, amount of training, continuous improvement, TQM, front-line decision-making, and employee awareness of organizational goals; and the second was likewise positively related to on-going training and amount of training, to front-line decision-making, and to employee awareness of organizational goals. Tables 32 and 33 included relationships for each of these scales. Their corresponding ranges of correlation sizes were 0.14 to 0.26 and 0.16 to 0.25 with average correlations of 0.20 in both cases.

Table 32

Alignment with Organizational Mission: Criterion-Related Validity Correlations

| Organizational Practice | Extent of Use | N | Effectiveness | N |
|---|---|---|---|---|
| On-going training | .14* | 223 | .19** | 218 |
| Amount of training | .16** | 296 | --- | --- |
| Continuous improvement | .26** | 234 | .24** | 227 |
| Total quality management | .20** | 220 | .24** | 207 |
| Front-line decision-making | .19** | 228 | .25** | 217 |
| Employee awareness of org. values | .17** | 228 | .18** | 223 |

Note. * = significant at the .05 level; ** = significant at the .01 level. All correlations were corrected for attenuation.

Table 33

Motivate to Excel: Criterion-Related Validity Correlations

| Organizational Practice | Extent of Use | N | Effectiveness | N |
|---|---|---|---|---|
| On-going training | .19** | 221 | .25** | 216 |
| Amount of training received | .23** | 294 | --- | --- |
| Front-line decision-making | .19** | 226 | .23** | 215 |
| Employee awareness of org. values | .16* | 226 | .17** | 221 |

Note. * = significant at the .05 level; ** = significant at the .01 level. All correlations were corrected for attenuation.

In contrast, the final scale of Understanding Customer and Business Needs in relation to Continuous Improvement was positively related to 11 of the 15, or 73%, of the organizational

practices that were posited. The relationships ranged in size from 0.14 to 0.28 with an average correlation of 0.19. This scale did not relate positively to the extent of use of on-going training or customer service measures or to SPC extent or effectiveness. It was significantly associated with amount of training, the effectiveness of on-going training and customer service measures, and both the extent of use and effectiveness of continuous improvement, TQM, front-line decision-making, and employee awareness. Table 34 includes the results for this scale.

Table 34

Understand Customer and Business Needs: Criterion-Related Validity Correlations

| Organizational Practice | Extent of Use | N | Effectiveness | N |
|---|---|---|---|---|
| On-going training | .11 | 223 | .22** | 218 |
| Amount of training received | .28** | 298 | --- | --- |
| Continuous improvement | .24** | 234 | .16** | 227 |
| Total quality management | .17** | 220 | .22** | 207 |
| Statistical process control | .06 | 222 | .02 | 207 |
| Customer service/satisfaction | .02 | 217 | .16* | 203 |
| Front-line decision-making | .14* | 228 | .19** | 217 |
| Employee awareness of org. values | .14* | 228 | .18** | 223 |

Note. * = significant at the .05 level; ** = significant at the .01 level. All correlations were corrected for attenuation.

In addition to these trends in relationships across scales, it was also informative to examine trends across the organizational practices that were associated with the team leader scales. For most of the practices – in particular, on-going training, amount of training, cross-training, continuous improvement, TQM, front-line decision-making, team input on hiring and

pay, and employee awareness of organizational goals and vision – the vast majority of relationships between these practices and the team leader scales were significant and positive. This positive trend across these eight organizational practices was consistent both for the extent to which the practices were implemented in an organization and the degree to which they were effective. However, for SPC, JIT manufacturing, customer service measures, and cross-functional work teams, this was not true. The majority of proposed relationships associated with these four organizational practices were not significant. The descriptive statistics of these variables did not vary markedly from those of the other organizational practices.

Trends in the relationships between team leadership and the extent of use versus the effectiveness of the organizational practices were also examined. In six cases, the extent of use relationships were not significant when their corresponding effectiveness statistics were. In contrast, there were no cases in which extent of use was significant and effectiveness was not. Interpretations and implications of each of these trends will be considered in the discussion section.

### Proposition 2: Convergent Validity Evidence

Table 35 includes the descriptive statistics for the variables that were included in the convergent validity propositions. The means for these variables were based on different scales – self-directed work team responses ranged from 0 to 2, and responses to percentage of time variables ranged from 0 to 100. The sample sizes listed did not include team leaders who responded "not applicable" or who did not respond to the item. Again, Table 10 contains the statistics for the team leader scales used in this study.

Table 35

Descriptive Statistics of Variables included in Convergent Validity Propositions

| Variable | M | SD | N |
|---|---|---|---|
| Self-directed work teams - extent of use | .89[a] | .74 | 211[b] |
| - effectiveness | .97 | .66 | 167 |
| Percent of time spent in activities related to: | | | |
| Coaching and facilitation | 24.71 | 16.95 | 276 |
| External contacts | 11.41 | 9.29 | 197 |
| Liaison | 15.38 | 11.27 | 260 |
| Hands-on production work | 28.63 | 26.43 | 232 |

Note. [a] Extent of use values: 0 = do not currently use; 1 = use somewhat; 2 = use extensively. Effectiveness values: 0 = not effective; 1 = somewhat effective; 2 = very effective. [b] N does not include respondents who marked the "N/A" response

Table 36 below outlines the variables and relationships for the convergent validity propositions. Where no relationships were posited, dashes (---) were inserted in the table. The trends in the convergent validity relationships were similar to those in the criterion-related validity propositions. A majority of the posited relationships were substantiated across the scales. However, unlike the criterion-related propositions, none of the scales had as few as 25% of the proposed relationships or as high as 100%. The range of sizes of significant correlations was also larger. Correlations with "percentage of time spent in hands-on production" was actually negatively related (-0.14 and -0.21) to the scales they were posited to have positive correlations with. However, the average positive relationships were generally stronger than those in the criterion-related propositions. This finding was not surprising because the majority of these correlations represented relationships among the team leader scales.

Table 36

Convergent Validity Correlations

| Team Leader Function | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| 1 Production Monitoring | 1.00 | .35** | .64** | .47** | .31** | .46** | .37** | .43** | .60** |
| and Improvement | (337) | (333) | (336) | (333) | (333) | (332) | (334) | (332) | (337) |
| 2 Material Allocation | | 1.00 | .38** | .36** | .32** | .43** | .54** | .35** | .30** |
| | | (333) | (333) | (331) | (331) | (331) | (332) | (330) | (333) |
| 3 Environment of Support/ | | | 1.00 | .50** | .31** | .38** | .43** | .62** | .44** |
| Problem-Solving | | | (336) | (333) | (333) | (332) | (334) | (332) | (336) |
| 4 Training and Development | | | | 1.00 | .50** | .47** | .50** | .46** | .42** |
| | | | | (333) | (331) | (330) | (332) | (330) | (333) |
| 5 Personnel Decisions | | | | | 1.00 | .39** | .45** | .37** | .25** |
| | | | | | (333) | (330) | (333) | (331) | (333) |
| 6 Customer Communication | | | | | | 1.00 | .45** | .39** | .49** |
| | | | | | | (332) | (331) | (329) | (332) |

Table 36 (continued)

| Team Leader Function | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| 7 Alignment with Organizational Mission | | | | | | | 1.00 | .55** | .41** |
| | | | | | | | (334) | (332) | (334) |
| 8 Motivate to Excel | | | | | | | | 1.00 | .41** |
| | | | | | | | | (332) | (332) |
| 9 Understand Customer and Business Needs | | | | | | | | | 1.00 |
| | | | | | | | | | (337) |
| Self-directed work teams | | | | | | | | | |
| extent of use | .18** | .04 | .04 | .17** | .29** | .23** | .07 | .07 | .12* |
| | (211) | (210) | (211) | (209) | (210) | (211) | (211) | (209) | (211) |
| effectiveness | .11 | -.03 | .13 | .08.17* | | .08 | .02 | .14* | -.01 |
| | (167) | (166) | (167) | (165) | (166) | (167) | (167) | (167) | (167) |
| Percent of time spent in activities related to: | | | | | | | | | |
| Coaching/facilitation | .05 | .11* | .01 | .06 | -.03 | .05 | .07 | -.02 | .01 |
| | (276) | (274) | (276) | (273) | (274) | (273) | (275) | (274) | (276) |

Table 36 (continued)

| Team Leader Function | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| External contacts | | | | | | .24** | .15* | .12 | .15* |
| | | | | | | (195) | (196) | (196) | (197) |
| Liaison | | | | | | .06 | .05 | .07 | -.08 |
| | | | | | | (257) | (259) | (259) | (260) |
| Hands-on production work | -.14* | -.21** | | | | | | | |
| | (232) | (229) | | | | | | | |

Note. * = significant at the .05 level; ** = significant at the .01 level. All correlations were corrected for attenuation. "---" indicates relationships that were not tested.

The most unexpected findings were in the relationships between team leader scales, self-directed work teams, and the percentage of time that team leaders spent on various activities (see Table 36). While all the relationships between scales were positive and strong, the same was not found for SDWTs or these activities. In fact, the majority of these latter propositions were not substantiated. The "extent of use of SDWT" was expected to relate positively to all of the team leader scales, but was only significant in relation to five scales – Production Monitoring, Training and Development, Personnel Decisions, Customer Communication, and Understanding Business Needs. The "effectiveness of SDWTs" was positively related only to two of the nine expected scales, Personnel Decisions and Motivate to Excel. The SDWT descriptive statistics showed the lowest means compared to the other organizational practice scales in Appendix E, with the SDWT mean similar in size to its standard deviation and with relatively low sample sizes.

The "percent of time spent on activities related to coaching and facilitation" was also expected to relate positively to all team leader scales; however, only one of these nine relationships was substantiated – with Material Allocation. Similarly, none of the relationships posited for the "time spent as a liaison" or for "hands-on production work" were found. However, three of the four relationships between "percent of time spent with external contacts" and team leadership scales were found, i.e., Customer Communication, Alignment with Organizational Mission, and Understand Business and Customer Needs.

In spite of these discrepancies, in substantiation of Proposition 2, the majority of proposed convergent validity relationships were upheld. Table 37 shows the trends in relationships across each team leader scale. The interpretations of the findings and potential shortcomings of several of the related measures will be considered in the discussion section.

Table 37

Trends Across Convergent Propositions

| Scale | Number of significant correlations | Percent of significant correlations | Range of significant correlations | Average correlation |
|---|---|---|---|---|
| 1 Production Monitoring & Improvement | 9/12 | 75% | -.14 - .64 | .42 |
| 2 Material Allocation | 9/12 | 75% | -.21 - .54 | .35 |
| 3 Environment of Support/Problem-Solving | 8/11 | 73% | .31 - .64 | .46 |
| 4 Training and Development | 9/11 | 82% | .17 - .50 | .43 |
| 5 Personnel Decisions | 10/11 | 91% | .17 - .50 | .34 |
| 6 Customer Communication | 10/13 | 77% | .23 - .47 | .39 |
| 7 Alignment with Organizational Mission | 9/13 | 70% | .15 - .54 | .43 |
| 8 Motivate to Excel | 9/13 | 70% | .14 - .62 | .41 |
| 9 Understand Customer and Business Needs | 10/13 | 77% | .12 - .60 | .36 |

Note. Only correlations that substantiated the propositions were included in this mean, not negative correlations.

### Proposition 3: Discriminant Validity Evidence

Appendix F outlines descriptive statistics for the variables included in the discriminant validity propositions. Unlike the criterion-related and convergent validity propositions, all of the variables in the discriminant validity propositions were categorical variables. Therefore, frequencies, rather than means, are listed and all of the related analyses were analyses of variance (ANOVAs).

Offering overwhelming substantiation for the discriminant validity propositions (Proposition 3), Table 38 includes the results from the related analyses. Table 39 outlines the related trends for these findings. The discriminant validity propositions were upheld in 70 of the 72 related propositions. There were no significant relationships between any of the nine team leadership scales and the "team leader's time in the high-tech industry," the "number of work teams the leader leads," or "whether the team leader had participated in previous AEA projects."

Likewise, for demographic measures – education, ethnic group, and gender – did not relate to any of the scales. In only one case each, "the number of people on the primary work team" and the "geographic region" related to one of the scales. The other eight scales were not related to either of these variables. The importance of these non-relationships will be explored in the discussion section as it related to overall construct validity evidence.

Table 38

Discriminant Validity Results

| Team Leader Function | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Source | | | | | | | | | |
| Time in high-tech industry | | | | | | | | | |
| F | .92 | 1.63 | .37 | .48 | 1.53 | 2.32 | .98 | .67 | .37 |
| df | 4,328 | 4,324 | 4,327 | 4,324 | 4,325 | 4,323 | 4,326 | 4,324 | 4,328 |
| MS error | .48 | 1.28 | .25 | .82 | 1.82 | 1.63 | 1.17 | .63 | .56 |
| Number of work teams leader leads | | | | | | | | | |
| F | 1.48 | 1.22 | 1.06 | 1.86 | 1.40 | 2.17 | 1.63 | .80 | 1.22 |
| df | 4,310 | 4,307 | 4,310 | 4,307 | 4,308 | 4,306 | 4,309 | 4,307 | 4,310 |
| MS error | .45 | 1.30 | .25 | .78 | 1.84 | 1.61 | 1.17 | .63 | .55 |
| Number of people on primary work team | | | | | | | | | |
| F | 2.54* | .16 | .91 | 2.35 | 1.65 | 1.22 | .58 | .40 | 1.67 |
| df | 4,314 | 4,311 | 4,314 | 4,311 | 4,312 | 4,310 | 4,313 | 4,311 | 4,314 |
| MS error | .45 | 1.31 | .26 | .77 | 1.82 | 1.63 | 1.18 | .65 | .54 |

Table 38 (continued)

| Team Leader Function | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Source | | | | | | | | | |
| Previous participation in AEA projects | | | | | | | | | |
| F | .24 | .05 | .18 | .02 | .42 | .05 | 2.31 | .12 | 1.61 |
| df | 1,322 | 1,318 | 1,321 | 1,318 | 1,319 | 1,317 | 1,320 | 1,318 | 1,322 |
| MS error | .46 | 1.28 | .25 | .83 | 1.84 | 1.65 | 1.15 | .60 | .57 |
| Level of education | | | | | | | | | |
| F | 1.50 | 1.34 | .97 | 1.22 | 1.07 | .56 | 1.87 | .67 | .99 |
| df | 6,328 | 6,324 | 6,327 | 6,324 | 6,325 | 6,323 | 6,326 | 6,324 | 6,328 |
| MS error | .48 | 1.28 | .25 | .81 | 1.82 | 1.66 | 1.14 | .63 | .56 |
| Ethnic group | | | | | | | | | |
| F | .39 | .20 | .66 | .43 | .25 | .37 | .80 | .48 | .75 |
| df | 5,324 | 5,320 | 5,323 | 5,320 | 5,321 | 5,319 | 5,322 | 5,320 | 5,324 |
| MS error | .48 | 1.28 | .26 | .80 | 1.82 | 1.65 | 1.18 | .63 | .56 |

Table 38 (continued)

| Team Leader Function | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Source | | | | | | | | | |
| Gender | | | | | | | | | |
| F | .36 | .10 | .99 | 1.22 | .07 | .01 | .10 | 1.33 | 1.74 |
| df | 1,329 | 1,325 | 1,328 | 1,325 | 1,326 | 1,324 | 1,327 | 1,325 | 1,329 |
| MS error | .48 | 1.27 | .25 | .79 | 1.80 | 1.63 | 1.17 | .62 | .56 |
| Geographic region | | | | | | | | | |
| F | 1.42 | 1.04 | 1.20 | 1.03 | .72 | 2.71* | 2.25 | 2.28 | 2.00 |
| df | 4,330 | 4,326 | 4,329 | 4,326 | 4,327 | 4,325 | 4,328 | 4,326 | 4,330 |
| MS error | .48 | 1.28 | .25 | .81 | 1.83 | 1.62 | 1.14 | .61 | .55 |

Note. F values were asterisked if they were significant at the .05 level.

Table 39

Trends Across Discriminant Propositions

| Scale | Number of propositions upheld | Percent of propositions upheld |
|---|---|---|
| 1 Production Monitoring and Improvement | 7/8 | 88% |
| 2 Material Allocation | 8/8 | 100% |
| 3 Environment of Support/ Problem-Solving | 8/8 | 100% |
| 4 Training and Development | 8/8 | 100% |
| 5 Personnel Decisions | 8/8 | 100% |
| 6 Customer Communication | 7/8 | 88% |
| 7 Alignment with Organizational Mission | 8/8 | 100% |
| 8 Motivate to Excel | 8/8 | 100% |
| 9 Understand Customer and Business Needs | 8/8 | 100% |

## Trends Across Validity Propositions

Table 40 below includes a summary of the number and percent of propositions that were upheld across the three types of construct validity evidence that were explored in Study 2. With a range of 26 to 36 propositions examined for each of the nine scales, from 68% to 91% of these propositions were upheld. On those measures alone, Material Allocation and Customer Communication had the poorest substantiation with 68% and 72% of their propositions upheld. As noted previously, these represented scales with the lowest percentage of the sample performing them. It was notable, however, that across all three types of validity explored in Study 2, all nine scales' propositions were upheld in over two-thirds of the cases. The discussion

section will more closely examine these results in conjunction with an examination of the content validity findings in Study 1.

Table 40

Trends Across Propositions in Study 2

| Scale | Number of propositions upheld | Percent of propositions upheld |
|---|---|---|
| 1 Production Monitoring and Improvement | 29/37 | 78% |
| 2 Material Allocation | 19/28 | 68% |
| 3 Environment of Support/Problem-Solving | 25/30 | 83% |
| 4 Training and Development | 23/26 | 88% |
| 5 Personnel Decisions | 31/34 | 91% |
| 6 Customer Communication | 21/29 | 72% |
| 7 Alignment with Organizational Mission | 28/32 | 88% |
| 8 Motivate to Excel | 24/28 | 86% |
| 9 Understand Customer and Business Needs | 29/36 | 81% |

# CHAPTER VII

## CONCLUSIONS

The organization of work and of employee job roles has changed dramatically in recent years (Antonucci & Tannenbaum, 1995; Kravetz, 1988; Rosen, 1990), and as a result, team leadership is of increasing importance (Graham & LeBaron, 1994; Campion et al., 1996). The purpose of this study was to describe and understand the work that team leaders do and how their work relates to other aspects of organizational performance.

Guzzo and Shea (1992), Morgan and Lassiter (1992), and Ruggeberg (1996) have all argued that a great deal more research is needed concerning team leadership. The present study redressed many problems of team leadership research thus far. Among the shortcomings with team leadership research were that multi-team comparative studies were the exception rather than the rule (Pratt & Jiambalvo, 1981) and that much of the methodology has been based on anecdotal evidence rather than on empirical substantiation (Ruggeberg, 1996). Many studies have used ad hoc and contrived teams in non-naturalistic settings. As Ilgen and colleagues (1993) have suggested, further research has been needed on permanent project teams, such as those in this study. Studies have often incorporated narrow definitions of team leadership and few studies have distinguished between team leadership and other managerial forms (Ruggeberg, 1996). Each of these deficits was addressed in the present research. This study offered a first step toward developing a more integrated research base for testing theories of team leadership.

This work sought to make several distinct contributions to the theoretical and empirical literature, as well as to organizational practice. First, the study provided an integration of the team and leadership literatures, a comprehensive review of the existing team leadership literature, and an identification of the most critical facets of team leadership through the background research. Based on the literature review and the background research, a content

validation of these facets was explored. This series of steps built on specific suggestions for measurement development made by Graham and LeBaron (1994), the team research of Campion and colleagues (1993, 1996), and suggestions for team leadership research made by a number of authors (Cohen et al., 1996; Hackman & Walton, 1986; Pratt & Jiambalvo, 1981; Ruggeberg, 1996).

Second, the research drew from an unusually large and diverse sample of companies from one of the most innovative and high-performing industries in the world (Kravetz, 1988), drawing upon the strength and generalizability that field research offers, an advantage argued for in previous research (e.g., Cohen et al., 1996). The sample included the best performers in this industry providing a standard of superior performance for workplace applications.

Third, rather than looking at team leadership in isolation, this study examined the larger organizational context, the company practices that interact with the processes of team work and team leadership, as well as organizational productivity and financial outcomes. The examination of the relationships between team leadership and other facets of organizational functioning, particularly in Study 2, addressed recommendations by McIntyre and Salas (1995) and Dunphy and Bryant (1996). These authors suggested an exploration of the organizational context's effect on fostering team work and team effectiveness and the role of team leadership in these relationships. Cohen and colleagues (1996) also specifically argued for building better theory through an examination of team effectiveness within the larger organizational context and for drawing from a large number of companies to ensure variability. Furthermore, Campion et al. (1993) stated that such research must provide management with specific guidelines for intervention. This research addressed each of these suggestions, exploring the larger company context in relation to team leadership, identifying the most critical organizational variables that

affect company outcomes, and providing pointers for future personnel applications related to training, assessment, reward, and staffing of team leaders.

Finally, this research sought to contribute evidence of construct validity for team leadership scales to be used in future research, theory building, and for practical applications in the high-tech industry. This study, building on a continuing line of research, was unique in its effort to describe and validate the work of team leaders in the high-tech industry. Study 1 investigated the content validity evidence for team leader work roles. Study 2 examined the relationship of these team leader roles with other aspects of organizational functioning – demonstrating criterion-related, convergent, and discriminant validity evidence. Initial substantiation for construct validity was demonstrated in the results of Studies 1 and 2. This chapter will explore the interpretation, implications, and limitations of these results.

## Study 1 Findings

As will be recalled, the main question of interest in Study 1 was "What are the most critical work functions of a team leader in the high-tech industry?" The findings from this content validation study and their implications have been discussed in Chapter III Results and will be briefly reviewed here. In short, the results strongly supported the content validity of the seven functions and twenty activities proposed in background research. In full support of Proposition 1, all activities were performed by a vast majority of the team leaders and all were considered important by these team leaders. Support was not found for the second proposition that the seven functions would fall out as seven factors in a confirmatory factor analysis. An alternative model, resulting from the exploratory factor analysis, demonstrated a factor structure similar to the twenty activities that were sub-dimensions of the original seven functions. These factors were averaged into scales and examined for inclusion in Study 2. Nine of these scales were included in Study 2's investigation of criterion-related, convergent, and discriminant

validity as they represented the general content areas that had been reviewed in the literature review and met the criteria for inclusion. Methodological limitations of Study 1 related to sample size, method bias, and the psychometrics of the survey were discussed in Chapter III.

In addition to empirical support for content validity, Study 1 also offered theoretical substantiation for the seven functions and twenty activities. The background research demonstrated initial evidence of the existence and importance of the team leadership activities. In a review of models of team functioning, Fleishman and Zaccaro (1992) also identified seven team functions that corresponded to these seven team leader functions. Their correspondence along with the empirical validation of the team leader functions might be seen as further validation evidence for Fleishman and Zaccaro's team functions.

## Study 2 Findings

The propositions for Study 2 were all explored within the context of an organizational model (Cummings & Worley, 1993). Mixed support for the propositions in Study 2 was demonstrated. Strong support was shown for the criterion-related propositions. These propositions specifically addressed relationships between team leader activities and other company-wide practices. However, only partial evidence of convergent validity was demonstrated. These convergent validity propositions dealt with relationships between variables that were expected to be similar to the team leadership activities. Strong evidence was found for discriminant validity as the proposed variables for these research propositions did not relate to variables that were outside the nomological net. The theoretical background and specific results of these propositions will be discussed below.

## Theoretical Substantiation for Study 2 Findings

As noted, Study 2 propositions were derived from theoretical relationships within the organizational model (Cummings & Worley, 1993). The model included organizational

variables and relationships with other organizational components similar to those in other studies (e.g., Nieva et al., 1978; Salas et al., 1992; Sundstrom et al., 1990), and they were generally supported in Study 2. The mean scores on these organizational variables indicated that all of the company practices investigated in the study were implemented across the companies.

The specific practices that were used to operationalize the components of Cummings and Worley's model (1993) were chosen based on a general premise of "high performance" companies, similar to Walton's (1985) commitment vs. control theory. This theory has stated that successful team implementation will occur in settings in which management empowers workers and relies on commitment from employees to achieve organizational effectiveness rather than imposing control and compliance. Teams have been introduced as a subset of the high performance practices that occur in such companies (e.g., Goodman, Devadas, & Hughson, 1988). As noted previously, the operating assumption was that in organizations where these team leader roles were enacted and were considered important, other innovative, high performance organizational practices were likely to be implemented and were likely to be related to the team leader scales. In other words, a common context existed that made innovative team leadership possible along with other organizational practices. Figure 3, presented earlier, provided an illustration of the origin of these propositions.

Substantiation for individual hypotheses about relations between team leadership and other organizational variables were drawn primarily from the general team literature, and team leadership facets were proposed based on a combination of team functioning and the functional leadership approach. This emphasis on the team as opposed to the leader in the literature was both an asset and a challenge for this study. It was an asset because new ground was broken, and this study built directly on research proposals suggested by a number of authors (e.g., Campion et al., 1993; Cohen et al., 1996; Graham & LeBaron, 1994; Hackman & Walton, 1986; McIntyre

& Salas, 1995). The emphasis on the team was a challenge, however, because inferences had to be made from facets of general team functioning and effectiveness to specific facets of team leadership. For the specific propositions in Study 2, the relationships between team leadership and organizational functioning were based on the organizational design literature.

## Criterion-Related Validity Propositions

The central question for criterion-related validity evidence in Study 2 was "Do the team leadership activities relate to and predict other organizational variables?" In support of this general proposition, Table 25 demonstrated that for seven of the nine scales, the majority of criterion-related propositions were supported and that the validity coefficients ranged in size from 0.12 to 0.41, with average correlations of approximately 0.20. Similar validity coefficients were found in studies of team effectiveness examining similar variables, with correlations ranging from 0.18 to 0.64 and with many averaging around 0.20 (e.g., Campion et al., 1993; Campion et al., 1996).

Propositions for two scales that related to the "typical" areas of leadership, Motivate to Excel and Alignment with Organizational Mission, were supported 100% of the time. Propositions for the five scales of Production Monitoring and Improvement, Environment of Support/Problem-Solving, Training and Development, Personnel Decisions, and Understand Customer and Business Needs were supported in the vast majority of cases. These positive findings indicated that the propositions for these seven scales were reasonable and that evidence of criterion-related validity was demonstrated.

In contrast, the scales related to Customer Communication and Material Allocation demonstrated the poorest criterion-related validity support, with 50% and 25% of their propositions supported, respectively. The Customer Communication scale represented an activity with a comparatively lower mean importance rating and percent of the sample

performing it (see Table 7). The lack of support for relationships with other organizational practices may not have been surprising, except that the activity was still performed by over 75% of the sample and was rated as "important." Of the eight proposed relationships for this scale, the use and effectiveness of customer service and satisfaction measures was not related to Customer Communication at all. This seemed particularly unusual given the common focus on customers. It may have been that the team leaders were aware of the need for customer attention, but corresponding efforts in other parts of the organizations were not related to this aspect of team work.

Low importance ratings and percent performing results were not found for the Material Allocations scale. The unsupported propositions for this scale included relationships with TQM and SPC. It was expected that these quality practices would be related to the manufacturing front-line and therefore the material resources needed for front-line effectiveness. However, it may have been that these measurement-oriented quality practices were only important for the production of materials, as evidenced by the support for these practices in the production scale, but not for obtaining and allocating materials. The more surprising result was that the just-in-time manufacturing practice was not related to the Material Allocation scale. This practice was directly concerned with ensuring that inventory is managed to keep stocks low and turn-around on materials high, seemingly related to a team leader's Material Allocation role. JIT also was not related to the Production Monitoring and Improvement scale, so it may be that although it was implemented in companies (see Appendix E), it was not an integral part of the functioning of teams or team leaders. Perhaps inventory was controlled by other functional departments or higher levels of the organizations.

While the majority of the criterion-related propositions were not supported for these latter two scales, the majority of criterion-related validity propositions were substantiated for the

other seven scales. In addition to the general support across the scales, it also was informative to examine relationships that were found across organizational practices. As logically follows from the examination of separate scales, the majority of relationships between organizational practices and team leader scales were positive. Specifically, amount of training, cross-training, continuous improvement, shared financial benefits, and all-salaried pay systems related to every proposed team leadership scale. For both the degree of implementation and the effectiveness of the practice, these five variables were positively correlated with the related team leader scale. Additionally, on-going training, TQM, front-line decision-making, and employee awareness related to the vast majority of team leader scales that were proposed.

In contrast, for SPC, JIT, customer service, and cross-functional work teams, most proposed relationships were not supported. In general, the means and variability for these variables were not markedly different from other practices. It may be that in the case of SPC, JIT, and customer service measures, these practices related to other levels and operations of the organization than team functioning. Although they may be implemented in companies, areas other than the front-line manufacturing teams may have been using them. It also was possible that cross-functional teams, the fourth unsupported practice, were implemented in executive, administrative, and service areas, rather than on the manufacturing front-line. Further data will have to be gathered to make conclusions about these unsupported relationships. Interestingly, the lack of substantiation for these propositions provided some evidence that percept-percept bias was not acting to inflate relationships across all propositions.

In addition to looking at the trends across team leader scales and organizational practices, it also was noted that a trend appeared in responses related to extent of use vs. the effectiveness of organizational practices. It will be remembered that respondents rated each organizational practice both in terms of the extent to which they were implemented in the

company and in terms of how effectively the practice was implemented. In each case in which the extent of use of an organizational practice was related to a team leader scale, so was the effectiveness of that practice. However, there were six cases in which the extent of use of an organizational practice was not related to the team leader scale, but the effectiveness of the practice was significantly related. Because it was only six cases, this represented a small percentage of the relationships examined; therefore the trend may have been due to chance. However, it may have been that the importance of team leader activities was more closely related to whether an organizational practice was effective than it was to the extent to which the practice was implemented. For example, in companies where team leaders considered it important to understand business and customer needs (Scale 9), these companies also were likely to effectively institute customer service measures ($r = 0.16$), although understanding customer needs was not related to how widely customer service measures were implemented ($r = 0.02$ between extent of use and Scale 9). An alternative explanation may have been that team leaders' perceptions of importance of understanding business needs were more closely related to their perception of the customer satisfaction measures' effectiveness than to the degree to which the satisfaction surveys were implemented. As will be discussed below, future studies will have to tease apart the degree to which the results of this study reflected actual organizational functioning and the degree to which it measured team leaders' perceptions. As noted above, some evidence indicated that percept-percept bias did not account for all the findings in the study.

## Convergent Validity Propositions

In Study 2, the convergent validity propositions addressed the question, "Do the functions of team leadership relate to other conceptually similar variables?" While all the team leader scales were substantially inter-related, few of the other variables that were expected to

relate to each team leader scale was significantly correlated. Across the scales, 70% to 91% of propositions were confirmed, and average correlations ranged from 0.34 to 0.46.

Because the team leader scales were developed from related factors, it was anticipated that they would have significant and positive correlations. This supported the argument that while they were separate factors of team leadership, there were significant similarities among the aspects of team leadership. The correlations among these scales were, not surprisingly, the strongest in the Study 2 propositions (see Table 36).

However, other variables, such as self-directed work teams and percent of time spent on activities related to team leadership did not show trends in support of convergent validity. SDWTs had been posited to relate to all team leader scales because the most successful team leaders were expected to be found in companies with the most widespread and effective use of self-directed work teams. This was expected because the team leadership functions were framed in terms of enabling, coaching, and facilitating, an approach that might be common in SDWTs, as opposed to a directive or imposing supervisory approach. Additionally, the study included leaders who were members of the work team, making it reasonable to assume that leadership could come from within the team as would occur in a self-directed work team. Additionally, the functional leadership approach (Hackman & Walton, 1986) implied that leaders only intervened in areas to support team efforts where necessary.

Despite this reasoning, the proposition related to SDWTs was not fully supported. Some scales were positively related to SDWTs, but only in terms of the extent of use, not effectiveness (with the exception of Personnel Decisions). See Table 36. The extent to which SDWTs were implemented (i.e., extent of use) was related to the team leader scales of Production Monitoring and Improvement, Training and Development, Personnel Decisions, Communication with Customers, and Understanding Business and Customer Needs. However, it was not related to

Material Allocation, Supportive/Problem-Solving Environment, Alignment with Organizational Mission, or Motivate to Excel. The latter three scales appeared to represent more traditional areas of management than some of the other scales, and for this reason, the implementation of these team leader roles might have actually impeded the development of self-directed work teams because of the pronounced role of a leader. In support of this hypothesis, results of Cohen et al. (1996) demonstrated that supportive leadership behaviors did not contribute to the effectiveness of self-managed teams. The reason for the lack of a relationship between the use of SDWTs and Materials Allocation was not clear from the data. A relationship was expected because both implied advanced and empowered roles for front-line teams. It should be noted that self-directed work teams were rated at relatively lower levels of implementation and effectiveness, in comparison to most organizational practices (see Appendix E and Table 36). These combined results may call into question the self-leadership theories of Manz and Sims (1993) or at least raise the question of whether companies are currently mature enough to implement SDWTs and realize the results that are theoretically associated with them.

A lack of substantiation for convergent propositions also was demonstrated by the low number of positive relationships found between team leadership and the percent of time spent on coaching and facilitation, hands-on production work, and acting as a liaison. In fact, hands-on production work was negatively related to the ratings of Production Monitoring and Material Allocation. An obvious explanation for the lack of findings was that the percentage of time spent on activities was not an adequate measure for exploring convergent validity in relation to team leadership. Quantity of time spent on any activity did not indicate the quality of that effort nor the extent to which the effort was necessary. For example, a very critical but rarely performed aspect of leadership, such as crisis management, would not be represented adequately by these measures. On the other hand, the propositions simply may have been incorrect. The

negative relationship with hands-on production time may have indicated that an effective team leader should *not* be extensively involved with production work. In fact, it may be more difficult to carry out the functions of monitoring production and allocating materials if a leader is too involved with the "hands-on" work. This potentially mutually exclusive relationship between being a leader and being a participating member of the team in its daily work should be investigated further.

Interpretations of these findings were limited because the variables used in the convergent validity propositions were the least developed of those included in the background research. Therefore, the general conclusion was that the measurement of convergent validity was not well-developed and that later studies should particularly focus on this area. Clearly, better measures and better theory should be developed to determine the most appropriate variables to consider for convergent validity with the team leadership scales in this study.

On the other hand, relationships were positive and significant between the percentage of time a team leader spent with external contacts and the scales of Communication with Customers, Alignment with Organizational Mission, and Understand Business and Customer Needs. This mix of findings made it more difficult to interpret the adequacy of the "percentage of time" measures for exploring convergent validity. It may have been that for activities with external contacts, these relationships were more easily quantified and therefore represented more appropriate measures.

## Discriminant Validity Propositions

In contrast to the convergent validity propositions, all discriminant validity propositions were strongly supported. Proposition 3 in Study 2 addressed the question "Do the functions of team leadership *not* relate to organizational variables that should be conceptually distinct?" Of the 72 discriminant validity propositions, only 2 were not upheld. Therefore, as expected,

relationships outside the nomological net were not significant. This lack of significant relationships between team leader scales and all other variables also helped demonstrate a lack of percept-percept bias because such a bias might have created a trend toward significant relationships among all variables, not only those proposed to relate to one another.

## Trends Across All Validity Evidence

A number of authors have asserted that construct validity can be obtained through many different approaches (e.g., Binning & Barrett, 1989; Fleishman et al., 1991). Construct validity grows with the volume and variety of evidence offered. Of nine possible sources of construct validity evidence that have been proposed by Cascio (1991), five of these sources were explored in Studies 1 and 2. They included factor analyses of the measure, natural separation of respondents based on scores, internal consistency evidence, convergent and discriminant validity evidence, and expert judgment about the construct and the scores. The two studies in this research demonstrated results of content, criterion-related, convergent, and discriminant validation processes that supported conclusions about the construct validity of the team leadership functional areas and related scales.

Construct validity of the team leadership scales, the degree to which these scales measured constructs that fit logically into the defined nomological net (Cronbach & Meehl, 1955), could be asserted based on the cumulative evidence of Studies 1 and 2. The combined evidence from validity findings for each scale demonstrated initial construct validity evidence. Although the convergent relationships were only strongly supported by relationships between team leader scales rather than with other variables, and although correlations across the criterion-related validity propositions were only of modest strength, strong trends were still identified in relationships between team leadership and other variables in the nomological net. See Table 40 for a summary of the findings across the types of validity in Study 2. This, in conjunction with

the content validity findings (see Table 7), demonstrated that the activities of team leadership received initial evidence of their validity. Specific contributions to the literature will now be considered.

## Contributions

To evaluate the contributions that the research made, it is important to identify what the research sought to achieve. This research was not a job analysis effort nor an attempt at fine-grained model development. It was a descriptive and prescriptive study to examine and understand the activities most important to team leaders and for team effectiveness, to determine with what frequency those activities were being performed, and to establish whether they were likely to occur in conjunction with other organizational practices.

The purpose also was not to describe all the facets of team work and their relationships to team effectiveness. The purpose was to describe where a team leader might intervene to influence team work and therefore contribute to team effectiveness. The integration of team functions (Fleishman & Zaccaro, 1992) with team leadership activities focused specifically on the leadership necessary to enable the team to accomplish its tasks.

This was the first study of its type and the validation of the team leader scales represented a substantial contribution to the literature. The use of a sample from the high-tech industry was another unique feature of this study. The high-tech industry has been at the forefront of organizational transformation (Kravetz, 1988) and with its teamwork emphasis and relatively under-developed styles of leadership (Warrick, 1990), it was an appropriate industry to include in this research. Additionally, the response rate for team leaders was over 60%, one considerably higher than many field studies of its kind. This high response rate was even more notable because it included team leaders from over 60 different companies. Such a multi-site, field-based study is unusual in the team literature (Ilgen et al., 1993; Pratt & Jiambalvo, 1981;

Ruggeberg, 1996). The voluntary involvement of so many electronics companies and so many team leaders, whose time was very limited by work demands, represented an investment on their part in the worth of the study.

Another contribution this research made was to offer a description of the current workplace and its requirements. Common themes that cut across team leader activities were uncovered. These themes reflected the work demands in the electronics companies in this study and included, for example, responsiveness to larger organizational business needs, a focus on customer needs, quality incorporated in every step, an emphasis on innovation and creativity, and the need for quick response times. Because these common themes represented the needs of the present workplace and were reflected in the team leader functions, the functions and activities of team leadership can provide a prescriptive guide for manufacturing product teams, especially in the high-tech industry. The functions can be adapted and used for developing task definitions, performing job analyses, creating selection instruments, promoting and assessing team members and existing team leaders, developing training programs, and improving job design efforts.

These applications will be possible and appropriate because the team leader functions were created and tested to reflect the most important functions identified by the most superior performers rather than reflecting the *status quo* or mediocre performance. Clearly, further data will need to be collected. One issue that must be addressed is the most appropriate number of functions and activities for investigation of practical applications. The nine scales included in Study 2 clearly have the most empirical support for future use. However, the other seven scales that were identified in Study 1 but not used in Study 2 should be investigated further and considered in the development of practical applications. Additionally, the sample was not large enough to modify the original seven-function model, and future research should examine the

appropriateness of these seven functions in comparison to the sixteen scales. In the interim, the nine scales included in Study 2 appear the most appropriate for immediate applications.

Based on the findings in Study 2 and further identification of an appropriate model, work sample selection tests for team leaders might be developed based on the activities and performance indicators from the team leader scales. Behavior-based training programs could be created to identify, train, and assess the aspects of team leadership needed. For example, a team leader who has shown deficiencies in developing a supportive team environment might receive a training class centered around the activities and performance indicators from that scale. Through the investigation of relationships between team leader scales and organizational reward practices, implications might also be drawn for appropriate means of motivating and rewarding employees. For example, all-salaried pay systems, team input on hiring and pay, and financial benefits shared by a team all represented organizational practices that were positively related to team leadership and could be implemented in companies that are also developing teams and team leaders. Companies also might use these team leader roles to benchmark themselves against other companies and their successful implementation of teams and team leadership.

## Limitations

Ilgen and colleagues (1993) stated that diversity should be tolerated in different research approaches and that the relative value added to the literature, rather than the absolute value, should be the criterion of interest. While there were a number of methodological limitations in this research, it can be seen that as the first study of its kind, new ground was broken and new ideas were introduced for future studies. Furthermore, the research was based on extensive background efforts and was part of a continuing line of research, each of which substantiated the importance of these studies. However, the limitations of the study should also be evaluated.

As has been noted, the most outstanding limitation of this study was its reliance on a single method of data collection. Organizations that were successful and that adopted high performance practices with more widely implemented and more effective practices were expected to have more informed team leaders and were expected to recognize the value of team leader roles and reward and support them accordingly. However, in this study, this assumption was difficult to test conclusively because the same subject matter experts (i.e., team leaders) gave responses to questions about team leadership and about organizational practices. While this single method of data collection introduced percept-percept bias, there were trends in the data that indicated that other forces besides percept-percept bias contributed to the results. For example, the criterion-related validity propositions and the discriminant validity propositions were both strongly supported – a finding that would not have occurred if percept-percept bias alone was acting. Additionally, the results demonstrated moderate correlations similar to those in other studies that used different sources of data collection (e.g., Campion et al., 1993; Campion et al., 1996). While divergent trends in validity evidence were found, while other research supported the findings, and while theoretical substantiation was offered for each of the research propositions, there still was no proof in this study that the results were not spurious. This level of certainty would be unusual for any single research effort, therefore, future studies will have to gather data from a number of sources to disprove this claim.

Another criticism was that the use of survey information as the data collection method meant that the results only represented beliefs, not objective information about organizational functioning. Team leaders were asked which activities and performance indicators they performed and how important they were for effective team leadership. One might argue that all that was being measured was team leader beliefs. This interpretation of perceptual data would apply to results throughout the psychological literature because perceptions and survey data have

frequently been used rather than observation or other sources of "objective" data. Because the survey was written in a manner that attempted to solicit accurate feedback about whether activities were actually performed and because extensive background research had been conducted, the data were interpreted as indicating more objective information about organizations than simply respondent beliefs. Clearly, the certainty of this interpretation was muddied by the implications of percept-percept bias and that data were not collected from other sources. Future research will have to evaluate the accuracy of the interpretation of the findings.

Another related limitation was that each team leader was the representative for describing organizational practices at his or her individual company site. This introduced level of aggregation issues (Rousseau, 1985; Hulin & Roznowski, 1985). Data were not aggregated in this research because many companies only included one team leader in the study. Moreover, in cases where more than one team leader from a company was included, inter-rater agreement could not be tested because the team leaders were frequently from different geographical locations (e.g., the same corporation but at locations in New York and Texas). The implementation and effectiveness of organizational practices were likely to differ at different company sites. Future studies should gather data from more than one team leader and from multiple sources at different levels in the organization.

Another limitation of this study was that team effectiveness was not measured specifically. A team effectiveness measure would have provided direct evidence of the relationship between the team leadership functions and team success. The leadership and team activities included in this study were selected, however, based on previous support for team success. Therefore, to the degree that the team leader activities were performed and their related performance indicators were achieved, the leader could be judged as contributing to team success. This approach to leadership involved two implicit assumptions -- that the leader was (1)

actually contributing and (2) the effect of a poor leader was not just drowned out by how well the team performed *in spite of the leader*. Future studies should therefore include team effectiveness measures in order to investigate the accuracy of these assumptions and the relationship between leadership and team success.

An additional limitation of the study was the measure used to gather data on team leader functions. Possible response bias, method bias, and demand characteristics were discussed in Chapter III. The small sample size was another limiting factor in the study. Further examination of the confirmatory factor analysis in Study 1 could not be conducted because of the low sample size. Additionally, the survey created to gather data about organizational outcomes and higher levels of aggregation could not be analyzed because too few human resource representatives returned and completed the survey. Extensive, yet unsuccessful, efforts were made to increase the sample size, including two rounds of follow-up letters and two rounds of phone calls to non-participants.

The range restriction issues noted in Study 1's discussion section were particularly likely to mitigate against validity evidence in Study 2 because it was expected that there would not be enough variability in responses among team leaders who were all superior performers. However, in support of the propositions, results still demonstrated significant and positive relationships. Each of these limitations must be considered in future studies.

## Future Research

This research provided a descriptive basis and evidence of predictive relationships that will assist future test developers, theoreticians, and practitioners to better understand the construct of team leadership, to refine and develop better measures, and to develop tools for employment selection, performance appraisal, training, and team development. Future research should extend the theoretical base and the empirical results of these studies. As noted, this

research was part of an ongoing program. Efforts will be made by the authors to gather other data, to extend the generalizability of the findings, and to create practical workplace applications. This section will outline the next specific steps of research to be undertaken.

These studies created a foundation that can be tested on other samples and in other arenas to see whether these facets of team leadership map onto related constructs in other teams, other companies, and other industries. Because researchers must heed the limits of generalizability (McGrath, 1986; Ilgen et al., 1993), the team leadership roles in this study were deliberately formulated so that they were general. For example, nothing specific was included with regard to particular technologies or products. Therefore, companies in other industries, such as the automobile or biotech industries, that face similar organizational needs and market forces for empowerment and innovation might also require similar team leader functions. Additionally, industries that are not considered as innovative, for example, textiles or machine-working, might also make appropriate settings in which to study the team leadership activities to test the limits of their generalizability. Furthermore, a replication effort of the current study, including such methodologies as a Q-sort of the activities and performance indicators to compare to the factor analysis in this study along with other measurement refinements, will be considered.

As noted previously, the development of these team leader functions was part of a nationwide effort and the ultimate aim has been an integration of functions across different industries. Therefore, the researchers will examine the possibility of validating these team leader functions in two of the other participating industries, namely, the biotech industry and the machine-working industry. The former is likely to be very similar in organizational and market demands to the electronics industry. On the other hand, the machine-working industry is a more traditional and less innovative one and is likely to provide a context quite different from that of the high-tech industry. The examination of two different types of industries will contribute to

refinement of the functions and to testing the limits of their generalizability. It should be noted that the nine scales included in Study 2 are the most appropriate for validation efforts in these initial tests of generalizability. Following refinement and further investigation of the seven-function model and the sixteen factors identified in Study 1, these aspects of team leadership should be included in other similar validation efforts as well.

A more fine-grained organizational model also will be examined in the next stages of this research effort. The organizational components and relationships in the Cummings and Worley (1993) model will be tested in more detail in the high-tech industry. For instance, the use of certain practices such as SDWTs and JIT was not fully supported in this study and might be examined in more detail to determine whether there was something idiosyncratic about this study or whether these practices actually were not appropriate for the model in the first place. It may be that self-directed work teams are not related to team leadership because SDWTs are less likely to have an individual acting as a leader and are more likely to incorporate each of the team leader functions into every individual member's work. For instance, a research proposition that could be tested is that a more mature and highly effective SDWT is less likely than a less mature SDWT to have one individual who performs these team leader functions. At the early stages of implementation of a SDWT, it may be that a team leader would be appointed and that it would be essential for this one individual to carry out these functions for effective team functioning. Therefore, a closer examination of the types of SDWTs, their relative maturity and effectiveness, and the corresponding implementation of the team leader functions will provide insights into the findings in this study.

Furthermore, other organizational practices that were included in this study will also be refined and operationalized in more detail. Due to time and space limitations, observational data and respondents from other parts of the organization were not included in this study. However,

in the next study, more specific definitions and more detailed measurements of practices such as JIT, TQM, financial benefits shared with the team, on-going training, and front-line decision-making will be included. This data will be gathered from archival records, observational data, and other respondents in addition to team leaders. Moreover, efforts will be made to gather data from more than one team member so that inter-rater agreement can be tested. In addition, multiple team leaders from the same company will be tapped, so that data related to higher levels of the organization can be aggregated and analyzed.

Other relationships such as the team's interface with specific tasks and technology (Goodman, 1986), types of team rewards (House, 1971), and team decision-making efforts (Ilgen et al., 1995) were explored in this study and will be examined in more detail in a future study as well. This research included team leaders who worked in such diverse areas within the electronics industry as semiconductors, aerospace engineering, and biomedical electronics. The kind of task work and the specific equipment and technology related to these sub-fields are likely to require different emphases and types of guidance from team leaders.

Potential task-related variables that should be considered might include the number of people and level of interaction required for task completion, task complexity, the level of experience required, the specific type of equipment used, and the time required for production. Therefore, the validity of the team leadership functions and their relationship to other facets of the team's task work and technology should be explored in more specific settings. For example, activities such as Monitor and Improve Production are likely to require different leader actions in biomedical work in comparison to aerospace electronics because of the different task-related variables. The work related to the activity of Obtain and Allocate Materials also might be considerably different in these two settings. Furthermore, other factors such as the use of TQM and continuous improvement may moderate the relationships between the type of team task and

team leader activities related to production process and machine availability. If the product development cycle times and the types of quality measurements differ across tasks and across sub-industries, these moderating relationships with TQM and continuous improvement also may be significantly different.

Additionally, different types of tasks and technology are likely to create different decision-making settings in which team leaders must work. Front-line decision-making was positively related to every proposed team leader scale. However, the nature of the decision-making is likely to vary in type according to different tasks and different organizational contexts. Some tasks may be highly routinized and require less team problem-solving, while others may require integrated team decision-making and leadership at each stage in product development.

Appropriate team reward structures also may vary across settings that require different tasks and technology. In one setting, it may be that individuals should be rewarded based on the number of products they produce. Whereas in another, more collaborative team setting, rewards may be more appropriately based on a shared team input because the task and technology require more member interactions and therefore should result in shared outcomes and rewards. An advantage of the present study is its generalizability. Based on each of these possibilities related to technology, decision-making, and rewards, future studies should be designed focusing on teams with clearly defined parameters, observing their efforts and interactions over time, and examining the kinds of leadership these parameters require.

In a continuation of the present efforts at construct validation, it is essential that a multi-trait, multi-method matrix of team leadership be developed and tested as more measures of team leadership are developed and as the nomological net is explored further. The measure used in this study will be refined and developed further in future research. Additionally, validation

evidence will be gathered for the other seven factors that were identified in Study 1 but not included in Study 2.

In addition to the next programmatic stages in the research outlined above, there are several other studies that would be interesting and informative to pursue. For example, further research on the organizational model and the role of team leadership should be conducted to examine other relationships and use other statistical analyses. An assumption of independence, an additive relationship among the elements in the Cummings and Worley (1993) model, was adopted in this research. More complex, interactive relationships might have been posited; however, given the lack of prior empirical data on the team leadership activities, there was not a sufficient foundation upon which to base such propositions. For example, the next study might test the interaction between the implementation of measurement systems (e.g., TQM and SPC), the type of technology used by the manufacturing team, and the effectiveness of the production monitoring team leadership function.

Additionally, leadership in this study was examined as it related directly to team functioning and effectiveness. Leadership is not only or necessarily a direct factor affecting team functioning, and the moderating and mediating effects of leadership should be explored in future research. Furthermore, no causal relationships were tested in this research, and a path analysis model would offer further insight to the relationships among variables. For example, it may be that a particular organizational environment and culture, such as the high performance one posited in this study (Walton & Hackman, 1986), leads to the use and effectiveness of all-salaried pay systems, of front-line decision-making, of leadership functions related to a supportive team environment, and to better productivity outcomes.

Few studies have been conducted that examined the wide array of practices in terms of both extent of use and effectiveness, across so many companies, as in this study. Building on

this and expanding the understanding of high performance organizations (e.g., Applebaum & Batt, 1993; Lawler, 1992; Walton & Hackman, 1986), future studies should examine the degree to which particular high performance practices are practiced in the same company, what other relationships might be demonstrated between these practices and team leadership, what profile of organizational functioning results, and what the effects of these variables are on productivity and financial performance. Additionally, other organizational practices that are not considered "high performance" (e.g., seniority-related pay structures rather than merit-based pay systems) should be included in order to distinguish between those that relate to Walton's commitment paradigm and those that represent a more traditional, control and compliance approach (Walton, 1985; Walton & Hackman, 1986). Next, practical applications related to this research will be considered.

## Practical Applications

Among the practical applications that might be implemented from extensions of this research are team leader training programs, selection and appraisal mechanisms, reward systems, and work group design efforts. On-going training efforts and the amount of training received by leaders were consistently positively related to the team leader scales. Training efforts may be developed based on team leader activities and performance indicators. Team leader activities might be prioritized according to specific organization-wide requirements and training programs developed based on this. For example, across a company, the activity related to Alignment with organizational mission may be assessed as the most critical weakness of team leaders. Thus, a training program related to this activity and its performance indicators could be designed. Furthermore, for individual team leaders, training programs – whether formal or on-the-job efforts – could be undertaken to address their specific weaknesses. For instance, if a particular team leader were having difficulty helping team members with decision-making, training in this

area could be formulated based on the related activity (Environment of Encouragement and Problem-Solving). Following or during the training, the leader could be assessed based on whether he or she successfully completed related performance indicators (e.g., "Rationale for decisions is explained and understood by team" and "Support in decision-making is provided"). Additionally, it was demonstrated in this research that the team leader activity importance ratings were related to particular types of training, such as problem-solving, facilitative skills, and conflict resolution training. The implementation of these training programs along with training on particular team leader activities may further increase team leader effectiveness.

As noted earlier, with further validation evidence of the job-relatedness of these team leader activities, selection and performance appraisal instruments might be developed through job analysis efforts and measurement development. As one example, further research may show that the activity related to Training and Development Needs can be legally upheld as job-related for manufacturing specialist team leaders in the high-tech industry. Based on this, a work sample selection test might be developed to help employers evaluate how effectively a potential team leader can achieve the activity. Particular work sample tasks be based on how successfully a team leader completed the related performance indicators of "Making training decisions based on business requirements" and "Allocating time and resources to meet training goals."

For practical applications related to pay systems, organizations can use the results of this research to evaluate appropriate means for rewarding team leaders. The organizational practices of sharing financial benefits with team members and implementing all-salaried pay systems were strongly related to the importance of the Personnel Decisions team leader activity. One interpretation of these results is that companies that have an environment that supports these innovative reward structures also offer a context in which a team leader is involved with these personnel decisions. However, it also may be that a causal relationship could exist – i.e., as

these reward systems are implemented, team leaders are motivated to perform more effectively. Therefore, organizations should investigate these relationships in their own companies to determine whether the implementation of these practices may provide means for improving team leader motivation and performance.

Finally, efforts at effective design and implementation of work teams could build on the findings in this research. A large number of teams are currently being implemented in high-tech companies (Antonucci & Tannenbaum, 1995). The importance of team leadership for ensuring team success (Burgess et al., 1992; Stewart & Manz, 1994) indicates that these team leader activities may play a role in determining the most effective team designs. Graham and LeBaron (1994) stated that team structures should be designed around a number of organizational processes that are reflected in the team leader activities: a climate of learning, team member contributions, and self-direction; a disciplined pursuit of excellent performance; a commitment to shared vision; and an energized quest for quality. Ruggeberg (1996) has examined the knowledge, skills, and abilities (KSAs) of team leaders, and Stevens and Campion (1994) have classified the KSAs of team members. These findings might be combined with the results of the present research to relate these KSAs to successful team design efforts as well as team leader redesign efforts.

In sum, the present study has provided a foundation for future research and for practical applications. The content validation effort demonstrated that functions of team leadership can be described and applied in a variety of settings. The other validity evidence identified relationships and examined an organizational model in which team leadership can be further explored and better understood. This on-going research effort provides a basis from which other team leadership studies and construct validation efforts can advance, along with practical implementations in the workplace of today.

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# APPENDIX A

## SURVEY PACKAGE

MANUFACTURING SPECIALIST TEAM LEADER SURVEY

# WORKFORCE SKILLS PROJECT
# NATIONAL VALIDATION SURVEY

## Manufacturing Specialist Team Leader

February 1996

AMERICAN ELECTRONICS ASSOCIATION

## WELCOME TO THE HIGH-TECH INDUSTRY'S WORKFORCE SKILLS PROJECT

By completing this survey, you will become part of a select group of high-tech workers and supervisors across the country who are working together to help define a new standard of excellence for our industry.

You know how much work has changed during the past few years. From using computer systems to helping develop new products, people throughout the industry are doing new jobs in new ways.

With so much changing, many in our industry felt it was important to spell out what work now requires. That is why the American Electronics Association (AEA) created the Workforce Skills Project.

We asked hundreds of front-line workers and supervisors to tell us what their jobs require. Based on what they said, we identified industry-wide workforce skill standards for the manufacturing specialist team leader.

Now we want to find out if the manufacturing specialist team leader standards are meaningful and applicable throughout the industry. That is why your honest responses on this survey are so important.

## THE SURVEY

In the next hour, you will be asked to evaluate whether the standards described in the survey truly reflect the most important aspects of your job.

To help you do that, let us explain a little bit about the workforce skill standards that have been developed for the job you do. your peers across the country identified seven key job roles within your occupation. We call these key roles "critical functions."

One example of a critical function for the manufacturing specialist team leader occupation is *"Facilitate and model productive work relationships within the team."* One of seven such critical functions will be located at the top of each survey page. A sample page appears to the right.

Each critical function has a set of related activities. For example, *"Help team to improve communications within the team"* is one of two activities related to the critical function listed above. The activity is located in the box on each survey page under the "critical function" to which it is related.

Each activity has two or more performance indicators that tell us when this activity is performed well. For example, *"Guidelines for team communications are established and applied by all team members"* is one of six performance indicators for the activity listed above ("Help team to improve communications within team"). The performance indicators appear below the activity on each survey page.

# SAMPLE PAGE

Critical Function
**Facilitate and model productive work relationships within the team**

**How important is the following activity to your job?***

| | Not Performed | Of Little Importance | Somewhat Important | Important | Extremely Important |
|---|---|---|---|---|---|
| Activity<br>Help team to improve communications within the team | 0 | 1 | 2 | 3 | 4 |

**When you perform this activity, how important is it that...****

| | | | | | |
|---|---|---|---|---|---|
| Performance Indicator<br>a. Guidelines for team communications are established and applied by all team members. | 0 | 1 | 2 | 3 | 4 |
| Performance Indicator<br>b. Communications by team are made openly and without fear of reprisal. | 0 | 1 | 2 | 3 | 4 |
| Performance Indicator<br>c. Communication tools are used effectively by team. | 0 | 1 | 2 | 3 | 4 |
| Performance Indicator<br>d. A team review of the communication process is conducted periodically and improvements are made when possible. | 0 | 1 | 2 | 3 | 4 |
| Performance Indicator<br>e. Feedback is given and received among team members and improvement opportunities are documented. | 0 | 1 | 2 | 3 | 4 |
| Performance Indicator<br>f. Mistakes are presented as opportunities to learn and for improvement. | 0 | 1 | 2 | 3 | 4 |

* If you are not a manufacturing specialist team leader but the supervisor of a team leader, please answer how important the activity is for a fully competent manufacturing specialist team leader.
** If you are not a manufacturing specialist team leader but the supervisor of a team leader, please answer how important the performance indicator is for a fully competent manufacturing specialist team leader.

## SURVEY INSTRUCTIONS

What we want you to do

1. Read each activity and tell us (by circling the appropriate rating scale) whether or not the activity listed is an important part of your job. Please note that it is possible that all of these activities are important. If you are not a manufacturing specialist team leader but the supervisor of a team leader, please answer how important the activity is for a fully competent manufacturing specialist team leader.

2. Read the corresponding performance indicators and tell us (by circling the appropriate rating scale) how important they are when you perform the activity on that page. If you are not a manufacturing specialist team leader but the supervisor of a team leader, please answer how important the performance indicator is for a fully competent manufacturing specialist team leader. Please note that it is possible that all of the performance indicators are important. There will be several performance indicators for each activity.

3. If you don't perform an activity, circle "not performed," skip the related performance indicators and go on to the next activity. There are no right or wrong answers. We just want your honest opinion. There are no trick questions.

4. Please complete the demographic questions at the end of the survey. This information is confidential and will ensure that we have a representative sample of the industry. It is also extremely important and should be given the same consideration as the rest of the survey.

Remember, it is possible that all of these activities and performance indicators are important to a manufacturing specialist team leader's job. That's OK. However, if some activities are not performed or is some are less important, please let us know.

The survey will take you about an hour to complete. We recommend that you turn the page and begin the survey now. After completing the first few pages of the survey, you may wish to return to these instructions for review.

When you have completed the survey, please put it in the enclosed envelope, seal the envelope and return the sealed envelope to the survey administrator at your company.

Thank you very much for helping to set the standard for excellence in the manufacturing specialist team leader role.

Critical Function 1:
Enable the team* to understand the process of continuous improvement** and integrate it into everything they do

How important is the following activity to your job?[1]

| | Not Performed | Of Little Importance | Somewhat Important | Important | Extremely Important |
|---|---|---|---|---|---|
| Activity 1:1 | | | | | |
| Ensure the team understands the continuous improvement processes | 0 | 1 | 2 | 3 | 4 |
| When you perform this activity, how important is it that...[2] | | | | | |
| a. Information on continuous improvement processes is obtained by team. | 0 | 1 | 2 | 3 | 4 |
| b. Help in understanding continuous improvement processes and team's role in those processes is provided to team. | 0 | 1 | 2 | 3 | 4 |
| c. Team implements improvements based on quality processes. | 0 | 1 | 2 | 3 | 4 |

* Team - Includes self-managed work team, work cell, work group, or any other group of people working together to complete a task or group of tasks at work

** Continuous improvement - Refers to the ongoing search for quality improvement that is integrated into daily activities; *not* a one-time event.

1. If you are not a manufacturing specialist team leader but the supervisor of a team leader, please answer how important the activity is for a fully competent manufacturing specialist team leader.
2. If you are not a manufacturing specialist team leader but the supervisor of a team leader, please answer how important the performance indicator is for a fully competent manufacturing specialist team leader.

Critical Function 1:
Enable the team to understand the process of continuous improvement and integrate it into everything they do

How important is the following activity to your job?[1]

| | Not Performed | Of Little Importance | Somewhat Important | Important | Extremely Important |
|---|---|---|---|---|---|
| Activity 1:2<br>Ensure the team understands customer needs and business requirements in making continuous improvements | 0 | 1 | 2 | 3 | 4 |
| When you perform this activity, how important is it that...[2] | | | | | |
| a. Information to clarify and interpret customer needs* and business requirements is obtained by team. | 0 | 1 | 2 | 3 | 4 |
| b. Help in clarifying customer needs is provided to team. | 0 | 1 | 2 | 3 | 4 |
| c. Team meets customer needs and business requirements in making continuous improvements. | 0 | 1 | 2 | 3 | 4 |

* Customer needs - Refers to specific needs of customer as expressed in product specifications and exchanges of information, as well as more general needs of the company's broader customer base.
** Business requirements - Refers to bottom-line needs of organization, including financial goals and requirements, quality goals, and customer requirements
1. If you are not a manufacturing specialist team leader but the supervisor of a team leader, please answer how important the activity is for a fully competent manufacturing specialist team leader.
2. If you are not a manufacturing specialist team leader but the supervisor of a team leader, please answer how important the performance indicator is for a fully competent manufacturing specialist team leader.

Critical Function 1:
**Enable the team to understand the process of continuous improvement and integrate it into everything they do**

**How important is the following activity to your job?**

| | Not Performed | Of Little Importance | Somewhat Important | Important | Extremely Important |
|---|---|---|---|---|---|
| Activity 1:3<br>**Help* team to make continuous improvements based on customer needs and business requirements** | 0 | 1 | 2 | 3 | 4 |
| **When you perform this activity, how important is it that...** | | | | | |
| a. Existing processes and procedures are continuously evaluated for improvement. | 0 | 1 | 2 | 3 | 4 |
| b. The effectiveness of processes and procedures are evaluated correctly and measured up against the right criteria. | 0 | 1 | 2 | 3 | 4 |
| c. Problems are analyzed by team and appropriate solutions are identified. | 0 | 1 | 2 | 3 | 4 |
| d. Regular meetings are held to solve problems and to share feedback and quality findings. | 0 | 1 | 2 | 3 | 4 |
| e. New ideas are willingly offered and appropriate ones are accepted by team. | 0 | 1 | 2 | 3 | 4 |

* Throughout the standards for manufacturing specialist team leader, the word, help, is used mostly to start off the key activities. It is meant to encompass a wide variety of ideas, such as coach, facilitate, guide, enable, support, and lead. Because so many words, each with a subtly different meaning, apply, we decided to use help as a catch phrase and for ease of communication.

Critical Function 2:
**Enable team to develop, monitor, and improve production processes and systems to meet business requirements and customer needs**

**How important is the following activity to your job?**

| | Not Performed | Of Little Importance | Somewhat Important | Important | Extremely Important |
|---|---|---|---|---|---|
| Activity 2:1<br>Help team to interpret process flow instructions and monitor manufacturing cycle time | 0 | 1 | 2 | 3 | 4 |
| When you perform this activity, how important is it that... | | | | | |
| a. Work team activities are determined by work instructions. | 0 | 1 | 2 | 3 | 4 |
| b. Work team achieves cycle time* goals. | 0 | 1 | 2 | 3 | 4 |
| c. Actual cycle time is tracked and displayed. | 0 | 1 | 2 | 3 | 4 |
| d. Differences between planned and actual cycle time are regularly addressed. | 0 | 1 | 2 | 3 | 4 |

* Cycle time - Refers to production time from start to finish

Critical Function 2:
Enable team to develop, monitor, and improve production processes and systems to meet business requirements and customer needs

How important is the following activity to your job?

| | Not Performed | Of Little Importance | Somewhat Important | Important | Extremely Important |
|---|---|---|---|---|---|
| Activity 2:2<br>Help team to develop and monitor measurements of production performance and address problems that arise | 0 | 1 | 2 | 3 | 4 |
| When you perform this activity, how important is it that... | | | | | |
| a. Measures of production performance are developed based on the right criteria and satisfy identified customer needs and business requirements. | 0 | 1 | 2 | 3 | 4 |
| b. Information on the status of specifications is up to date and accessible. | 0 | 1 | 2 | 3 | 4 |
| c. Measures of production performance are understood and used by all team members. | 0 | 1 | 2 | 3 | 4 |
| d. When schedules and/or product specifications are not met, appropriate action is taken. | 0 | 1 | 2 | 3 | 4 |

Critical Function 2:
**Enable team to develop, monitor, and improve production processes and systems to meet business requirements and customer needs**

**How important is the following activity to your job?**

| | Not Performed | Of Little Importance | Somewhat Important | Important | Extremely Important |
|---|---|---|---|---|---|
| Activity 2:3<br>Help team to improve overall production processes* to ensure product quality, and to meet customer specifications and business requirements | 0 | 1 | 2 | 3 | 4 |
| When you perform this activity, how important is it that... | | | | | |
| a. Processes, procedures, and results are monitored, documented, and reported regularly. | 0 | 1 | 2 | 3 | 4 |
| b. Health, safety, and legal requirements are met. | 0 | 1 | 2 | 3 | 4 |
| c. Product quality is consistent and acceptable. | 0 | 1 | 2 | 3 | 4 |
| d. Actions are taken to prevent problems. appropriate action is taken. | 0 | 1 | 2 | 3 | 4 |
| e. Opportunities to improve existing processes and procedures are identified and implemented to meet customer needs and business requirements. | 0 | 1 | 2 | 3 | 4 |
| f. Customer needs beyond the specifications are anticipated and responded to proactively when possible. | 0 | 1 | 2 | 3 | 4 |
| g. Team suggestions on improvements are encouraged and used when appropriate. | 0 | 1 | 2 | 3 | 4 |
| h. Improvements and corrective actions are documented and implemented promptly. | 0 | 1 | 2 | 3 | 4 |
| i. The customer is informed when specifications cannot be met. | 0 | 1 | 2 | 3 | 4 |

* Overall production processes – Refers to the general manufacturing process, including the big picture of how work and people are organized, how materials are distributed, how equipment is maintained, etc.; not necessarily the production process relating to one specific job run or set of runs.

Critical Function 3:
Facilitate and model productive work relationships within the team

How important is the following activity to your job?

| | Not Performed | Of Little Importance | Somewhat Important | Important | Extremely Important |
|---|---|---|---|---|---|
| Activity 3:1<br>Help team to improve communications within the team | 0 | 1 | 2 | 3 | 4 |
| When you perform this activity, how important is it that... | | | | | |
| a. Guidelines for team communications are established and applied by all team members. | 0 | 1 | 2 | 3 | 4 |
| b. Communications by team are made openly and without fear of reprisal. | 0 | 1 | 2 | 3 | 4 |
| c. Communication tools are used effectively by team. | 0 | 1 | 2 | 3 | 4 |
| d. A team review of the communication process is conducted periodically and improvements are made when possible. | 0 | 1 | 2 | 3 | 4 |
| e. Feedback is given and received among team members and improvement opportunities are documented. | 0 | 1 | 2 | 3 | 4 |
| f. Mistakes are presented as opportunities to learn and for improvement. | 0 | 1 | 2 | 3 | 4 |

Critical Function 3:
Facilitate and model productive work relationships within the team

How important is the following activity to your job?

| | Not Performed | Of Little Importance | Somewhat Important | Important | Extremely Important |
|---|---|---|---|---|---|
| Activity 3:2<br>Help team to create an environment that encourages and supports change | 0 | 1 | 2 | 3 | 4 |
| When you perform this activity, how important is it that... | | | | | |
| a. New ideas are willingly offered and appropriate ones are accepted. | 0 | 1 | 2 | 3 | 4 |
| b. Team members are supported and encouraged to develop new skills. | 0 | 1 | 2 | 3 | 4 |
| c. Processes and procedures are continuously evaluated by the team for opportunities to improve. | 0 | 1 | 2 | 3 | 4 |

Critical Function 3:
Facilitate and model productive work relationships within the team

How important is the following activity to your job?

| | Not Performed | Of Little Importance | Somewhat Important | Important | Extremely Important |
|---|---|---|---|---|---|
| Activity 3:3<br>Help train and encourage team in problem-solving and decision-making | 0 | 1 | 2 | 3 | 4 |
| When you perform this activity, how important is it that... | | | | | |
| a. Ideas and suggestions are sought from team members to solve problems and make decisions. | 0 | 1 | 2 | 3 | 4 |
| b. Support in making decisions is provided without removing teams' responsibility for actions. | 0 | 1 | 2 | 3 | 4 |
| c. Rationale for decisions is explained and understood by team. | 0 | 1 | 2 | 3 | 4 |

Critical Function 4:
Enable team to establish and enhance linkages beyond the team to meet business requirements and customer needs

How important is the following activity to your job?

| | Not Performed | Of Little Importance | Somewhat Important | Important | Extremely Important |
|---|---|---|---|---|---|
| Activity 4:1<br>Help team to build productive working relationships beyond the team | 0 | 1 | 2 | 3 | 4 |
| When you perform this activity, how important is it that... | | | | | |
| a. Feedback from outside groups* is relayed to the team. | 0 | 1 | 2 | 3 | 4 |
| b. Communication channels outside the work team are established and used effectively. | 0 | 1 | 2 | 3 | 4 |
| c. Team members communicate effectively with outside groups in an open, friendly, and courteous manner. | 0 | 1 | 2 | 3 | 4 |
| d. Those outside the team who need to know about team activities, goals and problems are kept informed. | 0 | 1 | 2 | 3 | 4 |
| e. All team members are encouraged to contribute to communications with outside groups. | 0 | 1 | 2 | 3 | 4 |

* Outside groups include vendors, suppliers, others within the company, etc.

Critical Function 4:
**Enable team to establish and enhance linkages beyond the team to meet business requirements and customer needs**

**How important is the following activity to your job?**

| | Not Performed | Of Little Importance | Somewhat Important | Important | Extremely Important |
|---|---|---|---|---|---|
| Activity 4:2<br>Help team to communicate effectively with customer | 0 | 1 | 2 | 3 | 4 |
| **When you perform this activity, how important is it that...** | | | | | |
| a. Methods and systems to solicit customer feedback are established. | 0 | 1 | 2 | 3 | 4 |
| b. Feedback is solicited routinely. | 0 | 1 | 2 | 3 | 4 |
| c. Guidelines for communication with customers are established and followed. | 0 | 1 | 2 | 3 | 4 |
| d. Processes and procedures are established to enable customers to contact the work team. | 0 | 1 | 2 | 3 | 4 |
| e. Communication tools are used effectively. | 0 | 1 | 2 | 3 | 4 |
| f. Communication processes are based on customer needs. | 0 | 1 | 2 | 3 | 4 |
| g. Customer feedback is used in determining work processes, schedules, and outcomes. | 0 | 1 | 2 | 3 | 4 |
| h. Customers are informed when requirements cannot be met. | 0 | 1 | 2 | 3 | 4 |

Critical Function 5:
Ensure the availability of machines, equipment, and materials to meet business requirements and customer needs

How important is the following activity to your job?

| | Not Performed | Of Little Importance | Somewhat Important | Important | Extremely Important |
|---|---|---|---|---|---|
| Activity 5:1<br>Help team to ensure the availability and maintenance of machines and equipment | 0 | 1 | 2 | 3 | 4 |
| When you perform this activity, how important is it that... | | | | | |
| a. Activities to ensure availability and to maintain machines and equipment are determined according to identified business requirements. | 0 | 1 | 2 | 3 | 4 |
| b. Machinery is installed, manufactured and maintained to the standards required for product production. | 0 | 1 | 2 | 3 | 4 |
| c. Preventative maintenance and calibration requirements are included in work schedules. | 0 | 1 | 2 | 3 | 4 |
| d. Issues regarding availability and/or maintenance are communicated to others within the company, suppliers and/or service providers. | 0 | 1 | 2 | 3 | 4 |
| e. The acquisition or allocation of machines and equipment is based on identified needs. | 0 | 1 | 2 | 3 | 4 |

Critical Function 5:
Ensure the availability of machines, equipment, and materials to meet business requirements and customer needs

How important is the following activity to your job?

| | Not Performed | Of Little Importance | Somewhat Important | Important | Extremely Important |
|---|---|---|---|---|---|
| Activity 5:2<br>Help team to obtain and allocate materials to meet business requirements and customer needs | 0 | 1 | 2 | 3 | 4 |

When you perform this activity, how important is it that...

| | | | | | |
|---|---|---|---|---|---|
| a. Material requirements are determined according to identified business requirements and customer needs. | 0 | 1 | 2 | 3 | 4 |
| b. Materials for work flow are obtained and allocated to meet business requirements and customer needs. | 0 | 1 | 2 | 3 | 4 |
| c. Issues regarding material shortages and surpluses are communicated appropriately. | 0 | 1 | 2 | 3 | 4 |
| d. Materials are obtained in time to meet delivery schedules. | 0 | 1 | 2 | 3 | 4 |

Critical Function 6:
Help team to ensure it has necessary human resources to meet business requirements and customer needs

How important is the following activity to your job?

| | Not Performed | Of Little Importance | Somewhat Important | Important | Extremely Important |
|---|---|---|---|---|---|
| Activity 6:1<br>Help team to identify and plan for team human resource requirements and customer needs | 0 | 1 | 2 | 3 | 4 |
| When you perform this activity, how important is it that... | | | | | |
| a. Human resource needs are identified based on current and forecasted work schedules. | 0 | 1 | 2 | 3 | 4 |
| b. Team members are assigned so that their skills match the requirements of the task in the best possible way. | 0 | 1 | 2 | 3 | 4 |
| c. Team members set realistic work goals and coordinate assignments with team. | 0 | 1 | 2 | 3 | 4 |
| d. Availability of team members is assessed regularly. | 0 | 1 | 2 | 3 | 4 |
| e. Contingency plans are prepared to meet shortfalls in skill and team member availability. | 0 | 1 | 2 | 3 | 4 |
| f. Work assignments are reviewed and monitored to optimize up time. | 0 | 1 | 2 | 3 | 4 |

Critical Function 6:
Help team to ensure it has necessary human resources to meet business requirements and customer needs

*How important is the following activity to your job?*

| | Not Performed | Of Little Importance | Somewhat Important | Important | Extremely Important |
|---|---|---|---|---|---|
| Activity 6:2<br>Help team to assess and meet team and individual training and development requirements | 0 | 1 | 2 | 3 | 4 |
| When you perform this activity, how important is it that... | | | | | |
| a. Training needs are identified for all team members. | 0 | 1 | 2 | 3 | 4 |
| b. Training decisions are based on business requirements. | 0 | 1 | 2 | 3 | 4 |
| c. Qualifications, courses taken, and skills acquired by each team member are reviewed and documented. | 0 | 1 | 2 | 3 | 4 |
| d. Time and resources allocated for training are adequate to meet training goals. | 0 | 1 | 2 | 3 | 4 |
| e. Training strategies and tools are developed or obtained to meet training goals. | 0 | 1 | 2 | 3 | 4 |
| f. Training activities and outcomes are evaluated systematically. | 0 | 1 | 2 | 3 | 4 |
| g. Team members are cross-functionally trained when necessary. | 0 | 1 | 2 | 3 | 4 |

Critical Function 6:
Help team to ensure it has necessary human resources to meet business requirements and customer needs

How important is the following activity to your job?

| | Not Performed | Of Little Importance | Somewhat Important | Important | Extremely Important |
|---|---|---|---|---|---|
| Activity 6:3<br>Help team to assess and provide feedback on performance | 0 | 1 | 2 | 3 | 4 |
| When you perform this activity, how important is it that... | | | | | |
| a. Roles and performance objectives are clearly identified. | 0 | 1 | 2 | 3 | 4 |
| b. Performance is assessed against established criteria and results are documented. | 0 | 1 | 2 | 3 | 4 |
| c. Team members are assessed based on how their work contributes to meeting company's overall business objectives. | 0 | 1 | 2 | 3 | 4 |
| d. Team members assess their own performance and that of others based on established criteria. | 0 | 1 | 2 | 3 | 4 |
| e. Useful feedback is communicated to appropriate person(s) promptly. | 0 | 1 | 2 | 3 | 4 |

Critical Function 6:
Help team to ensure it has necessary human resources to meet business requirements and customer needs

How important is the following activity to your job?

| | Not Performed | Of Little Importance | Somewhat Important | Important | Extremely Important |
|---|---|---|---|---|---|
| Activity 6:4<br>Help team to make recommendations for team hiring, reward, reassignment, and removal based on company standards, legal requirements, team needs and other key considerations | 0 | 1 | 2 | 3 | 4 |
| When you perform this activity, how important is it that... | | | | | |
| a. Individual and team contributions and deficiencies are identified. | 0 | 1 | 2 | 3 | 4 |
| b. Recommendations for team hiring, reassignment, reward, or removal are fully documented in accordance with company procedures and legal requirements. | 0 | 1 | 2 | 3 | 4 |
| c. Recommendations are made to the appropriate people. | 0 | 1 | 2 | 3 | 4 |
| d. Team hiring, reassignment, reward, or removal recommendations reflect company, individual and team goals. | 0 | 1 | 2 | 3 | 4 |

Critical Function 7:
Provide leadership to help team meet business requirements and customer needs

How important is the following activity to your job?

| | Not Performed | Of Little Importance | Somewhat Important | Important | Extremely Important |
|---|---|---|---|---|---|
| Activity 7:1<br>Help team to coordinate and align its activities and goals with the mission, values, and business strategy of the larger organization | 0 | 1 | 2 | 3 | 4 |
| When you perform this activity, how important is it that... | | | | | |
| a. Team identifies and acts on new business opportunities that align with company goals and initiatives. | 0 | 1 | 2 | 3 | 4 |
| b. Team members understand and can convey connection between their work and the larger organizational vision and goals. | 0 | 1 | 2 | 3 | 4 |
| c. Team results contribute to larger organization's bottom-line business objectives. | 0 | 1 | 2 | 3 | 4 |
| d. Team receives assistance in adjusting to transitions and changes in company strategy. | 0 | 1 | 2 | 3 | 4 |

Critical Function 7:
Provide leadership to help team meet business requirements and customer needs

How important is the following activity to your job?

| | Not Performed | Of Little Importance | Somewhat Important | Important | Extremely Important |
|---|---|---|---|---|---|
| Activity 7:2<br>Motivate fellow team members to excel and encourage team members to motivate each other | 0 | 1 | 2 | 3 | 4 |
| When you perform this activity, how important is it that... | | | | | |
| a. Effective motivational techniques are modeled by team leader. | 0 | 1 | 2 | 3 | 4 |
| b. Standards for excellence are set and known by team. | 0 | 1 | 2 | 3 | 4 |
| c. Team willingly motivates fellow team members. | 0 | 1 | 2 | 3 | 4 |
| d. Team members willingly embrace and accept new assignments. | 0 | 1 | 2 | 3 | 4 |
| e. Team members follow through on responsibilities and take action beyond what is expected, if necessary. | 0 | 1 | 2 | 3 | 4 |

Critical Function 7:
Provide leadership to help team meet business requirements and customer needs

How important is the following activity to your job?

| | Not Performed | Of Little Importance | Somewhat Important | Important | Extremely Important |
|---|---|---|---|---|---|
| Activity 7:3<br>Resolve conflicts and make decisions when team is unable to do so on its own | 0 | 1 | 2 | 3 | 4 |
| When you perform this activity, how important is it that... | | | | | |
| a. Conflicts and decisions that require team leader resolution are identified. | 0 | 1 | 2 | 3 | 4 |
| b. All efforts to enable team members to resolve conflicts and make decisions on their own are made before team leader intervenes to make decisions. | 0 | 1 | 2 | 3 | 4 |
| c. Efforts to identify and solve underlying problems and opportunities are made to avoid future conflicts and problems. | 0 | 1 | 2 | 3 | 4 |
| d. Conflicts are resolved and decisions are made based on team input as well as business requirements and customer needs. | 0 | 1 | 2 | 3 | 4 |

## ADDITIONAL QUESTION

1. **Are there any activities or performance indicators that are important parts of this occupation that were not mentioned in the survey?**
   **If so, please describe them.**

_____

_____

_____

_____

_____

## DEMOGRAPHIC QUESTIONS

**Thank you for participating in the American Electronics Association's National Validation Survey. Now we need some information about you. Your response to the following questions will help us to ensure that we have a representative sample of the industry. Your information will be kept confidential.**

1. **Which of the following is closest to your current job function or role?**

   __ Team leader
   __ Team facilitator
   __ Team coach
   __ Supervisor
   __ Team members
   __ Other _____

2. **What is the length of time you have been in your current job role?**

   __ Less than 1 year
   __ 1-5 years
   __ 6-10 years
   __ 11-15 years
   __ More than 15 years

3. **What is the length of time you have worked in the high-tech industry?**

   __ Less than 1 year
   __ 1-5 years
   __ 6-10 years
   __ 11-15 years
   __ More than 15 years

4. **What is the highest level of education you have completed?**

   __ Did not complete high school
   __ High school graduate or equivalent
   __ Completed vocational, trade, apprenticeship, or business school program after high school
   __ Some college, no degree
   __ College degree (2 years)
   __ College degree (4 years)
   __ Advanced degree (M.S., M.A.)

5. What is your gender?

__ Male
__ Female

6. Which one of the following groups best describes you?

__ Black (African-American)
__ American Indian/Alaskan Native
__ Asian-American/Pacific Islander
__ White, non-Hispanic (Caucasian)
__ Hispanic (Mexican-American or other Latino)
__ Other (please specify): _____

7. In which State do you work (Please circle the state):

Pacific Region:
AK AZ CA HI MT ID NV OR UT WA

West Region:
AR CO KS LA ND NE NM OK SD TX WY

Great Lakes Region:
IL IN IA MI MO MN OH WI

Southeast Region:
AL DE FL GA KY MD MS NC SC TN VA WV DC

Northeast Region:
CT ME MA NH NJ NY RI PA VT

8. What are your company's major product categories (check all that apply):

___ Computers & Peripherals
___ Semiconductors & Components
___ Communications
___ Aerospace & Defense Electronics
___ Industrial Electronics
___ Software
___ Other Electronics
_____

9. How many employees are employed at the location where you work?

__ 1-100
__ 101-200
__ 201-300
__ 301-500
__ 501 - 1000
__ 1001-2000
__ 2001 or greater
__ Uncertain

10. How many employees do you lead?

__ 0-4
__ 5-9
__ 10-15
__ 16-25
__ More than 25

11. How many work teams are you a member of?

__ 1
__ 2
__ 3
__ 4
__ More than 4 teams

12. How many work teams do you lead?

__ 1
__ 2
__ 3
__ 4
__ More than 4 teams

13. How many people are in the primary work team you lead?

__ 0-4
__ 5-9
__ 10-15
__ 16-25
__ More than 25

14. Are you classified as:

__ An exempt employee (salaried)
__ A non-exempt employee (hourly)
__ Don't know

15. Is your performance evaluation based in part on your role as team leader?

__ Yes
__ No
__ Don't know

16. Please indicate which of the following practices your company uses by circling the appropriate number.

**EXTENT OF USE**

0 = do not currently use
1 = use somewhat
2 = use extensively
N/A = not applicable and/or unfamiliar with this practice

| | | EXTENT OF USE | | | |
|---|---|---|---|---|---|
| a. | Customer service/satisfaction measurement | 0 | 1 | 2 | N/A |
| b. | Statistical process control | 0 | 1 | 2 | N/A |
| c. | Just in time manufacturing | 0 | 1 | 2 | N/A |
| d. | Benchmarking | 0 | 1 | 2 | N/A |
| e. | Cross training | 0 | 1 | 2 | N/A |
| f. | Total quality management program | 0 | 1 | 2 | N/A |
| g. | Pay for skill, knowledge, and/or performance | 0 | 1 | 2 | N/A |
| h. | Self-directed work team (e.g., do own planning and hiring) | 0 | 1 | 2 | N/A |
| i. | Continuous improvement programs | 0 | 1 | 2 | N/A |
| j. | All salaried pay systems | 0 | 1 | 2 | N/A |
| k. | On-going training for front-line workers | 0 | 1 | 2 | N/A |
| l. | Broadened job titles/classes | 0 | 1 | 2 | N/A |
| m. | Employee awareness of organization values, goals, mission | 0 | 1 | 2 | N/A |
| n. | Cross-functional work teams | 0 | 1 | 2 | N/A |
| o. | Involvement of front-line workers in decision-making and/or problem-solving | 0 | 1 | 2 | N/A |
| p. | Work redesign/process re-engineering | 0 | 1 | 2 | N/A |
| q. | Team input on hiring and pay decisions | 0 | 1 | 2 | N/A |
| r. | Financial benefits and profits created by team are shared with individual employees | 0 | 1 | 2 | N/A |

17. Please indicate how effectively the following practices are being implemented in your company by circling the appropriate number.

**EFFECTIVENESS**

N/A = not applicable and/or unfamiliar with this practice
0 = not effective
1 = somewhat effective
2 = very effective

| | | EFFECTIVENESS | | | |
|---|---|---|---|---|---|
| a. | Customer service/satisfaction measurement | N/A | 0 | 1 | 2 |
| b. | Statistical process control | N/A | 0 | 1 | 2 |
| c. | Just in time manufacturing | N/A | 0 | 1 | 2 |
| d. | Benchmarking | N/A | 0 | 1 | 2 |
| e. | Cross training | N/A | 0 | 1 | 2 |
| f. | Total quality management program | N/A | 0 | 1 | 2 |
| g. | Pay for skill, knowledge, and/or performance | N/A | 0 | 1 | 2 |
| h. | Self-directed work team (e.g., do own planning and hiring) | N/A | 0 | 1 | 2 |
| i. | Continuous improvement programs | N/A | 0 | 1 | 2 |
| j. | All salaried pay systems | N/A | 0 | 1 | 2 |
| k. | On-going training for front-line workers | N/A | 0 | 1 | 2 |
| l. | Broadened job titles/classes | N/A | 0 | 1 | 2 |
| m. | Employee awareness of organization values, goals, mission | N/A | 0 | 1 | 2 |
| n. | Cross-functional work teams | N/A | 0 | 1 | 2 |
| o. | Involvement of front-line workers in decision-making and/or problem-solving | N/A | 0 | 1 | 2 |
| p. | Work redesign/process re-engineering | N/A | 0 | 1 | 2 |
| q. | Team input on hiring and pay decisions | N/A | 0 | 1 | 2 |
| r. | Financial benefits and profits created by team are shared with individual employees | N/A | 0 | 1 | 2 |

18. Have you received special training to perform in the role of team leader?

__ Yes
__ No
__ Don't know

19. If you have received special training to perform in the role of team leader, what types of training have you received? Check more than one box, if more than one applies.*

__ How to lead a team
__ Budget and resource management
__ Training in hiring practices (e.g., interviewing)
__ Team membership training (e.g., how to work in teams, team dynamics, self-management)
__ Facilitation skills training
__ Conflict resolution in a team setting
__ Problem-solving in a team setting
__ Other * _____
__ None

* Remember: We are only asking about training for your role as team leader, not for other positions.

20. How did you obtain the position or role of team leader?

__ Elected by team members
__ Applied for position
__ Assigned by management
__ Informally became team leader (e.g., by default to fill a void)
__ Rotates among team members
__ Other _____

21. Does the role of team leader rotate among members of your team?

__ Yes
__ No
__ Don't know

22. If the role of team leader rotates among members of your team, how often does it rotate?

__ More than once a month
__ Every 1 - 2 months
__ Every 3 - 4 months
__ Every 5 - 6 months
__ Every 7 - 12 months
__ Other _____
__ Does not rotate

23. Are team leader responsibilities divided among different members (i.e., no one person serves as team leader, but instead responsibilities are shared among members)?

__ Yes
__ No
__ Don't know

24. If team leader responsibilities are divided among different members, what roles are divided among different members?

| Yes | No | |
|---|---|---|
| __ | __ | Administration/personnel decisions |
| __ | __ | Coaching |
| __ | __ | Work scheduling |
| __ | __ | Facilitation |
| __ | __ | Performance management |
| __ | __ | Coordinator with teams |
| __ | __ | Training |

Other responsibilities that are divided _____

25. As a team leader, your time is likely to be divided among a number of activities. Please indicate below the percentage of time you spend on the following activities.

What percentage of time do you spend working:

__ Doing hands-on production work
__ As a coach and facilitator
__ As a manager/supervisor
__ Acting as a liaison between different teams and different departments
__ Working with outside contacts, such as customers and vendors
__ On other activities such as _____

__ Total (should equal 100%)

26. How long has the primary team you lead been established?

__ Less than 1 year
__ 1 - 3 years
__ 4 - 6 years
__ 7 - 9 years
__ More than 9 years
__ Don't know

27. At which of the following stages of development would you describe your team as being?

__ Still developing structures ("forming")
__ Struggling with how to work together to accomplish tasks ("storming")
__ Very little outward conflict but not yet fully functioning ("norming")
__ Fully functioning ("performing")

28. Did you participate in the AEA Workforce Skills Project prior to completing this survey (e.g., expert panel, focus group, validation survey)?

__ Yes __ No

29. **Do you have any additional comments or feedback?**

_____

_____

_____

_____

_____

**Thank you for participating in**
**AEA's Workforce Skills Project**
**National Validation Survey**

**Please place the survey in the envelope provided, seal the envelope,**
**and return the sealed envelope to the survey administrator at your company.**

# PARTICIPATION FAXBACK FORM

**Thank you for agreeing to participate in the American Electronics Association Skill Standards Validation Survey. To provide the most useful results to the industry, we need to gather some information about the participating companies. We are doing this to ensure that we have a representative sample of the industry. Please complete this brief form and fax it to the AEA at (408) 970-8565 when you have finished.**

---

1. What are your company's major product categories (check all that apply):

___ Computers & Peripherals
___ Semiconductors & Components
___ Communications
___ Aerospace & Defense Electronics
___ Industrial Electronics
___ Software
___ Other Electronics
_____

2. What is the size of your company:

___ Less than $2 million
___ $2-10 million
___ $10-50 million
___ $50-100 million
___ $100-500 million
___ More than $500 million

3. Is your company an AEA member? ___ Yes___ No

4. How many employees are employed by your entire company (national and international)?
_____

5. How many employees are employed at your company location? _____

6. Please indicate which of the following practices your company uses by circling the appropriate number.

**EXTENT OF USE**

0 = do not currently use
1 = use somewhat
2 = use extensively
N/A = not applicable and/or unfamiliar with this practice

| | | EXTENT OF USE | | | |
|---|---|---|---|---|---|
| a. | customer service/satisfaction measurement | 0 | 1 | 2 | N/A |
| b. | statistical process control | 0 | 1 | 2 | N/A |
| c. | just in time manufacturing | 0 | 1 | 2 | N/A |
| d. | benchmarking | 0 | 1 | 2 | N/A |
| e. | cross training | 0 | 1 | 2 | N/A |
| f. | total quality management program | 0 | 1 | 2 | N/A |
| g. | pay for skill, knowledge, and/or performance | 0 | 1 | 2 | N/A |
| h. | self-directed work team (e.g., do own planning and hiring) | 0 | 1 | 2 | N/A |
| i. | continuous improvement programs | 0 | 1 | 2 | N/A |
| j. | all salaried pay systems | 0 | 1 | 2 | N/A |
| k. | on-going training for front-line workers | 0 | 1 | 2 | N/A |
| l. | broadened job titles/classes | 0 | 1 | 2 | N/A |
| m. | employee awareness of organization values, goals, mission | 0 | 1 | 2 | N/A |
| n. | cross-functional work teams | 0 | 1 | 2 | N/A |
| o. | involvement of front-line workers in decision-making and/or problem-solving | 0 | 1 | 2 | N/A |
| p. | work redesign/process re-engineering | 0 | 1 | 2 | N/A |
| q. | team input on hiring and pay decisions | 0 | ! | 2 | N/A |
| r. | financial benefits and profits created by team are shared with individual employees | 0 | 1 | 2 | N/A |

7. Please indicate how effectively the following practices are being implemented in your company by circling the appropriate number.

**EFFECTIVENESS**

N/A = not applicable and/or unfamiliar with this practice
0 = not effective
1 = somewhat effective
2 = very effective

| | | EFFECTIVENESS | | | |
|---|---|---|---|---|---|
| a. | customer service/satisfaction measurement | N/A | 0 | 1 | 2 |
| b. | statistical process control | N/A | 0 | 1 | 2 |
| c. | just in time manufacturing | N/A | 0 | 1 | 2 |
| d. | benchmarking | N/A | 0 | 1 | 2 |
| e. | cross training | N/A | 0 | 1 | 2 |
| f. | total quality management program | N/A | 0 | 1 | 2 |
| g. | pay for skill, knowledge, and/or performance | N/A | 0 | 1 | 2 |
| h. | self-directed work team (e.g., do own planning and hiring) | N/A | 0 | 1 | 2 |
| i. | continuous improvement programs | N/A | 0 | 1 | 2 |
| j. | all salaried pay systems | N/A | 0 | 1 | 2 |
| k. | on-going training for front-line workers | N/A | 0 | 1 | 2 |
| l. | broadened job titles/classes | N/A | 0 | 1 | 2 |
| m. | employee awareness of organization values, goals, mission | N/A | 0 | 1 | 2 |
| n. | cross-functional work teams | N/A | 0 | 1 | 2 |
| o. | involvement of front-line workers in decision-making and/or problem-solving | N/A | 0 | 1 | 2 |
| p. | work redesign/process re-engineering | N/A | 0 | 1 | 2 |
| q. | team input on hiring and pay decisions | N/A | 0 | 1 | 2 |
| r. | financial benefits and profits created by team are shared with individual employees | N/A | 0 | 1 | 2 |

8. May we list your company among the 200+ who have helped in the Workforce Skills Standards Project?

____ Yes ____ No

Companies involved in AEA's Workforce Skills Project have expressed that it is often difficult to tie workforce organization and training to company bottom-line results. We are asking for the following information so that this survey of manufacturing team leaders will produce data with which we can correlated manufacturing team competencies to bottom line performance measures. AEA has found nothing in our extensive research on manufacturing skills in the high-tech industry which can provide such correlations, and as such, this information should be extremely valuable to the companies participating in the survey and other AEA member firms. Your answers are completely confidential.

What were your company's returns on the following measures in the last reporting period?

9. In the last reporting period, what were your company's sales per employee?

___ Our sales per employee were: _____
___ I am unfamiliar with this term
___ No comment

10. In the last reporting period, what were your company's price-to-earnings ratio of stock?

___ Our price-to-earnings ratio of stock were: _____
___ I am unfamiliar with this term
___ No comment

11. In the last reporting period, did your company's market share increase or decline?

___ Increased
___ Declined
___ Remained the same
___ I am unfamiliar with this term
___ No comment

12. In the last reporting period, what was your company's return on assets (ROA)?

___ Our ROA was: _____
___ I am unfamiliar with this term
___ No comment

13. In the last reporting period, what was your company's return on equity (ROE)?

___ Our ROE was: _____
___ I am unfamiliar with this term
___ No comment

14. In the last reporting period, what was your company's percentage growth rate in sales?

___ Our percentage growth rate in sales was: _____
___ I am unfamiliar with this term
___ No comment

In your company's (or division's) self-assessment, how effective is your company's:

15. Rate of development of new products:

___ Not effective
___ Somewhat effective
___ Very effective
___ Don't know

16. Time to market:

___ Not effective
___ Somewhat effective
___ Very effective
___ Don't know

17. Has your company engaged in reengineering (e.g., right-sizing, downsizing, or work reorganization) in the last 12 months?

___ Yes
___ No
___ Don't know

18. If your company has reengineered, how effective has that effort been?

___ Not effective
___ Somewhat effective
___ Very effective
___ Not applicable
___ Don't know

19. In your company's opinion, by how much did your market share change in the last reporting period?

___ Market share change: _____
___ Did not change
___ No comment
___ I don't know

20. Which of the following categories *best* captures your company's present stage of development?

___ Start-up[1]
(e.g., high financial risk, little organizational systems or procedures)
___ Turnaround
(e.g., weak competitive position but business worth saving, high time pressures)
___ Extract profit and rationalize existing business
(e.g., internal organizational stability, controlled financial risk)
___ Dynamic growth in existing business
(e.g., new markets, rapidly expanding, moderate-to-high financial risk, shifting power bases)
___ Redeployment of efforts in existing business
(e.g., resistance to change, low-moderate short-term risk and high long-term risk)
___ Liquidation/Divestiture of poorly performing business
(e.g., weak competitive position, need to cut losses, little opportunity for turnaround)
___ New acquisitions
(e.g., need to integrate acquired companies, management ambivalent about change)
___ No comment

Thank you for your support.

[1] Based on the definitions in "Strategic Selection: Matching Executives to Business Conditions," M Gerstein & H. Reisman, Sloan Management Review, Winter 1983.

American Electronics Association
5201 Great America Parkway, Suite 520, Santa Clara, CA 95054
PO Box 54990, Santa Clara, CA 95056-0990
Telephone 408-987-4200 Fax 408-970-8565
http://www.aeanet.org

January 26, 1996

To: AEA National Validation Survey Company Administrators

From: Cheryl Fields Tyler
Director, Workforce Excellence

Subject: AEA National Validation Survey

*Action Requested:*

--- *Please return the attached response form indicating your receipt of the surveys.*
--- *Please distribute the enclosed surveys between January 31 and February 2.*
--- *Instruct survey respondents to complete the surveys anytime between February 5 and February 16.*
--- *Collect and return the surveys to AEA using the enclosed return label by February 20, 1996.*
--- *Please complete and return the Participation FAXBACK Form by February 20. You may either fax it under separate cover or mail it with the surveys.*

Thank you for agreeing to participate in the National Validation Survey for the AEA Workforce Skills Project. With your help, we are certain this historic effort to strengthen our industry's workforce will be a success.

Enclosed are the surveys you have agreed to administer to a select number of your manufacturing specialist team leaders. The survey is easy to complete. The survey document includes all the instructions your employees need, it takes less than an hour to finish, and does not require supervision.

Here's what we want you to do:

1. Please complete the attached Survey Receipt Form and fax it back to AEA confirming your receipt of the surveys.
2. Please distribute the surveys to the appropriate people. Survey participants may complete the survey(s) anytime between February 5 and February 16. Each survey is enclosed in two envelopes – in order to ensure confidentiality for survey respondents. The employees who are taking the survey should return the survey to you sealed in the inside envelope.
3. You may administer the survey in three ways. You may:
    - Convene a meeting to brief survey participants and have individuals complete their survey at that time.

- Convene a meeting to brief survey participants and then have people complete the survey at their convenience.
- Individually brief survey participants, distribute each survey, and have individuals complete the survey at their convenience.

Regardless of how you administer the survey, the survey participants should return the survey(s) to you. (Please note that the survey instructions indicate that participants should return their survey to the survey administrator at their company.) If there are surveys that are not completed, please return these, as well.

4. Send the complete surveys to AEA by February 20. We have included a return mailing label for your convenience. As indicated on the label, all surveys should be returned to:

American Electronics Association
Attn: Workforce Excellence
5201 Great America Parkway
Suite 520
Santa Clara, CA 95054

5. Please complete and fax back the enclosed Participation FAXBACK Form. In our visits to companies, we've found that companies are very interested in relating their team efforts back to the bottom-line of the company. That's why we are asking you confidentially to complete some information about your company's performance. Then we will be able to aggregate across the high-tech industry and you, as a participant, will get the first look at the data. The information will be useful in your corporate development. Again, the information you share with us will be strictly confidential.

I am enclosing a list of common questions and answers which I hope will address any concerns you may have regarding the survey process. If you have additional questions, please call Johanna Merritt at (408) 987-4293.

Thank you again for your commitment and support.

## Survey Receipt Form

**Thank you again for participating in the American Electronic Association's Skill Standards Validation Survey. Please complete this brief form confirming receipt of the survey(s) and fax it back to AEA at (408) 970-8565.**

---

Please fax this form to:

**Cheryl Fields Tyler, Director, Workforce Excellence**
**American Electronic Association**
**Phone Number: 800-284-4232 x293**
**Fax Number: 408-970-8565**

From:

**Your Name:** _____
**Title:** _____
**Company:** _____
**Address:** _____
_____
**Phone:** _____
**Fax:** _____

---

___ **Yes, I received the surveys for the Workforce Skills Project.**

___ **Yes, I received the surveys, but I need more. Please send me the following number of surveys in addition to the survey I already have:** _____

**FAX TO (408) 970-8565**

AEA'S NATIONAL VALIDATION SURVEY
Most Commonly Asked Questions

---

Q. **Who should complete the survey?**

A. We are looking for top performing, front-line workers who are manufacturing specialist team leaders and their immediate supervisors.

Q. **What do you mean by "top-performing" employees?**

A. Those people who meet the full expectations of your company.

Q. **What do you mean by "immediate supervisor"?**

A. For us, someone is an immediate supervisor if he or she sees the work being done on a daily basis. The person's title is not as important as his or her opportunity to observe front-line manufacturing specialist team leaders.

Q. **How many people should complete the survey?**

A. Ideally, every front-line worker and supervisor that meets the above criteria.

Q. **Is there just one survey that everyone completes?**

A. Yes.

Q. **How should we distribute the survey?**

A. You have three options. You can:
- Convene a meeting to brief survey participants and administer the survey.
- Convene a meeting to brief survey participants and have people complete the survey on their own.
- Distribute the survey individually and have people complete the survey on their own.

Q. **How long will the survey take to complete?**

A. Less than one hour.

Q. **Can survey participants take longer than an hour if necessary?**

A. Yes. There is no time limit.

**Q. When should I administer the survey?**

A. The survey administrator should distribute the surveys by Friday, February 2. The survey recipients can fill out the survey anytime between February 5 and February 16.

**Q. When should I send the surveys back to AEA?**

A. Please mail them to us no later than Tuesday, February 20.

**Q. Where do I send the surveys when they are completed?**

A. A self-addressed stamped envelope will be included with your survey packet.

**Q. Is the survey confidential?**

A. Yes.

**Q. Who should I call if I have a question?**

A. Please direct all questions to Johanna Merritt at 408-987-4293 or Terry Pirtle at 408-987-4289. You may also reach us via fax at 408-970-8565.

AMERICAN ELECTRONICS ASSOCIATION

**Survey Return Checklist**

Did you remember to...

___ **Complete the demographic questions?**

___ **Use the enclosed self-addressed stamped envelope to return the survey?**

**Thank you for participating in the Workforce Skills Project**
**National Validation Survey**

**National Validation Survey**
**Survey Confirmation Form**

1. **Enclosed please find the following quantity of the surveys that you have requested:**

_____

**If this number is inaccurate,**
**please call Johanna Merritt at (408) 987-4293.**

2. **Please use the attached label to return the completed surveys:**

3. **Survey Return Checklist:**

___ **Have you collected all the surveys your company has distributed?**
**If not, please contact Johanna Merritt at (408) 987-4293.**

**Thank you for participating in the Workforce Skills Project**
**National Validation Survey**

**AEA's National Validation Survey**
**Participation Confirmation**

**Thank you...**

**for agreeing to participate in the**

**American Electronics Association's**

**Workforce Skills Project**

**National Validation Survey**

**Important information about the survey is attached...**

**AMERICAN ELECTRONICS ASSOCIATION**

**Survey Return Check List**

**Did you remember to...**

**___ Complete the demographic questions?**

**___ Place the completed survey in the envelope?**

**___ Seal and return the envelope to the survey administrator at your company?**

**Thank you for participating in the Workforce Skills Project National Validation Survey**

# APPENDIX B

## LIST OF PARTICIPATING COMPANIES

## Nation-Wide Validation Survey: Participating Companies*

ACS Wireless
Actown Electrocoil, Inc.
Advanced Micro Devices, Inc.
Advanced Technology Labs, Inc.
AIO Microservice, Inc.
Applied Precision, Inc.
AVTECH Corp.
Cardiometrics, Inc.
Cardion, Inc.
CLI (Compression Labs, Inc.)
Current Electronics, Inc.
De Young Mfg., Inc.
DH Print
Digital Systems International, Inc.
Ditek
Dynamic Instruments, Inc.
Eaton
ECI Semiconductor (Semtech)
Etak, Inc.
FSI International, Inc.
General Monitors
Hewlett-Packard
Hughes Network Systems
IBM
Instromedix
INTERMEC Corporation
Kaiser Electroprecision
Keithley Instruments
Key Technology
Kobe Precision, Inc.
Laughline-Wilt Group, Inc.
Marlow Industries
Merix Corp.
Micro Dynamics Corp.
Microsemi Corporation
Motorola
Naval Air Warfare Center
Nicolet Instrument Corp.
Protocol Systems
QuickLogic Corp.
Ramtron International Corp.
Raychem Corporation
Ryan Instruments LP
Schweitzer Engineering Labs
Siemens Corporation
Siemens Medical Systems, Inc.
Siemens, Stromberg-Carlson
Sierra Semiconductor Corporation
Siltec Corp.
Solectron Corporation
SSE Technologies, Inc.
Tektronix, Inc.
Tellabs, Inc.
ThrustMaster, Inc.
TV/Com International
Unitrode Corporation
Viasat, Inc.
Western Telematic, Inc.
Wiltron Co.
XEL Communications, Inc.

* Note: Four companies asked not to be included in a publication of participation.

# APPENDIX C

## SURVEY WRITE-IN RESULTS

# AEA Workforce Skills Project
# MSTL Survey Write-in Results

Overall rate of write-in responses was low

- about 9% of respondents included a comment on page 34 (comments/feedback)
- about 10% of respondents included a comment in on page 26 (additional questions)

Comments in the comment/feedback category generally fell into five categories.
General themes in each category:

1. Kudos: "Survey does an excelled job of covering all points." One respondent commented that the survey inspired positive team-related action.
2. Criticisms: Some items were confusing, vague, double-barreled and/or redundant. The activities and functions were vague and too open to interpretation. The survey did not allow for respondents to indicate differences between their priorities and company practice (i.e., leader believes item to be critical, but company doesn't support it). Other items are important, but not required of the team in question. The survey was excessively long and difficult to follow (non-linear). Some items and pages were identified as problematic; specifically mentioned were 12d, 16, 17, 30 and 31.
3. Content: some respondents emphasized points they felt were critical, such as communication, accurate appraisals, responsibility, training, complete involvement and commitment, supportive incentive systems, continuous improvement,
4. Caveat: Some respondents included disclaimers, indicating that they only recently joined the team, that their company doesn't use teams as discussed in the survey or has only recently begun to use them, that their team has had excessive turnover recently, or that they were simply not the right person to ask (i.e., only responsible for production).
5. Other/tangents: Some respondents included comments reflecting their desire to learn more about teams, requesting feedback on survey results, expressing the team's frustration with the lack of management support, and commenting that rapidly increasing responsibilities and a lack of "optimum tools" makes the job very challenging. Some clarified the specific team they had in mind while completing the survey, in cases of membership on multiple teams. One suggested that the answers to the survey are an indication of the maturity of the company. Another commented simply that it was "hard to believe that the stuff in the survey isn't needed in all service/manufacturing industries today!"

Additional Questions: Four participants indicated that the survey had covered the domain completely, and a fifth commended the survey on covering the "key areas" of quality, safety, motivation, training and planning. The remaining 32 respondents who responded in this section addressed content. The primary themes were leadership and communication.

Specific points in the additional questions section follow:

- Consideration of members' personal goals and direction
- "Help provide team leadership to help steer maturing of company (e.g., R&D, evolution to profitable production company)"
- Leadership should attend to both company and team goals, and develop tools to support this
- Training on problem solving
- Training/Leadership on how to function as leaderless team
- Recognition of individual performance/abilities
- Empowerment
- "Ability to do the work as the team does"
- "Team leaders/first line supervisors need to be hands-on, visible and accessible most of the time. Time spent away for other things deters our ability to manage effectively"
- Extra-team special projects and membership in teams outside the organization
- Team attitude to WIN
- Understanding of and accountability for team goals, authority and boundaries.
- Focus to prevent "wandering or dawdling in unimportant details"
- Team leaders must develop team resources (e.g. personnel, vendors, customers, peripheral support groups, benchmarking partners)
- Leadership responsibility to respond to members as people, and address members' emotional needs to sustain/improve morale--more than conflict management
- Measure/evaluate support group contributions to team efforts/goals
- Leaders need to provide good example to gain respect and motivate team
- Leaders' ability to train and motivate
- Leaders must follow-through and build trust and respect among teams
- Guidance on communication (two-way)
- Communicate problems within group
- Communicate rule/procedure changes
- Communicate through computers, use SPC for feedback, understand continuous improvement, meeting and exceeding expectations, acceptable levels of nonconformance (and advantages of that).
- Coordination between groups
- Work with manufacturing engineers on pilot projects, and to reduce machine time and costs.
- Collect and analyze all defect data; correct defects
- 100% accuracy (honesty in recording SPC data)
- Write and update process and equipment specifications
- Accountability of upper management, member/leader conflict, clearly establish whether responsibility lies with management or with team
- Work with planning for timely release to shop, and lowest cycle time (work together)
- Clarity of managers, directors and VP's should be made clear as well as company goals
- "Accountability/responsibility, trust/risktaking, vision/mission/goals, sportsmanship/coaching, charting."
- Critical thinking (cognitive skills)
- Link corporate gains/losses/values to team efforts and contribution
- Trainers teach proper procedure as well as share best business practices and "our place in the greater scheme of things."

# APPENDIX D

## ROTATED FACTOR MATRIX

| | Factor 1 | Factor 2 | Factor 3 | Factor 4 | Factor 5 |
|---|---|---|---|---|---|
| PERF4.2A | .82686 | | | | |
| PERF4.2F | .81459 | | | | |
| PERF4.2E | .79455 | | | | |
| PERF4.2C | .77770 | | | | |
| PERF4.2D | .77041 | | | | |
| PERF4.2B | .75416 | | | | |
| PERF4.2G | .74877 | | | | |
| ACTVT4.2 | .73794 | | | | |
| PERF4.2H | .68783 | | | | |
| PERF6.2D | | .75497 | | | |
| PERF6.2E | | .73117 | | | |
| PERF6.2F | | .67393 | | | |
| ACTVT6.2 | | .67382 | | | |
| PERF6.2A | | .67058 | | | |
| PERF6.2C | | .56741 | | | |
| PERF6.2B | .31551 | .53360 | | | |
| PERF6.2G | | .51201 | | | |
| PERF3.2A | | | .76092 | | |
| PERF3.3B | | | .64358 | | |
| PERF3.3A | | | .64245 | | |
| PERF3.2B | | | .58555 | | |
| ACTVT3.2 | | | .57167 | | |
| PERF3.1B | | | .54003 | | |
| PERF2.3G | | | .50051 | .45789 | |
| PERF3.3C | | | .48028 | | |
| ACTVT3.3 | | | .46264 | | |
| PERF2.3H | | | .42636 | .32410 | |
| PERF3.1F | | | .38887 | | |
| PERF3.2C | | | .37189 | | |
| ACTVT2.2 | | | | .61761 | |
| PERF2.2C | | | | .61332 | |
| PERF2.2B | | | | .59721 | |
| PERF2.2D | | | | .59025 | |
| PERF2.2A | | | | .55507 | |
| ACTVT2.3 | | | | .52791 | |
| PERF2.3C | | | | .45119 | |
| PERF2.3A | | | | .43684 | |
| PERF2.3E | | | .31672 | .43531 | |
| PERF2.3I | .37291 | | | .37590 | |
| PERF6.4C | | | | | .81537 |
| PERF6.4A | | | | | .79845 |
| PERF6.4D | | | | | .78771 |
| PERF6.4B | | | | | .77405 |
| ACTVT6.4 | | | | | .74380 |
| PERF3.1D | | | | | |
| PERF3.1C | | | .33581 | | |
| PERF3.1E | | | .35071 | | |
| PERF3.1A | | | | | |
| PERF1.3A | | | | | |
| PERF1.3B | | | | | |
| PERF1.3D | | | | | |
| PERF1.3C | | | .31121 | | |
| PERF1.3E | | | .33809 | | |

| | Factor 1 | Factor 2 | Factor 3 | Factor 4 | Factor 5 |
|---|---|---|---|---|---|
| PERF6.1D | | | | | |
| PERF6.1F | | .39904 | | | |
| PERF6.1E | | .36508 | | | |
| PERF6.1B | | .39429 | | | |
| PERF6.1C | .36287 | .34854 | | | |
| ACTVT6.1 | .32058 | | | | |
| PERF6.1A | .30842 | | | | |
| PERF2.3B | | | | | |
| PERF2.3F | .31369 | | | | |
| PERF2.3D | | | .33658 | .31270 | |

| | Factor 6 | Factor 7 | Factor 8 | Factor 9 | Factor 10 |
|---|---|---|---|---|---|
| PERF3.2A | | | | | |
| PERF3.3B | | | | | |
| PERF3.3A | | | | | |
| PERF3.2B | | | | | |
| ACTVT3.2 | | | | | |
| PERF3.1B | | | | | |
| PERF2.3G | | | | | |
| PERF3.3C | | | | .30410 | |
| ACTVT3.3 | | | | | |
| PERF2.3H | | | | | |
| PERF3.1F | | | | | |
| PERF3.2C | | | | | |
| ACTVT7.2 | .74466 | | | | |
| PERF7.2C | .73892 | | | | |
| PERF7.2D | .73690 | | | | |
| PERF7.2E | .66065 | | | | |
| PERF7.2B | .58603 | | | | |
| PERF7.2A | .57305 | | | | |
| ACTVT3.1 | .27308 | | | | |
| ACTVT5.1 | | .79519 | | | |
| PERF5.1A | | .68759 | | | |
| PERF5.1C | | .65870 | | | |
| PERF5.1B | | .62733 | | | |
| PERF5.1E | | .59562 | | | |
| PERF5.1D | | .58775 | | | |
| PERF5.2B | | | .83046 | | |
| ACTVT5.2 | | | .75499 | | |
| PERF5.2A | | | .75444 | | |
| PERF5.2D | | | .64010 | | |
| PERF5.2C | | | .60634 | | |
| PERF4.1B | | | | .70710 | |
| PERF4.1D | | | | .66314 | |
| PERF4.1A | | | | .60103 | |
| PERF4.1E | | | | .58368 | |
| PERF4.1C | | | | .54049 | |
| ACTVT4.1 | | | | .52133 | |
| PERF7.3A | | | | | .67472 |
| PERF7.3D | | | | | .65476 |
| ACTVT7.3 | | | | | .59779 |
| PERF7.3C | | | | | .56459 |
| PERF7.3B | | | | | .56064 |

| | Factor 6 | Factor 7 | Factor 8 | Factor 9 | Factor 10 |
|---|---|---|---|---|---|
| PERF1.3A | | | | | |
| PERF1.3B | | | | | .37290 |
| PERF1.3D | | | | | .31182 |
| PERF1.3C | | | | | |
| PERF1.3E | | | | | |
| PERF6.1D | | | | | |
| PERF6.1F | | .36639 | | | |
| PERF6.1E | | | | | |
| PERF6.1B | | .35528 | | | |
| PERF6.1C | | | | | |
| PERF2.3D | | | | | |

| | Factor 11 | Factor 12 | Factor 13 | Factor 14 | Factor 15 |
|---|---|---|---|---|---|
| ACTVT2.2 | | | | | |
| PERF2.2C | | | .32463 | | |
| PERF2.2B | | | | | |
| PERF2.2D | | | | | |
| PERF2.2A | | | | | |
| ACTVT2.3 | | | | | |
| PERF2.3C | | | | | |
| PERF2.3A | | | | | |
| PERF2.3E | | | | | |
| PERF2.3I | | | | | |
| PERF7.1C | .69186 | | | | |
| ACTVT7.1 | .66033 | | | | |
| PERF7.1B | .63221 | | | | |
| PERF7.1D | .61855 | | | | |
| PERF7.1A | .61572 | | | | |
| ACTVT1.2 | | .74117 | | | |
| PERF1.2A | | .66796 | | | |
| PERF1.2B | | .66022 | | | |
| PERF1.2C | | .63220 | | | |
| ACTVT1.3 | | .49217 | | | |
| PERF2.1C | | | .75379 | | |
| PERF2.1D | | | .68124 | | |
| PERF2.1B | | | .65824 | | |
| ACTVT2.1 | | | .52366 | | |
| PERF2.1A | | | .37485 | | |
| PERF1.1A | | | | .71938 | |
| ACTVT1.1 | | | | .69721 | |
| PERF1.1B | | | | .65038 | |
| PERF1.1C | | | | .57149 | |
| PERF6.3A | | | | | .66742 |
| ACTVT6.3 | | | | | .59816 |
| PERF6.3B | | | | | .57181 |
| PERF6.3E | | | | | .47366 |
| PERF6.3C | | | | | .47012 |
| PERF6.3D | | | | | .45593 |

| | Factor 16 | Factor 17 | Factor 18 | Factor 19 | Factor 20 |
|---|---|---|---|---|---|
| PERF3.2A | | | | | |
| PERF3.3B | | | | | |
| PERF3.3A | | | | | |
| PERF3.2B | | | | | |
| ACTVT3.2 | | | | | |
| PERF3.1B | .32595 | | | | |
| PERF2.3G | | | | | |
| PERF3.3C | | | | .40194 | |
| ACTVT3.3 | | | | | |
| PERF2.3H | | | | | |
| PERF3.1F | | | | | |
| PERF3.2C | .35489 | | | | |
| PERF3.1D | .67423 | | | | |
| PERF3.1C | .53694 | | | | |
| PERF3.1E | .53676 | | | | |
| PERF3.1A | .48326 | | | | |
| PERF1.3A | | .65105 | | | |
| PERF1.3B | | .47451 | | | |
| PERF1.3D | .31388 | .43032 | | | |
| PERF1.3C | | .39929 | | | |
| PERF1.3E | | .34257 | | | |
| PERF6.1D | | | .54085 | | |
| PERF6.1F | | | .51056 | | |
| PERF6.1E | | | .50951 | | |
| PERF6.1B | | | .50050 | | |
| PERF6.1C | | | .42681 | | |
| ACTVT6.1 | | | | | .54489 |
| PERF6.1A | | | | | .46863 |
| PERF2.3B | | | | | |
| PERF2.3F | | | | | |
| PERF2.3D | | | | | |

| | Factor 21 | Factor 22 | Factor 23 |
|---|---|---|---|
| ACTVT2.2 | | | |
| PERF2.2C | | | |
| PERF2.2B | | | |
| PERF2.2D | | | |
| PERF2.2A | | | |
| ACTVT2.3 | | | |
| PERF2.3C | | | |
| PERF2.3A | | | |
| PERF2.3E | | | .39598 |
| PERF2.3I | | | |
| ACTVT6.1 | | | |
| PERF6.1A | | | |
| PERF2.3B | | | |
| PERF2.3F | .52902 | | |
| PERF2.3D | | | .41619 |

# APPENDIX E

## DESCRIPTIVE STATISTICS AND CRITERION-RELATED VALIDITY RESULTS

Appendix E

Criterion-Related Validity Correlations

| Team Leader Function | M | SD | N | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| On-going training | | | | | | | | | | | | |
| extent of use | 1.42 | .61 | 223 | .20** (223) | | .17** (223) | .26** (221) | .14* (222) | | .14* (223) | .19** (221) | .11 (223) |
| effectiveness | 1.32 | .61 | 218 | .24** (218) | | .31** (218) | .28** (216) | .14* (217) | | .19** (218) | .25** (216) | .22** (218) |
| Amount of training received (0-7 courses) | 3.16 | 2.25 | 298 | .27** (298) | | .20** (297) | .18** (294) | .12* (295) | | .16** (296) | .23** (294) | .28** (298) |
| Cross-training | | | | | | | | | | | | |
| extent of use | 1.60 | .56 | 234 | | | | .21** (232) | | | | | |
| effectiveness | 1.42 | .62 | 226 | | | | .13* (224) | | | | | |
| All-salaried pay systems | | | | | | | | | | | | |
| extent of use | .53 | .69 | 152 | | | | | .25** (151) | | | | |
| effectiveness | .70 | .72 | 91 | | | | | .41** (90) | | | | |
| Financial benefits shared | | | | | | | | | | | | |
| extent of use | .72 | .79 | 206 | | | | | .22** (205) | | | | |
| effectiveness | 1.00 | .79 | 153 | | | | | .16* (152) | | | | |
| Continuous improvement | | | | | | | | | | | | |
| extent of use | 1.52 | .54 | 234 | .33** (234) | .18** (233) | | | | 26** (233) | .26** (234) | | .24** (234) |
| effectiveness | 1.33 | .60 | 227 | .26** (227) | .16** (226) | | | | .20** (226) | .24** (227) | | .16** (227) |

Appendix E (continued)

| Team Leader Function | M | SD | N | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total quality management | | | | | | | | | | | | |
| extent of use | 1.51 | .62 | 220 | .21** | .03 | | | | | .20** | | .17** |
| | | | | (220) | (219) | | | | | (220) | | (220) |
| effectiveness | 1.35 | .63 | 207 | .30** | .09 | | | | | .24** | | .22** |
| | | | | (207) | (206) | | | | | (207) | | (207) |
| Statistical process control | | | | | | | | | | | | |
| extent of use | 1.44 | .65 | 222 | .17** | -.01 | | | | | | | .06 |
| | | | | (222) | (222) | | | | | | | (222) |
| effectiveness | 1.32 | .66 | 207 | .23** | .01 | | | | | | | .02 |
| | | | | (207) | (207) | | | | | | | (207) |
| Just in time manufacturing | | | | | | | | | | | | |
| extent of use | 1.23 | .71 | 217 | .11 | .04 | | | | | | | |
| | | | | (217) | (217) | | | | | | | |
| effectiveness | 1.16 | .66 | 195 | .04 | -.05 | | | | | | | |
| | | | | (195) | (195) | | | | | | | |
| Customer service/satisfaction | | | | | | | | | | | | |
| extent of use | 1.55 | .64 | 217 | .20** | | | | | .01 | | | .02 |
| | | | | (217) | | | | | (216) | | | (217) |
| effectiveness | 1.34 | .63 | 203 | .28** | | | | | .02 | | | .16* |
| | | | | (203) | | | | | (202) | | | (203) |
| Front-line decision-making | | | | | | | | | | | | |
| extent of use | 1.36 | .60 | 228 | .17** | | .21** | | .14* | .07 | .19** | .19** | .14* |
| | | | | (228) | | (228) | | (227) | (227) | (228) | (226) | (228) |
| effectiveness | 1.19 | .61 | 217 | .15* | | .24** | | .15* | .20** | .25** | .23** | .19** |
| | | | | (217) | | (217) | | (216) | (216) | (217) | (215) | (217) |
| Cross-functional work teams | | | | | | | | | | | | |
| extent of use | 1.35 | .61 | 224 | | | .04 | .09 | | | | | |
| | | | | | | (224) | (222) | | | | | |
| effectiveness | 1.31 | .62 | 208 | | | .19** | .14* | | | | | |
| | | | | | | (208) | (206) | | | | | |

Appendix E (continued)

| Team Leader Function | M | SD | N | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Team input on hiring and pay | | | | | | | | | | | | |
| extent of use | .59 | .67 | 203 | | | .00 | | .32** | | | | |
| | | | | | | (203) | | (202) | | | | |
| effectiveness | .72 | .70 | 139 | | | .19* | | .26** | | | | |
| | | | | | | (139) | | (138) | | | | |
| Broadened job titles | | | | | | | | | | | | |
| extent of use | 1.09 | .68 | 202 | .10 | | | | .23** | | | | |
| | | | | (202) | | | | (201) | | | | |
| effectiveness | 1.05 | .65 | 169 | .04 | | | | .26** | | | | |
| | | | | (169) | | | | (168) | | | | |
| Employee awareness of organization values/mission | | | | | | | | | | | | |
| extent of use | 1.59 | .54 | 228 | | | .14* | | .04 | .00 | .17** | .16* | .14* |
| | | | | | | (228) | | (227) | (227) | (228) | (226) | (228) |
| effectiveness | 1.37 | .61 | 223 | | | .24** | | .09 | .12* | .18** | .17** | .18** |
| | | | | | | (223) | | (222) | (222) | (223) | (221) | (223) |

Note. * = significant at the .05 level; ** = significant at the .01 level. All correlations were corrected for attenuation.
Team Leader Functions are 1 = Production Monitoring and Improvement; 2 = Material Allocation; 3 = Environment of Support/Problem-Solving; 4 = Training and Development; 5 = Personnel Decisions; 6 = Customer Communication; 7 = Alignment with Organizational Mission; 8 = Motivate to Excel; 9 = Understand Customer and Business Needs in Relation to Continuous Improvement

# APPENDIX F

## DESCRIPTIVE STATISTICS FOR DISCRIMINANT VALIDITY

Frequencies Of Discriminant Validity Variables

| Variable | Frequency | Percentage of Sample |
|---|---|---|
| Time in high-tech industry | | |
| less than 1 yr. | 13 | 3.9 |
| 1-5 yrs | 53 | 15.7 |
| 6-10 yrs | 63 | 18.7 |
| 11-15 yrs | 57 | 16.9 |
| more than 15 yrs | 147 | 43.6 |
| Number of work teams leader leads | | |
| 1 | 162 | 48.1 |
| 2 | 70 | 20.8 |
| 3 | 38 | 11.3 |
| 4 | 15 | 4.5 |
| more than 4 teams | 30 | 8.9 |
| Number of people on leader's primary work team | | |
| 0-4 | 48 | 14.2 |
| 5-9 | 110 | 32.6 |
| 10-15 | 66 | 19.6 |
| 16-25 | 50 | 14.8 |
| More than 25 | 45 | 13.4 |
| Previous participation in AEA projects | | |
| Yes | 23 | 6.8 |
| No | 301 | 89.3 |
| Level of education | | |
| Did not complete high school | 7 | 2.1 |
| High school grad or equivalent | 66 | 19.6 |
| Completed vocational, trade or business program after high school | 20 | 5.9 |
| Some college, no degree | 84 | 24.9 |
| College degree (2 yrs) | 40 | 11.9 |
| College degree (4 yrs) | 84 | 24.9 |
| Advanced degree (M.S.,M.A.) | 34 | 10.1 |
| Ethnic group | | |
| African-American/Black | 6 | 1.8 |
| American-Indian/Alaskan | 3 | 0.9 |
| Asian-American/Pacific | 37 | 11 |
| Hispanic | 17 | 5.0 |
| Non-Hispanic White | 263 | 78.0 |
| Other | 4 | 1.2 |
| Gender | | |
| Female | 109 | 32.3 |
| Male | 222 | 65.9 |
| Geographic region | | |
| Pacific | 211 | 62.6 |
| West | 23 | 6.8 |
| Great Lakes | 46 | 13.6 |
| Southeast | 29 | 8.6 |
| Northeast | 26 | 7.7 |

Note. Non-respondents were not included in the frequencies. Therefore, the percentages do not necessarily sum to 100%.

# VITA

Johanna M. Merritt was born August 3, 1967, in Mount Airy, North Carolina. She received her B.A. in Psychology from University of North Carolina at Chapel Hill in May of 1990. While at the University of North Carolina, Dr. Merritt was inducted into Phi Beta Kappa and Psi Chi, was a John Motley Morehead Tuition Scholar, was a member of the UNC Fellows Leadership Program and the UNC Honors Program, received a research grant for undergraduate research in Republic of Ireland related to the Bahá'í Faith, and graduated *summa cum laude*.

Dr. Merritt attended Georgia Institute of Technology for her first year of graduate school. There she was inducted into Gamma Beta Phi National Honor Society, was offered a Presidential Fellowship, and was a representative of the Psychology Department Faculty Advisory Committee and the Georgia Tech Counseling Center Student Advisory Board. Dr. Merritt transferred to Old Dominion University [Psychology Department, 250 MGB, Norfolk, VA 23524]. She received her M.S. in Psychology from ODU in August 1993, and her Ph.D. in I/O Psychology in August 1997. While at ODU, she was inducted into Phi Kappa Phi National Honor Society, was awarded a Special Doctoral Research Assistantship and the Meredith Construction Company Scholarship (Most Outstanding Graduate Student), received a research grant for travel and study in East Asia, and was very involved with the local Bahá'í community.

Dr. Merritt has presented five academic papers at regional and national psychology conferences and has taught several undergraduate courses. She has consulted with a large number of local and national organizations on efforts related to job analysis, assessment, training, validation, leadership, teamwork, and employee involvement; has made numerous national presentations related to these projects; has acted as a trainer in a major corporation; and has been a contributing author on several technical reports.