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SELF-MANAGED WORK TEAM TRAINING PROGRAMS AND TECHNIQUES: A COMPARISON OF PERCEIVED EFFECTIVENESS OF HIGHER EDUCATION WITH NONACADEMIC SOURCES

by

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Submitted to the Faculty of The Graduate School
of East Texas State University
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May, 1996

SELF-MANAGED WORK TEAM TRAINING PROGRAMS AND TECHNIQUES: A COMPARISON OF PERCEIVED EFFECTIVENESS OF HIGHER EDUCATION WITH NONACADEMIC SOURCES

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ABSTRACT

SELF-MANAGED WORK TEAM TRAINING PROGRAMS AND TECHNIQUES: A COMPARISON OF PERCEIVED EFFECTIVENESS OF HIGHER EDUCATION WITH NONACADEMIC SOURCES

Howard L. Horton, Ph.D.
East Texas State University, 1996

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To make jobs more meaningful and to take advantage of the increased productivity and commitment that can follow, more organizations are turning to self-managed work teams as a workplace essential. Industry recognizes that such work teams must be trained, and is beginning to turn to outside training sources, including both higher education and nonacademic organizations, for assistance. Therefore, providers of training have a vested interest in creating effective programs for employee education.

Prior to the present study, it was not known how self-managed work team members perceived the overall effectiveness of both higher education and nonacademic *programs*. Neither was it known which training methods team members considered to be effective. Providers of training should design curricula after becoming aware of team members' preferences for specific techniques of training.

The major purpose of this study was to determine how self-managed work team members and leaders, in a selected segment of the manufacturing industry, rate the effectiveness of programs, and techniques used in those programs, provided by higher

education and nonacademic sources. An in-depth review of literature examined issues related to self-managed work team training programs and techniques: (1) trends and priorities in training; (2) self-managed work teams: a response to workforce change; (3) team training techniques; and (4) potential linkages between training providers and industry.

Self-managed work team members and leaders in three different segments of the manufacturing industry were surveyed. Of 195 surveys made available to industry for distribution and completion, 132 were returned. Their respondents became the survey sample.

Findings indicated that nonacademic sources are viewed *differently from* and *more effective than* higher education-provided training. Work team leaders and members overwhelmingly rated nonacademic sources as the more effective training programs.

This study also found that there is a very strong relationship between the same training techniques used in each of the two delivery systems. Of the ten techniques investigated, only three were rated more effective in a higher education-provided training program: teaching the making of presentations, use of programmed instruction, and role playing. Rated most ineffective in higher education training were maintenance procedures and equipment maintenance, which are classically vocational/technical in nature. The seven techniques rated superior among nonacademic sources received much higher ratings than did higher education training.

To my wife, Nancy

who, through her love, has endured my frustrations and sacrificed her time and energy to nourish and encourage me at the worst of times. She has also been so patient with the isolation that came from my long, late-night hours of writing. She has kept our "home fires burning" while I earned my doctorate at a time I also maintained a full teaching load.

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CHAPTER 1. INTRODUCTION

Industry recognizes that employee training is essential, and is beginning to turn to outside training sources for assistance. As collaboration between industry and training providers becomes more prevalent, organizations and institutions that provide training have a vested interest in creating effective programs for employee education in the American workplace (Craig and Evers, 1981; Peterfreund, 1976; Schuster, 1978).

Training has both current and future implications for the success of organizations as employers realize that the training or retraining of individuals for the jobs of the future may determine the success of many U.S. firms (Szabo, 1993). This training may take a variety of formats, including but not limited to job-skill training, supervisory training, management development, and employee development.

The official figure for training expense in the United States is $44 billion, or about 1.5% of payroll for companies with more than 100 employees. Traditionally about two-thirds of that has been devoted to developing professional managers and one-third to front-line workers. However, that proportion is changing (Brody, 1987). Organizations are realizing that they need to develop the skills of their front-line workers as much as those of their managers.

Something else is changing as well. An old axiom in human relations management was, "When things get tough, training is the first expenditure cut" ("Budget for Training Weathering Recession," 1992; Geber, 1991). Accordingly, in the 1982 recession, training was cut disproportionately because it was little valued by executives. In the 1992 recession, though, a survey conducted by the American Society for Training and

Development (ASTD) found that 40% of companies described as "very hard hit" by the recession made no change in their training budgets, 30% increased them, and 30% decreased them. The largest increases went to fund quality management, management development, and computer training ("Budget for Training Weathering Recession," 1992; Geber, 1991).

Techniques for developing skills in training programs can be divided into broad categories: *on-the-job* training and *off-the-job* training (Hoerr, 1989, July). Techniques for developing skills on the job usually are referred as *on-the-job* training. These techniques reflect a blend of job-related knowledge and experience, and include coaching, position rotation, and special project committees. Coaching is direct critiquing of how well an individual is performing a job. Position rotation involves moving an individual from job to job to enable the person to obtain an understanding of the organization as a whole. Special project committees involve assigning a particular task to an individual to furnish him or her with experience in a designated area.

Off-the-job techniques for developing skills also reflect a blend of job-related knowledge and experience (Mathis and Jackson, 1994). The skills addressed through these techniques can range from technical skills such as computer-aided design (CAD), to interpersonal skills such as leadership. Specific classroom techniques aimed at developing skills include various types of management games and role-playing techniques. The most common format for management games requires small groups of trainees to make and then evaluate various management decisions. The role-playing format typically involves

acting out and then reflecting on some people-oriented problem that must be solved in the organization.

Development is different from simple training in that it is the result of experience and the maturity that comes with it (Mathis and Jackson, 1994). It is possible to train most people to ride a bicycle, drive a truck, operate a computer, or assemble a radio. However, development in such areas as judgment, responsibility, compassion, or sympathy is much more difficult. Such factors may or may not develop over time with the experiences of life, or as a part of a planned program. Managers, particularly, need a variety of experiences to enhance their development; but a planned system of developmental experiences for all employees can help expand the overall level of abilities in an organization and increase its productivity, quality, and flexibility.

Because training has both current and future consequences for job success, it is an area targeted by equal employment opportunity (EEO) laws and regulations (Mathis and Jackson, 1994). One area of concern is the practice used to select individuals for inclusion in training programs. The criteria used must be job related and must not unfairly restrict the participation of protected-class individuals. Another concern is differences in pay based on training to which protected-class members have not had equal access. A third is the use of training as a criterion for selecting individuals for promotions. In short, fair employment laws and regulations definitely do apply to training, employers must be aware of them, and training activities and opportunities must be planned accordingly.

In an attempt to make jobs more meaningful and to take advantage of the increased productivity and commitment that can follow, more organizations are turning to

employee involvement as a basic part of modern employment. Many use self-directed/autonomous work groups which share a common philosophy: employees are more likely to be productive and innovative if they have a say in how the work is to be done (Hoerr, 1989, July).

Educating employees has always been a challenge, but it may be more challenging today than ever before (Haffner and Maleyeff, 1995). It is no longer considered adequate to focus on textbook problems or to keep a static curriculum. Entry-level employees are expected to contribute quickly to team effectiveness.

In some cases support departments are organizing into their own self-directed teams and are implementing plans for multiskilling (Wellins, Byham, and Wilson ,1991, p. 50). In manufacturing operations, it is common for work teams to form themselves into fully integrated and autonomous units free to determine work assignments, rest breaks, inspection procedures, and other similar activities (Wall, Kemp, Jackson, and Clegg, 1986). Fully autonomous work teams even select their own members and have members evaluate one another's performance. As a result, supervisory positions become less important and may sometimes even be eliminated.

Large, well-known organizations utilize autonomous work teams. Companies are redistributing power, authority and responsibility so that the people closest to the customer and the end product have decision-making capability (Williams, 1995, p. 50). Three companies following this new trend are Texas Instruments, Goodyear Tire and Rubber Company, and the PRIME project administered by the Veterans Administration (Day, 1994; *Job Choices: 1994 in Science and Engineering*, 1994; and Thompson, 1987).

Texas Instruments (TI), one of the industries that provided subjects for this research project at four of its locations, is at the forefront of the electronics industry with global strengths in the design, manufacture, and sale of semiconductors, defense electronics, computer systems, industrial control systems, electrical controls, and consumer electronics (*Job Choices: 1994 in Science and Engineering*, 1994). Headquartered in Dallas, Texas, TI employs over 60,000 people worldwide, and maintains sales or manufacturing operations in more than 30 countries (*Job Choices: 1994 in Science and Engineering*, 1994). In the classrooms of TI, teams learn and hone their abilities to become effective teams and to hold effective meetings. Members are taught vital lessons about communicating effectively, and decision-making.

TI has found that team development is often slow. The normal curriculum may not lead to effective team relationships. For some teams, trust is slow to develop. Truly effective communications, for all the lessons and training, are usually not the norm. Problem solving can creep along, instead of becoming a timely, efficient, core skill. Texas Instruments has, in fact, made a breakthrough for developing their many teams. An exciting team-building event has sprung forth from TI's Texins' Fitness and Recreation Association. Instituted in 1993 (Fischer, Michalak, and Meeker, 1994), this six-hour training program can hardly keep up with the demand. It is achieving a reputation for being able to leverage teams rapidly forward in their teaming processes. This training event takes the participants out of the classroom, and turns the gymnasium and outdoors into a training arena. In these settings, teams acquire fundamental lessons vital to effective teams, through exciting and fun experiential exercises and events (p. 171).

Goodyear has had remarkable success with autonomous work teams at its radial-tire plant in Lawton, Oklahoma (Thompson, 1987). Each of the 164 teams is made up of five to twenty-seven people. Team members set their own production schedule and their own goals, and they screen applicants to decide on new members. Goodyear's management has found that the plant can produce double the daily volume of comparable-sized, traditionally designed plants and can make comparable tires at a cost lower than its lowest-cost foreign competitors (p. 16).

PRIME (Primary Care in a Managed Care Environment), initiated by the Veterans Administration in July, 1994, is an example from the nonprofit sector of autonomy encouraged in work teams. PRIME is administered in the VA Central Office by VA's Assistant Chief Medical Director for Academic Affairs, Dr. Elizabeth M. Short. Day (1994) reports that PRIME recognizes the need for different types of training, and cites some innovative self-managed team approaches such as these: (1) primary and managed care training for residents; (2) education in team care by including associated professionals working side-by-side with attending physicians and medical residents; and (3) educating administrative and management trainees on how to organize and deliver primary and managed care.

Typically, employee involvement means that a team of employees replaces some of the supervisor's authority by controlling matters from scheduling to hiring and sometimes firing. About one in five U.S. firms currently operate with self-managed teams, and predictions are that by the year 2000, 40 to 50% of the U.S. work force could be managing themselves through such teams (Lublin, 1992). The push for better quality, and

the need to reduce management layers and cost, have led to an emphasis on employee involvement, because it seems to help in these areas (O'Brien, 1993).

Many organizations send employees to externally sponsored seminars or public short courses. Training seminars and conferences, presented by nonacademic organizations, can be used in both job-related and developmental training. Lectures and discussions are a major part of this training (Mathis and Jackson, 1994). These programs are offered by professional associations such as the American Management Association (p. 303).

Alternatively, industry has hired the services of an outside consultant or trainer (Orsburn, Moran, Musselwhite, and Zenger, 1990). An experienced consultant can point out the pitfalls, provide periodic feedback on progress, and in general help management avoid reinventing the work team (Harrington-Mackin, 1994). However, there are disadvantages to using nonacademic sources such as consultants or trainers. When consultants are called in, the risks associated with disruption increase. Consultants have no vested interest in the organization. Unlike managers, they do not have to experience the pain of discarding old habits or the stress of personally leading others to accept new value systems (White and Wooten, 1983).

Because of the disadvantages of using the services of outside consultants and trainers, many organizations are beginning to turn to community colleges and universities for training and professional development (Lohr, 1980; Schuster, 1978; *U.S. Training Census and Trends Report, 1983*). Linkages between industry and higher education training providers are becoming more common. According to Naisbitt (1982),

"Universities—with substantial cutbacks in federal funding, changes in their student populations, and the heavy blows of inflation—are hooking up right and left with companies for joint ventures in bioengineering and telecommunication: a new era of university-industry cooperation and a new concept of what a university is" (p. 97). According to Gordon G. Darkenwald (1983), "Clearly, educational institutions play a prominent role in the continuing education of the nation's work force through cooperative programming with business and industry" (p. 231). Randy Garrison (1987), in his article "The Role of Technology in Continuing Education," believed that technology and continuing education must go together if the latter is to be successful beyond the year 2000. He stated, "It is crucial that any discussion of the future of an enterprise like continuing education must seriously consider the capabilities of various technologies and their role in the adult learning process" (1987, p.4).

Western New England College (WNEC) has instituted partnerships with industry to improve engineering education. These partnerships are enabling WNEC to maintain a dynamic curriculum and integrate real-world experiences into the classroom and laboratory (Haffner and Maleyeff, 1995).

Another example of higher education/industry cooperative linkage may be seen in the liaison between Harvard University and Monsanto, which began in 1975 (Prager and Omenn, 1980). Monsanto was willing to commit $20,000,000 to this effort because it lacked expertise in certain research disciplines.

Texaco established a strategic consulting alliance with Yale University (Hencke, Greene, Rosner, and Nordine, 1976). Yale provides six-person teams of graduate students to the Texaco Research Center at Beacon, New York.

The present study was designed to evaluate potential linkages between selected segments of industry and providers of training for self-managed work teams, and techniques utilized in such training. As cooperation between the private sector and outside training sources increases, researchers have expressed a desire to have more information on how training providers could have a greater impact on organizational professional development and how industry could be better served (Craig and Evers, 1981).

Statement of the Problem

The problem under study was to analyze self-managed work team training programs and techniques by comparing the perceived effectiveness of higher education programs and training techniques with nonacademic source programs and techniques. The scope of the study included data gathered from self-managed work teams in three segments of the manufacturing industry—computer hardware manufacturing, software development, and industrial electronics remanufacturing.

Purpose of the Study

The major purpose of this study was to determine how self-managed work teams in three selected segments of the manufacturing industry rated the effectiveness of team

training programs, and techniques used in those programs, provided by both higher education and nonacademic sources.

Specific purposes were the following:

1. To compare the perceived overall effectiveness of both higher education and nonacademic *programs*.

2. To compare the perceived effectiveness of various work team training *techniques* employed in training by both higher education and nonacademic sources.

Research Questions

The following research questions are investigated to address the purpose and sub-purposes of this study:

1. What are the perceived differences in effectiveness between the following work team training *programs*: (a) higher education, to include two-year colleges, four-year colleges, and universities; and (b) nonacademic, to include in-house training, outside consultants/trainers, outside seminars/conferences, and technical/vocational institutes?

2. What are the perceived differences in effectiveness of various work team training *techniques*, provided by (a) higher education, to include two-year colleges, four-year colleges, and universities; and (b) nonacademic sources, to include in-house training, outside consultants/trainers, outside seminars/conferences, and technical/vocational institutes?

Hypotheses

Based upon a review of the literature, these two hypotheses were established:

Hypothesis 1. There is no significant perceived difference in effectiveness between the following work team training *programs*: (a) higher education, to include two-year colleges, four-year colleges, and universities; and (b) nonacademic, to include in-house training, outside consultants/trainers, outside seminars/conferences, and technical/vocational institutes.

Hypothesis 2. There is no significant perceived difference in effectiveness of various work team training *techniques*, provided by (a) higher education, to include two-year colleges, four-year colleges, and universities; and (b) nonacademic sources, to include in-house training, outside consultants/trainers, outside seminars/conferences, and technical/vocational institutes.

Significance of the Study

For higher education and nonacademic providers of self-managed work team training to be able to develop and provide effective educational services to industry, a comprehensive survey of training programs techniques in the workplace is needed. Managers and supervisors throughout organizations are responsible for the effective use of all of the resources available to them (Shimko, 1990). Therefore, effective training and development of the human resources is integral to any manager's job, whether as a physician, a hospital head nurse, a training manager, a self-managed work team leader or

member, assistant manager in a retail store, production manager, director of engineering, or president of a nonprofit agency.

Human resources training and development begins with the orientation of new employees and includes job-skill training (Holt, 1990). As jobs evolve and change, retraining is necessary to accommodate technological changes. Encouraging development of all employees, including supervisors and managers, is necessary to prepare organizations for future challenges.

With the sudden shift from an industrial to an information society, the need for training has become increasingly important. *Megatrends* author Naisbitt (1982) predicted that the rapid change ahead also means that one cannot expect to remain in the same job or profession for life, not even in an information occupation. "The coming changes will force us to seek retraining again and again" (p. 32). He pointed out that it is becoming increasingly important for workforce members to shift their thinking from short-term to long-term planning. The paradigm shift will transform the way education is viewed with respect to employment. "The notion of lifelong learning is already replacing the short-term approach to education, whereby you went to school, graduated, and that was that" (p. 100).

As organizations move toward self-direction, support functions such as training, finance, maintenance, and quality control often undergo a transformation. There are a number of methods organizations can use to integrate support functions into a team process.

One option is to integrate support functions into a work team. In these situations, either the team members learn support functions or an outside expert in the function becomes part of a team. An example would be inclusion of a maintenance expert in a team. The separate maintenance department then ceases to exist in the organization, or it is greatly reduced because a work team performs most maintenance functions (Wellins et al., 1991).

Training is another job that many teams have begun to assume. Team leaders and team members handle both technical training and other training in areas such as meeting skills and group dynamics (Lazes and Falkenberg, 1991). In these instances, the human resource staff members function as facilitators and resource experts instead of assuming responsibility for all direct training.

Although considerable literature addresses the topic of team training, a review of the literature revealed limited behavior guidance that may be used to develop and model team-training programs (Dubnicki, 1991; Lazes and Falkenberg, 1991). One study (Dumaine, 1994) suggested that guidelines be developed and integrated with current instructional system procedures and that they be distributed to training managers. Swezey, Streufert, and Mietus (1983) recommended a system for classifying team training guidelines and characteristics. They argued that a need exists to create a classification system for team-teaching design categories and issues, and to identify within the system actual team-training guidelines for use by trainers. Team process principles fall into four categories: (1) team mission and goals; (2) motivation and attitudes; (3) knowledge and skills development; and (4) team training situations (Dubnicki, 1991; Harrington-Mackin,

1994; Morgan, Coates, Kirby, and Alluisi, 1984; and Zigon, 1994). These categories are linked to a previous classification system as reported in a study by Harrington-Mackin (1994). Harrington-Mackin has suggested that organizations develop and design their team training programs according to characteristics such as the following:

- Provides an opportunity to share life experiences with other adults
- Allows some control and self-direction in the learning process
- Establishes correlation between prior experience and new skill development
- Encourages active participation and provides the opportunity to do tasks
- Has warm, friendly atmosphere receptive to contributions of team members
- Includes numerous repetitions of the same information in different formats
- Provides frequent, specific, and accurate feedback
- Offers an opportunity to ask questions

A 1991 nationwide study conducted jointly by the Association for Quality and Participation and *Industry Week* was reported by Wellins and George (1991). According to this study, 26% of 862 executives surveyed had implemented self-managed work teams in their organizations. Within five years, more than half of these respondents intended to be fully organized around teams. Since organizations are recruiting from a labor pool that continues to become more heterogenous, managers will need to develop better methods to integrate these divergent skills that occur within production groups.

This study focused on potential linkages between industry and outside sources in providing training to self-managed work teams. Training providers throughout the United States are serving a broader clientele than ever before through a variety of structures and

formats offered to employees (Wellins and George, 1991). It appears that this trend will continue. If those who provide training to teams are to do so most effectively, it is desirable that they know the most effective training resources for developing team skills for industry. However, searches of relevant literature and inquiries to the American Society for Training and Development (ASTD) revealed a lack of research concerning the types of training considered most effective by industry. An inquiry of Texas Instruments headquarters in Dallas yielded support for this contention. TI managers indicated to this investigator that there have been no previous studies conducted at TI to measure the perceived effectiveness of team training programs and techniques (Jerry Bayless and Kathy Jones, telephone interview by author, 7 Sep. 1995).

A questionnaire, designed for this study, has determined how team leaders and team members in selected segments of industry rated effectiveness of self-managed work team training programs and techniques. The results of this study may be used by training managers/education directors in industry, and by curriculum planners for providers of training.

A data base of information, showing the extent of industry support for providing technical training for self-managed work teams, and strategies for involving higher education institutions and nonacademic sources of training, does not exist. The present study provides insight into how industry and training providers can better relate.

Definitions

Words and terms used in this study have the following meanings.

1. *Higher Education Provider*: A two-year or four-year degree-granting postsecondary education institution, to include colleges and universities, which offers specific courses, workshops, or seminars to train work teams.

2. *Nonacademic Training Source*: An educational or industrial institution which focuses on providing vocational hands-on skills rather than courses for college credit.

3. *Self-Managed Work Team*: A team consisting of 5 to 20 multiskilled workers empowered with decision-making authority to produce an entire product or service, often supervised by an elected member.

Limitations and Delimitations

This study is subject to the following limitations and delimitations:

1. There were 195 survey instruments delivered to training managers with a request that they distribute them for voluntary completion to individuals who functioned as self-managed work team leaders or members. Of the 195 delivered to training managers, 132 (67.7%) were returned.

2. The organizational structure of organizations cooperating with this study, and the relatively small number of employees whose functions make them eligible to serve as subjects, made random sampling impossible. However, the subjects depicted a *representative* group of team leaders and team members. Survey monitors at each location were instructed to "enlist the cooperation of as many participants as possible, trying to

maintain a ratio of three times as many team *members* as team *leaders*." Thus this study meets the desired standards of reliability and validity. However, efforts to generalize these findings should be attempted with full cognizance of the limitations of the present study.

Assumptions

The following assumptions were applied to this study:

1. The limited number of self-managed work teams now working in the subject industries hindered the selection of persons qualified to participate.

2. Responses were based on sincere attempts to cooperate with the study.

3. The quality of training programs in the selected industry locations remained constant during the investigation.

4. The inventory of training programs and techniques was a valid instrument that has yielded accurate data.

Methodology

Surveys were distributed to 195 team members and team leaders to determine how self-managed work teams would rate the overall effectiveness of (1) both higher education and nonacademic sources as providers of team training, and (2) ten work team training techniques when provided by higher education and nonacademic sources respectively. One hundred thirty-two (132) individuals completed and returned the questionnaire. These included individuals who served as self-managed work team leaders or members in these

three segments of industry—computer hardware manufacturing, software development, and industrial electronics remanufacturing.

A three-part questionnaire, focusing on training issues with respect to team-building skills, was specifically designed to serve as the survey instrument (Appendix B). Part A requested general personal information including job title and function, education, salary, work experience, age, sex, urban location, and four opinion questions relating to corporate support of team training. Part B asked for the respondent's perception of the effectiveness of two different *program* providers as sources for work team training—higher education (two-year and four-year colleges and universities) and nonacademic sources of training (in-house training, outside consultants/trainers, outside seminars/conferences, and technical/vocational institutes). Part C identified respondents' perceptions of the effectiveness of ten types of training techniques, assessed separately for higher education-provided training and nonacademic sources of training.

The questionnaire's contents and format were evaluated for clarity, language, purpose, and validity by (1) experts in the field, (2) a pilot-test administered to a group of self-managed work team trainers and managers, and (3) an independent panel of experts in the field of business and higher education. The questionnaires were administered on-site at each survey location by a training manager in that organization.

Statistical analyses of data relating to the research hypotheses included frequency distribution, percentages, and measures of central tendency in both Parts B and C. In Part B, a Wilcoxon matched pairs signed-ranks test was conducted to determine whether higher education or nonacademic sources (as paired data) was statistically the "greater,"

i.e., ranked higher by subjects. In Part C, correlated (paired) *t*-tests were utilized. These correlated (paired) *t*-test analyses tested for significance of differences between subscale scores for higher education-provided training, and similar ratings of training provided by nonacademic training sources. Reliability analyses employing Cronbach's Alpha were conducted for subscale scores derived from Part C of the questionnaire.

Organization of Remaining Chapters

Chapter 2 presents an in-depth review of literature. This review examines issues related to self-managed work team training programs and techniques. Chapter 3 presents the research methodology for this study. Chapter 4 includes the results and data analysis. Chapter 5 summarizes the study, presents the findings, conclusions, implications for practice, and makes recommendations for further study.

CHAPTER 2. REVIEW OF LITERATURE

Providers of work team training throughout the United States are serving a broader clientele than ever before. If industries which provide educational and training offerings are to do so most effectively, it is desirable that they know how professionals in their industry perceive the effectiveness of teams, programs for training teams, and various techniques employed in these programs.

This review of literature will examine issues related to self-managed work team training programs and techniques. These issues include (1) trends and priorities in training; (2) self-managed work teams: a response to workforce change; (3) team training techniques; and (4) potential linkages between training providers and industry.

Trends and Priorities in Training

Until quite recently, American industry has had a workforce that was accepting and unquestioning of authority, and had unwavering faith in managerial judgment and decisions (Daft, 1994). Workers were expected to obtain their own training and to be well qualified for a job before they commenced working in that position. Such is no longer the case. Changes in the available workforce are requiring industry to establish new training priorities, devise innovative ways to provide employee training, revise training budgeting paradigms, implement new training methods, and generally be willing to grant ever-increasing autonomy to workers who are products of today's changing workforce (Daft, p. 415).

Changing Workforce

As a direct result of having more formal education, our society continually has become more critical and less accepting of authority (Schuster, 1978). This change has clearly been reflected in the work force with younger workers increasingly challenging management's judgment and resisting decisions made by supervisors and authority figures. However, this challenge can be used as an asset. According to Fred E. Schuster, "It is an opportunity because higher quality human resources are potentially more productive human resources, if they can be directed toward the organization's purpose" (p. 34).

Another important societal change has been the shifting balance between manual workers and knowledge workers, or the shift from an industrial to an information society (Naisbitt, 1982; Schuster, 1978). According to Schuster, Peter Drucker has pointed out that this historic shift in the nature of work makes Theory Y, a democratic, non-authoritarian approach to management, a necessity. The knowledge worker simple does not maintain a high level of productivity under Theory X, an autocratic approach to management. Knowledge has to be self directed; the knowledge worker has to take responsibility for his actions and level of productivity.

Another significant change has been the tendency for larger numbers of the work force to identify with their profession or occupation rather than their organization or employer (Schuster, 1978). When the level of training increases, the result seems to be workers who begin to identify as a member of a professional group or collective union rather than an individual organization.

Priorities in Training

It is difficult to gauge the priority given to training within organizations, since opinions differ according to circumstances. According to Lee (1982), there are those in the field who believe in-house training programs for lower level jobs have become virtually non-existent. Lee quoted Barry Bluest on as having maintained that "there is a fundamental circularity in the industry's employment practices. Little training and low wages have led to the enormous turnover rates" (p. 60). A different opinion was held by Kenneth Olsen ("Chief Executives Report . . .", 1978), President of Digital Equipment Corporation. Olsen believes that Digital's educational services have surpassed the company growth rate. He stated, "We now have almost 1,000 professional people involved full-time in educating our customers, the community at large, our field service engineers, our software service specialists, and our administrative/management staff" (p. 37).

Commenting on trends in training at 3M Company, L.W. Lehr, president of operations in the United States, maintained training must be "realistic" and "results-oriented," because training is a good dollar investment ("The Role of Training at 3M," 1976). Top management looks for training to provide current guidance and communication on how an organization can operate more effectively with and through its employees. Lehr stated, "Actually the training budget has been one of the last to be cut, because the function operates as a cost center and must sell its services to various divisions. In that way, it operates like an outside consulting center" (p. 17).

Even as early as 1976, then chairman and CEO of United States Steel, Edgar G. Speer, stated his support for the lifelong learning concept ("The Role of Training at U.S. Steel," 1976). He viewed the training functions in the corporation as being responsible for providing necessary skills and knowledge. He saw this as being accomplished in the formats of workshops, seminars, short courses and university advanced management programs.

Assuming that demographic shifts and an increased focus on the productivity of adult workers results in additional resources being devoted to training, corporate employer-based training systems will continue to expand (Gorovitz, 1983).

A survey of employer-sponsored training and development activities in the United States was conducted in 1983 by *Training*, a periodical devoted to reporting issues and trends in the training field ("U.S. Training Census and Trends Report, 1983," 1983). Ten thousand surveys were mailed via first-class mail to a sample of organizations with 50 or more employees in industries from the following sectors: manufacturing; transportation-communications-public utilities; wholesale trade; retail trade; finance-insurance-banking; health services; educational services; business services; and public administration. Seventy percent of the names for the intended sample were supplied by Dun's *Market Identifier* data base maintained by the Dun and Bradstreet Company and the remainder were supplied by *Training*. The surveys were addressed to the chief executive officer of each organization. Subjects were asked three related questions: (1) How much did organizations spend on training and development in 1983? (2) Which groups of employees were trained and what types of training did they receive? and (3) What types of programs

do organizational training departments design and deliver themselves and what types of programs do they depend on outside vendors to provide? Respondents were asked to indicate that their organizations conducted *some* amount of formal training or conducted *no* formal training or human resources development training. Of the 10,000 surveys distributed, 727 usable ones were returned. Eighty-four percent indicated that their organizations did *some* formal training (p. 31).

Employee Training

Employee training represents a planned effort by an organization to facilitate employees' learning of job-related behaviors (Keys and Wolfe, 1988). The success of any training can be gauged by the amount of learning that occurs and is transferred to the job ("Company Illustrates Power of Investing in Human Beings," 1993, January 3). Too often, unplanned, uncoordinated, and haphazard training efforts significantly reduce the learning that could have occurred. Training and learning will take place, especially through informal workgroups, whether an organization has a coordinated training effort or not. Employees learn from other employees. But without a well-designed systematic approach to training, what is learned may not be what is best for the organization. There are five major components in a training system: (1) needs assessment, (2) budgets, (3) determination of recipients, (4) training methods, and (5) evaluation.

Training needs assessment. Training is designed to help the organization accomplish its objectives ("Who Receives Training? and What Kind of Training Do They Get?" 1983). Determining organizational training needs is the diagnostic phase of setting training objectives.

Nowack (1991) maintained that true training *needs* are different from true training *wants*. He proposed an approach for designing a questionnaire that can help separate *needs* from *wants*. The two main criteria on such a questionnaire should be importance and proficiency. Importance, according to Nowack, is the relevance of specific tasks and behaviors in a particular job and the frequency with which they are performed. He defined proficiency as an employee's current demonstration of competence in a specific job. A job profile contains specific definitions of job requirements under which groups of related behaviors can be reliably classified. According to Nowack, typically a job profile results in 12 to 15 categories or dimensions (p. 69). The number of dimensions depends on the nature of the job, the complexity of the tasks, and the skills required for effective job performance.

The first step in any training needs analysis is to differentiate between training wants and true training needs:

- A true training need exists when specific job tasks or behaviors are important and an employee's proficiency in them is low.
- A training want may arise when specific job tasks or behaviors are not important and an employee's proficiency in them is low.

Step two requires developing the questionnaire, step three analyzes the questionnaire, step four involves statistical analysis. Finally, in step five, trainers interpret questionnaire findings to develop specific job objectives based on training needs.

Nowack (p. 73) concluded that the consequences of designing training to meet wants instead of true training needs are costly and time consuming. It is important to

distinguish between wants and needs in a training needs analysis before constructing a training program.

In the process of providing practical guidance for designing a questionnaire, Nowack (1991) proposed three types of analysis as helpful in determining a job profile: organizational, task, and individual analyses. The first type of analysis, organizational analysis, considers the organization as a system. This identifies the knowledge, skills, and abilities that will be needed by employees in the future as both jobs and the organization change.

In task analysis a second way to diagnose training needs of the specific tasks performed and job requirements in the organization are examined (Nowack, 1991). Job descriptions and job specifications provide information on the performances expected and skills necessary for employees to accomplish the required work. By comparing the requirements of jobs with the knowledge, skills, and abilities of employees, training needs can be identified.

Finally, training needs can be ascertained through individual analysis, which focuses on individuals and how they perform their jobs (Nowack, 1991). The use of performance-appraisal data in making these individual analyses is the most common approach. To assess training needs through the performance-appraisal process, an employee's performance inadequacies first must be determined in a formal review. Then some type of training is designed to help the employee overcome revealed weaknesses (p. 73).

Hazucha and Holt (1991) proposed yet another way to assess individual training needs—simply ask employees what they believe are their problems and what actions they recommend. Both managerial and nonmanagerial employees can be surveyed, interviewed, and/or tested.

Training budgets. As with most programs, employee training programs are subject to the constraints imposed on them by company budgets. On-going reallocation of training budgets produces further shifts in training trends and priorities. Brody (1987) has estimated that organizations with more than 100 employees spend $44 billion each year on training and development. In 1987, IBM reported spending more than $750 million a year on corporate schooling, more than the entire budget of Harvard University.

Private and public employers of the United States make an immense investment in the education and training of their employees. The American Society for Training and Development (ASTD), whose members develop, conduct, and manage such programs for employers, estimated that $30 billion are spent each year to provide formal training and education away from the office or plant (Craig and Evers, 1981). More recent estimates by ASTD have suggested that has estimated that $210 billion is spent by U. S. firms for all employee training ("Budgets for Training," 1992).

Measured in dollars invested in training and development, $52.2 billion was devoted by U. S. organizations to training in 1995 ("Training Budgets: 1995 Industry Report," 1995, October, p. 41). Seventy-two percent of that, $37.6 billion, was allocated to training staff salaries. Thirty-six percent of U.S. industries predicted their 1996 training budgets would be greater than they were in 1995, while 54% forecast they would remain

the same. Only 10% predicted a downturn in training expenditures (p. 48). Fifty-four percent of budget training dollars are aimed at programs for managers and professionals. Sales people also attract a significant proportion (14%). The remaining one-third of the training dollars are spent for other employees: production workers, service workers, and administrative staff (p. 46).

Even in recessionary times, a substantial amount of money is spent on employer-sponsored education. According to Seymour Lusterman (1977, p. 8): "During the single recession year of 1975, the nation's 7,500 or so largest private employers, corporations with 500 or more employees, spent over two billion dollars on employee education. This was as much as the annual total in recent years of contributions and grants to all U.S. colleges and universities from all sources." Lusterman (1977, p. 8) emphasized the need for employee training for business purposes by saying, ". . . while employer-sponsored education may be incidentally supportive of the job and career aspirations of participating employees, most of it stems from business needs."

Recipients of training. A 1995 survey of who actually receives training identifies a trend toward providing more management development courses ("Vital Statistics: 1995 Industry Report," 1995). The emphasis on management development held true regardless of the industry type, or size of the organization. Training emphasis varies by industry, but the single type of formal training most likely to be provided by employers, large and small, is a course that teaches some kind of computer skill. In 1990, three-quarters of U.S. organizations with 100 or more employees provided computer-skills training. In 1994, that figure rose to 88%. In 1995, 93% of employers offer computer-skills training. Training in

technical skills/knowledge in general ranked fifth among all types of training provided in 1994. In 1995, it moved up to third place (p. 60).

Remedial education was the lowest priority for companies. Respondents (47.6%) indicated their organizations were making increased efforts to retrain employees whose job classifications were being phased out (p. 42).

Forty percent of U.S. organizations with 100 or more employees will offer some training to sales people in 1995 ("Vital Statistics: 1995 Industry Report," 1995). The average company that trains sales people will train 60 of them, which means a total of 4.4 million sales people will be trained in 1995. The average sales person who receives training will get 37 hours' worth, which means a total of 164.3 million hours of training will be delivered to sales people this year. Whether sales people, supervisors, or production workers, the number of people offered some kind of formal training by their employers has increased steadily during the 1990s. The average number of individuals trained per organization is up slightly for most job categories, as is the average number of hours of training per individual. In 1995, some 49.6 million people will receive training, a 26% increase over 1990. Likewise, the total number of hours of training delivered by U.S. organizations with 100 or more employees has increased by 24% since 1990 (p. 56).

IBM requires supervisors and middle managers to attend several days of course work each year on supervision (Galagan, 1989). The company spends almost $900 million annually on education, nearly two-thirds of it on first-line managers and nonmanagement employees who complete five million student days a year—about twelve days per employee—in formal training sessions. On any given day, 18,000 IBM employees are in

formal training that covers a wide range of topics from basic literacy to quality control engineering systems.

Methods of training. In addition to innovational thinking about budgets, priorities, and recipients of training, companies also experiment with a variety of training methods, according to Altonji and Spletzer (1991). Training may be conducted either on- or off-the-job, and individually or in a team environment.

The most common type of training at all levels in an organization is *on-the-job training* (OJT) (Holt, 1990). Whether or not the training is planned, people do learn from their job experiences, particularly if these experiences change over time. On-the-job training usually is conducted by the manager and/or other employees. A manager or supervisor who trains an employee must be able to teach, as well as show, the employee. The problem with OJT is that it often is haphazard (Mathis and Jackson, 1994). Trainers may have no experience in training, no time to do it, and no desire to participate. Under such conditions, learners essentially are on their own, and training likely will not be effective. On-the-job training is so popular because it is flexible and relevant to what the employee is doing. However, Altonji and Spletzer (1991) found that OJT has some problems as well. It can disrupt regular work, and the person doing the training may not be an effective trainer. OJT can amount to no training in some circumstances, especially if the trainee simply is abandoned to learn the job alone (Mathis and Jackson, 1994).

Some training efforts focus on emotional and behavioral learning (Holt, 1990). Employees can learn about behavior by role-playing, in which individuals assume identities in a certain situation and act it out. Business games, case studies, and short work

assignments called, in-baskets are other behaviorally experienced learning methods. Sensitivity training or laboratory training is an example of a method used for emotional learning. The critical issue in any situation using these methods is the purpose of the exercise. Employees may perceive role playing as fun or annoying, but they should understand clearly what the exercise is attempting to teach. Also, they must be able to transfer the learning back to their jobs.

Some types of training are offered totally away from the job site. *Off-the-job training* is the method of choice when employees need to learn skills not readily available in the organization (Holt, 1990). It can include course work at local colleges, seminars by experts, and in-plant education in other organizations. Whether off-the-job training is offered by colleges, experts, or other plants, the more popular off-the-job training methods are classroom lectures, video tapes and films, and simulation exercises. Classroom lectures are well suited for conveying specific information. They can be used effectively for developing technical and problem-solving skills. Video tapes can also be used to explicitly demonstrate technical skills that are not easily presented by other methods. Interpersonal and problem-solving skills may be best learned through simulation exercises such as case analyses, experiential exercises, role playing, and group interaction sessions.

However, complex computer models, such as those used by airlines in the training of pilots, are another kind of simulation exercise, which in this case is used to teach technical skills (Holt, 1990). So, too, is vestibule training, in which employees learn their jobs on the same equipment they will be using, except that the training is conducted away from the actual work floor. Many large department stores train cashiers how to operate

their new computer cash registers in specially created vestibule labs that simulate the actual checkout environment. This way, mistakes result in learning experiences rather than irate customers. A hospital that wants its technicians trained in computer programming might pay for formal college courses, send the technicians to professional seminars, or have them trained by the computer manufacturer that supplies equipment to the hospital (Holt, 1990).

Many organizations send employees to training institutes or enroll them in seminars and programs conducted by universities or training institutes. The American Management Association (AMA) is one of many professional organizations serving thousands of firms with development courses and seminars (Holt, 1990).

"For any training program to succeed, it has to have sound methodology and measurement of results must be accurate," said Scott Beth, manager of project management training for Hewlett-Packard Company, Palo Alto, California ("Training Program's Results Measured in Unique Way," 1992, p. 18). Because training programs represent a cost investment—costs include materials, trainer time, and production loss while the individuals are being trained rather than doing their jobs—a reasonable return is required.

Some larger corporations such as the General Motors Institute have their own accredited university programs. Others hire professional staff for one or two years to conduct intensive in-house training for a variety of skills or development objectives ranging from upgrading computer applications to comprehensive management techniques (Holt, 1990).

According to Brody (1987), companies such as Toyota that spend heavily on selection also invest in employee training and development. The 10% of employees selected for training programs undergo several weeks of training for their specific jobs, often at the employees' own expense. At General Motors' truck plant, each assembly line worker received 400 to 500 hours of paid training. Each skilled worker got training of 1,000 hours—the equivalent to almost six months. Motorola, Macy's, and Texas Instruments are examples of companies that appreciate the importance of thorough training to remain competitive in the global marketplace (p. 88).

In an attempt to make jobs more meaningful and to take advantage of the increased productivity and commitment that can follow, more organizations are turning to employee involvement as a basic part of modern jobs (Lublin, 1992). Typically, employee involvement means that a *team* of employees replaces some of the boss's authority by controlling matters from scheduling to hiring and sometimes firing. These teams may be described as being formal or self-managing (Daft, 1994).

A variety of formal teams can exist within organizations (Certo, 1994; Daft, 1994; and Mears and Voehl, 1994). Formal teams are created by the organization as part of the formal organization structure. Two common types of formal teams are vertical and horizontal, which typically represent vertical and horizontal structural relationships. A third type of formal team is a special-purpose team (Daft, 1994, p. 585).

A *vertical team* is composed of a manager and his or her subordinates in the formal chain of command. Sometimes called a functional team or a command team, the vertical team may in some cases include three or four levels of hierarchy within a

functional department (Larson and LaFasto, 1989). Typically, the vertical team includes a single department in an organization. The third-shift nursing team on the second floor of St. Luke's Hospital is a vertical team that includes nurses and a supervisor. Further, according to Larson and LaFasto, a financial analysis department, a quality control department, an accounting department, and a human resource department are all command teams. Each is created by the organization to attain specific goals through members' joint activities and interactions.

A *horizontal team* is composed of employees from about the same hierarchical level but from different areas of expertise (Larson and LaFasto, 1989). A horizontal team is drawn from several departments, is given a specific task, and may be disbanded after the task is completed. The two most common types of horizontal teams are task forces and committees.

A *task force* is a group of employees from different departments formed to deal with a specific activity and exists only until the task is completed. The task force might be used to create a new product in a manufacturing organization or a new business curriculum in a university. Several departments are involved and many views have to be considered, so these tasks are best served with a horizontal team. IBM used a large task force to develop the IBM System/360. Contact among team members was intense, and principal players met every day (Daft, 1994, p. 586).

A *committee* is generally long-lived and may be a permanent part of the organization's structure. Membership on a committee is usually decided by a person's title or position rather than by personal expertise (Daft, 1994). A committee often needs

official representation, compared with selection for a task force, which is based on personal qualifications for solving a problem. Committees typically are formed to deal with tasks that recur regularly. For example, a grievance committee handles employee grievances; an advisory committee makes recommendations in the areas of employee compensation and work practices; a worker-management committee may be concerned with work rules, job design changes, and suggestions for work improvement (Mears and Voehl, 1994, pp. 169-171).

Special-purpose teams are created outside the formal organization structure to undertake a project of special importance or creativity (Larson and LaFasto, 1989). McDonald's created a special team to create the Chicken McNugget. E.J. (Bud) Sweeney was asked to head up a team to bring bits of batter-covered chicken to the marketplace. The McNugget team was separated from the formal corporate structure to give it the autonomy to perform successfully. A special purpose team is still part of the formal organization and has its own reporting structure, but members perceive themselves as a separate entity (p. 73).

The second major type of teams is the self-managing team. Gradually, companies have moved toward greater autonomy for employees, which has led to self-managing teams (Hoerr, 1989, July 10). Self-managing teams consist of from five to twenty multiskilled workers who rotate jobs and produce an entire product or service (Daft, 1994, p. 588). Since self-managed work teams are a major focus of this study, they will be considered in depth later in this chapter.

Evaluation of training. Evaluation of training compares the posttraining results to the objectives expected by managers, trainers, and trainees (Ostroff, 1991). Too often, training is performed without any thought of measuring and evaluating it later to see how well it worked. Because training is both time consuming and costly, such evaluation should be an integral part of the program. Ostroff found that examinations of the success of training programs have produced mixed results. People usually like the training and learn the material taught, but behavior and performance do not always reflect the extent of training delivered and supposedly learned (p. 353).

Self-Managed Work Teams: a Response to Workforce Change

Modern organizations in the United States face numerous problems, such as decreasing quantity and quality of production, worker dissatisfaction, high levels of turnover and absenteeism, and counterproductive employee behavior (Cummings and Molloy, 1977). New approaches are required to deal with the increasing interdependence, complexity, and uncertainty in the environments of these organizations (Trist, 1977). One of these approaches, the self-managed work team is the vehicle of interest to the present study. This new breed of work team is referred to by many names; self-regulated, self-directed, self-managed, high-performance, and sociotechnical design are a few of the more common terms found in the literature (Lee, 1990). In the present study, the term "self-managed work team" will be utilized.

Current approaches to motivation theory emphasize external forces such as performance evaluation, rewards, and expectations of others (Mitchell, 1982). Theories of

employee motivation are now intimately linked with job design and organizational change (Hackman and Oldham, 1980; Hammer and Van Tassell, 1983). At the practical level (Mitchell, 1982), participatory management practices are becoming popular motivational techniques, along with appraisal and incentive systems, for improving employee performance.

The importance of problem-solving groups in organizations can hardly be overstated (Wood, Phillips, and Pedersen, 1986). Increasingly, management and decision making are passing from the single executive to groups, as committees and task forces are formed to make management decisions, to solve problems, and to formulate policy. Since the late 1970s, the search for a workable solution to the problems of a dissociated workforce has rapidly accelerated. One possible solution is the design of work around self-regulating work groups (Davis, 1979; Hackman and Suttle, 1977; Lawler, 1978). Derived from sociotechnical systems theory, this prominent quality of work life approach encourages the voluntary acceptance of traditional managerial responsibilities by employee groups. It is a work-related form of self-determination.

Historical Development of Self-Managed Work Teams

Experimentation with autonomous work groups began with the pioneering work of Eric Trist and his colleagues who were attempting to find the effects of different forms of work organization with different forms of technology in the British coal industry (Trist and Bamforth, 1951; Trist, Higgin, Murray, and Pollock, 1963). Review of the literature reveals that this research has continued for more than 25 years in a variety of industries and in several cultures (Cummings and Molloy, 1977; Galagan, 1986; Lawler and

Hackman, 1969; Manz and Simms, 1989; Susman, 1970; Wellins and George, 1991). Hackman has suggested that self-managing work teams usually include "a relatively whole task; members who each possess a variety of skills relevant to the group task; workers' discretion over such decisions as methods of work, task schedules, and assignment of members to different tasks; and compensation and feedback about performance for the group as a whole" (Cummings, 1978, p. 625). The use of self-managing groups involves a shift in focus from individual methods of performing work to group methods. The rationale for making this shift has been described as resulting from "the proposition that a group can more effectively allocate its resources when and where required to deal with its total variance in work conditions, than can an aggregate of individuals each of whom is assigned part of the variance" (Susman, 1976, p. 183). When employees become members of a self-managing group, they tend to define their work roles in terms of their value as contributors to the group's primary task rather than in relation to one specific job.

Eric Trist and his colleagues (Trist et al., 1963) have shown that the team members are able to self-regulate and control the group task best where the members are multiskilled, all-around workmen. Ideally, each worker should be able to perform a wide variety of tasks and be able to switch jobs, replacing co-workers when they are tired, bored, or absent. Comprehension by the workers of a variety of skills along with job switching tends to reduce the likelihood of occurrence of prestige and status differences within the group. In addition, it allows for improved communication and greater stability of the group's internal structure (Trist, 1973). Failure of the group's members to develop

these multiple skills can lead to role differentiation and status differences that tend to reinforce external affiliation and inhibit internal mobility.

Pearce and Ravlin (1987) described self-regulated work groups (SRWGs). These authors characterized them as having internal task control on a relatively permanent basis for any identifiable task requiring multiple skills. Typically, SRWGs are responsible for managing quality control, inventory purchases, employee training and personnel issues like absenteeism. Thus, quality circles, task forces, and various committees do not qualify as SRWGs.

Prevalence of Self-Managed Work Teams

Self-managed work teams occupy central positions in business organizations (Daft, 1994). Self-directed/autonomous work groups all share a common philosophy: employees are more likely to be productive and innovative if they have a say in how the work is to be done. They are the basic components composing organizations and the contexts within which workers work. Work teams structure work and coordinate and control human and technological resources; work teams also constrain workers and provide them with opportunities for meeting their needs. The focus is on work groups which produce products or services.

About one in five U.S. firms operate with self-managed teams today, and predictions are that by the year 2000, 40 to 50% of the U.S. workforce could be managing themselves through such teams (Lublin, 1992, p. B1). The push for better quality, and the need to reduce management layers and cost have led to an emphasis on employee involvement, because it seems to help in these areas (O'Brien, 1993).

A recent nationwide study conducted jointly by Development Dimensions International (DDI), the Association for Quality and Participation (AQP) and Industry Week revealed that 26% of 862 executives surveyed had implemented Self-Managed Work Teams at some level in their organizations (Wellins and George, 1991). Within five years, more than half of these survey respondents intended to be fully organized around self-managed work teams. At the same time, organizations are recruiting from a labor pool that continues to become more heterogenous, both demographically and philosophically. Managers will need to develop skills on how to integrate these divergent skills that occur within work teams and production groups.

According to another estimate (Lawler, 1986), two to three hundred manufacturing plants in the United States seem to be using some derivative of a highly participatory team approach. In addition, there are other, nonmanufacturing organizations that rely on some variation of this approach, like the insurance firm studied by Manz and Angle (1986). These groups, called autonomous or self-managed work groups, are work innovations mainly characterized by the attempt to create a high degree of decision-making autonomy and behavioral control at the work group level. Consequently, a much greater emphasis is placed on control within rather than from outside the group. There is some debate whether these teams are established to improve productivity or simply employee quality of work life, but it seems clear that managers who take this approach at least have implicit goals of improved productivity, better quality, and/or reduced conflict. Williams (1995) pointed out that, according to *Business Week*, "self-directed work teams are, on average, 30 to 50% more productive than their conventional counterparts" (p. 51).

Employee involvement through teams is designed to increase the participation of lower-level workers in decision making and the conduct of their jobs, with the goal of improving performance (Daft, 1994). Problem-solving teams typically consist of 5 to 12 hourly employees from the same department who voluntarily meet two hours a week to discuss ways of improving quality, efficiency, and the work environment. Self-directed work teams, also known as self-managing teams, represent an approach to organizational design that goes beyond quality circles or ad hoc problem solving teams. These teams are natural work groups that work together to perform a function or produce a product or service. They not only do the work, but also take on the management of that work—functions formally performed by supervisors and managers. This allows managers to teach, coach, develop and facilitate, rather than simply direct and control (Williams, 1995, p. 51). Recommendations are proposed to management for approval. Problem-solving teams are usually the first step in a company's move toward greater employee participation.

Lublin (1992) studied several U.S. corporations operating with self-managed work teams. Lublin's research showed how more corporations are using self-managed teams to reduce excessive absenteeism and rejuvenate the work ethic. Charles Manz, management professor at Arizona State University, predicted that "by the turn of the century you could be looking at 40 to 55% of all U.S. workers managing themselves through such teams—up from the current 7 to 9%" (Lublin, 1992, p. B1).

Lublin reported that in 1986, the United Auto Workers Union and Chrysler attempted to save New Castle, one of Chrysler's oldest and most rundown facilities in

rural New Castle, Indiana. Lublin explained that workers were renamed "technicians" and line supervisors became "team advisors" and time clocks disappeared. "The plant's 77 teams now assign tasks, order repairs, and even talk to customers. Employers have sort of taken ownership of this plant," said Ed Zachary, UAW Local 371 president. Absenteeism plummeted to 2.9% from 7%. Union grievances tumbled to 33 in 1991; previously they exceeded 1,000 a year. Also in 1991, the number of defects per million parts made fell to 20 from 300 in 1988 (p. B1).

Lublin (p. B1) concluded that typically, a work team replaces the boss by controlling everything from schedules to hiring and, sometimes, firing. This "empowerment" trend, which emerged during the 1980s at major manufacturers, now is moving from the factory into the white-collar service sector, including banks and mutual funds.

The problem-solving teams laid the foundation for the self-managing work teams of the 1990s that appear to be the wave of the future (Hamilton, 1992). These self-managing teams consist of 5 to 20 multiskilled workers who work together to produce an entire product or service. Each group is led by an elected team leader. Members learn all the tasks and rotate from job to job on the project. The teams even take over such managerial duties as scheduling work and vacations and ordering materials. The concept of the work team is a fundamental change in how work is organized, giving the employees control over their jobs (p. 5).

By employing work teams, the firm draws upon the talent and creativity of all its employees, "not just a few maverick inventors or top executives," to make important

decisions (Pasmore and Mlot, 1994, p. 18). As product quality becomes more and more important, managers will need to rely more and more on the team approach in order to stay competitive (Wellins and George, 1991). In a bid to improve both quality and productivity, the auto industry has attempted to introduce work teams into its factories. Teams consist of multiskilled workers who are given far greater job-related freedom than in the past. Working together, teams like those at New United Motor Manufacturing, Inc. (NUMMI, a General Motors-Toyota joint venture at Fremont, California), work with little management supervision under a revolutionary manufacturing system (Turner, 1989).

Self-managed work teams are viewed by many organizations to hold a competitive advantage in today's fast paced, global marketplace (Gilmore and Rose, 1994). Much has been written about how such team-based management systems have been successfully utilized in manufacturing plants. However successful implementation in non-manufacturing, "white collar" service environments is considered by many as impractical if not impossible. Self-managed work teams can be used in both product and service industries.

A multimillion-dollar program designed to move Veterans Administration medical treatment in a new direction was launched in July, 1994 (Day, 1994). PRIME (primary care training in a managed care environment) has begun providing four-year grants to supplement the training of VA's resident doctors and health care students . The pilot program was started at 49 Veterans Administration Medical Centers (VAMCs) in 1994. The 129 VA hospitals affiliated with medical schools are eligible to participate in PRIME,

which is designed to provide training in the treatment of patients by interdisciplinary teams, emphasizing primary care treatment.

The increasing focus on work teams in organizations has emphasized the need for methods to build the adaptive teamwork skills that underlie team effectiveness (Wellins et al., 1991). Yet, there is a gap between these necessary skills and our knowledge of the means by which they develop. Typically teamwork skills are not formally trained, but must develop in the performance setting. Often there is a simple faith that they will be acquired through experience, although there is little evidence that experience alone is an effective teacher. This places emphasis on the role of the training manager and the team leader to guide and structure team training that facilitates the development of team skills. Existing theories of team development provide little practical guidance in this regard. In some cases support departments are organizing into their own self-directed teams and are implementing plans for multiskilling (p. 50).

In manufacturing operations, it is common for work teams to form themselves into fully integrated and autonomous units that are free to determine work assignments, rest breaks, inspection procedures, and make other decisions that affect their quality of life in the workplace (Wall et al., 1986). Fully autonomous work teams even select their own members and have members evaluate one another's performance. As a result, supervisory positions become less important and may sometimes even be eliminated.

Goodyear Tire and Rubber has had remarkable success with autonomous work teams at its radial-tire plant in Lawton, Oklahoma (Thompson, 1987). The 164 teams are made up of five to twenty-seven people. The team members set their own production

schedule and their own goals and screen applicants to decide on new members. Goodyear's management has found that the plant can produce double the daily volume of comparable-sized, traditionally designed plants and can beat the cost of comparable tires made by its lowest-cost foreign competitors (p. 16).

The popularity of manufacturing teams, for example, has led to new ideas in training and developing (Messmer, 1992). "Cross-discipline" training enables employees to understand the relationship of their job to others so that everyone works toward the common corporate goal. "Integrative learning" uses team exercises to establish and reinforce effective teamwork habits (Cournoyer, 1991; Power and Ivey, 1989).

Based on the literature, it may be concluded that an impressive amount of energy, both time and money, is expended on training within organizations in America each year. These expenditures on employer-sponsored education touch the lives of a significant number of workers throughout America. Only by examining priorities and trends in training can one realistically explore the possibility for creating linkages between organizational training and other entities in the future.

Critics of Self-Managed Work Teams

The self-managed work team concept has its critics as well as its champions. The critics of teamwork are raising important questions about the pace of work, stress, and the role of unions in work places where teams are operating. But critics such as Mike Parker and Jane Slaughter, former auto workers and authors of the 1988 book *Choosing Sides: Unions and the Team Concept* (quoted in Hoerr, 1989, February 20), also confused the issue by charging that work teams are inevitably used by management as "union-busting"

devices and, therefore, are not good for workers anytime or anywhere. The evidence does not support such a sweeping indictment. More often than not, workers who are part of teams find their jobs more rewarding and stimulating than fragmented, production-line work.

The teamwork critics are beginning to have an impact. *Choosing Sides* (1988) has received wide attention in union circles, and negative articles by Parker and Slaughter recently have appeared in dozens of newspapers. Dissidents in the United Auto Workers are voicing protests against work teams in regional and local meetings, demanding the overthrow of top UAW leaders who support the concept. As momentum against Self-Managed Work Teams builds, even louder complaints are likely (p. 70).

While the advantages of having work teams are obvious, GM has encountered stiff resistance from the United Auto Workers (UAW) (Hoerr, 1989, February). Although some UAW leaders believe that teams make work fulfilling and save jobs by making the companies more competitive, others see it as a threat to existing jobs. They fear that increased efficiency and cuts in supervisory jobs ultimately may lead to the elimination of union jobs, as well. Some union members point out that the introduction of teams reduces job classifications, thereby giving management more control over moving workers from job to job. The teamwork concept, therefore, according to Hoerr, is seen by some as part of a management plot to cut down on union power in the workplace.

The People's Caucus, an opposition group within one local union (Turner, 1989), complained that there is constant pressure from the union to work harder and faster, not just smarter. They argued that close cooperation between unions and management makes

the two indistinguishable and no longer permits the union to provide strong representation for its members. At the same time, Caucus members are careful to emphasize that they support NUMMI and the team concept and only want to make the system more humane and democratic.

Unions have not been the only stumbling blocks faced by General Motors in its attempt to introduce teams. Major cultural changes also have been required. Supervisors may find it difficult to shift from the traditional top-down approach to a democratic-style management. As one foreman concluded, "need to start discussing and suggesting rather than issuing orders" (p. 41).

Hoerr (1989, February) emphasized that the union debate could be important for the future of the auto industry. Studies indicate that work teams, systems that allow workers real participation in decision-making—and not all do—can produce better quality cars more efficiently than do auto plants with traditional work organizations. For this reason, the Big Three auto makers, especially General Motors and Chrysler, see teamwork as a key to their competitiveness and are rushing to install the concept in many plants. But they need the cooperation of UAW locals.

Organizational Components Critical to the Self-Managed Work Team

Certain organizational components may be critical to the development of Self-Managed Work Teams. A review of the literature showed 29 post-1970 field experiments which addressed the interrelationship of two key organizational components: organizational structure and management strategies. In the following sections, these components are examined along with specific practices which managers must employ to

encourage greater utilization of individual talents in work teams. The exploration of the first component, organizational structure, reviews the basic characteristics associated with an organic environment, which is the foundation on which Self-Managed Work Teams are built.

Organizational structure. The organizational structure is often a reflection of the management styles that are valued within an organization. Organizations that run smoothly have an alignment of values between the organizational structure and management strategies. The term "adhocracy" was coined by Warren Bennis and used by Mintzberg (1989, p. 196) to represent highly organic organizational structures. The characteristics that distinguish an adhocracy from other organizational forms include:

- a tendency to use group specialists
- reliance on formal training
- selective decentralization
- innovation as a means to break established patterns

Slevin and Coven (1990) suggested that organic structures also encourage open channels of communication, authority based in the individual, an emphasis on getting things done, and frequent use of participation to achieve group consensus. These characteristics provide an organization with the opportunity to achieve greater flexibility and self-renewal. The critical element of coordination in an adhocracy is achieved through the creation of work teams that represent various sectors of the organization (Bailey and Neilsen, 1992).

The team environment tends to create organizational structures that are flatter and more informal (Lee, 1990). Those organizations are generally leaner than traditional organizations because the leader is a coach and facilitator, information is shared readily with all employees, and employees are expected to learn all jobs and tasks required of the team (Quinn, Faerman, Thompson, and McGrath, 1990). According to Galagan (1986) organizational changes that support the implementation of participatory work designs include flexibility among work units, few formal rules, decentralization of authority, and trust between workers and managers. Organic structures are a prerequisite for the effective implementation of power, control, and informational changes at the work group level (Macy, Peterson, and Norton, 1989).

A remarkable example of reengineering the organizational structure may be seen at the headquarters of Aid Association for Lutherans (AAL). This example shows how transitioning to a work team environment changes the organizational structure, and is a reflection of the management styles that are valued within an organization. AAL's traditional organizational structure consisted of three functional departments with employees specialized to handle health insurance, life insurance, or support services (Hoerr, 1988, November 28, p. 64). This structure seemed efficient, but policyholder inquiries often were passed among several departments and then back again. For example, a request to use the cash value of a policy to pay the premiums for health insurance would bounce through all sections, taking at least 21 days. Coordination across sections took additional time when misunderstandings arose.

AAL's top managers decided to risk everything on a team approach. At precisely 12 noon on a given day, nearly 500 clerks, technicians, and managers wheeled their chairs to new locations, becoming part of 25-person teams (p.64). Each section consists of three to four teams that serve a region of the country. Each team has specialists who can do any of the 167 tasks, required for policyholder sales and service. Research by Wellins et al. (1991) suggested that AAL team members can learn as many as twenty different service-related jobs necessary to meet the needs of their customers. The request to pay health insurance premiums with life insurance cash value is now handled in five days. Productivity is up 20% and case-processing time has been reduced by as much as 75%. Administrative overhead is way down, because teams need little supervision. AAL teams do their own interviewing and make hiring decisions (Wellins et al., 1991). Fifty-five middle management jobs were eliminated as the teams took over self-management responsibility. Thanks to the team concept AAL gained the ability to handle 10% more transactions of all kinds, with 10% fewer employees (Hoerr, 1988, November 28, p. 68).

Formalization, socialization, training, and decentralization can be structured to encourage the success of self-managed work team initiatives. Each of these methods are presented below.

Formalization. Mintzberg (1979) defined formalization as the extent to which rules, procedures, instructions, and communications are written down. Managers tend to focus on the formal aspects of work which include written policies, work hours, and safety. However, it is the informal social structure and rules that are followed by 90% of the employees (Ray, 1988). Four informal processes encourage the development of

superior work teams, according to Kinlaw (1991). These processes are communicating and contracting (emphasis on team members' verbal interactions, vis-à-vis meetings); responding and adapting (to each other, to problems and to challenges; influencing and improving quality of results; and appreciating and celebrating—everyone's ideas are treated with respect; all team members have an opportunity at challenging work; practical concern is shown for each team member's well being.

Successful teams require a high level of interdependence and these informal processes promote mutual adjustment among group members and other groups. Lee (1990) suggested that the informality is the foundation of the self-managed work team structure.

Socialization. An article written by Schein (1988) defined socialization as the process of "learning the ropes," of being taught what is important in the organization. The effectiveness of an organization depends on socialization because it helps to determine employee loyalty, commitment, productivity, and turnover. According to Schein, socialization processes that create conformity should be avoided if innovation is critical. Organizations that value conformity or resistance to change will find it harmful to the development of self-managed work teams.

Van Maanen (1978) identified formal socialization as being segregated from ongoing work and informal socialization as being integrated with the actual practices of the department. Informal socialization increases the influence of the work group on the new employee. Van Maanen proposed that when organizations implement informal socialization, each person starts out equal to all other participants, regardless of age, sex,

race, or other background factors. Informal socialization strategies are useful in the creation of autonomous work groups because the perception of equal status promotes a more cooperative and participatory spirit among people in an organization.

Ray (1988) recommended that the informal structure is one of the most effective ways to indoctrinate new employees efficiently. The effectiveness of the socialization process is increased significantly if the formal and informal systems complement each other. Research completed by Chatman (1991) found that informal socialization practices were extremely influential in affecting how well an employee eventually "fits" into an organization.

In companies moving toward self-managed teams, the team leader or facilitator may actually create the team. If so, he or she is responsible for picking the members of his or her team and making sure that everyone who would be seriously affected by the group's work—whether members of the team or not—has input into the process (Sisco, 1993).

Training. In a traditional sense, training teaches people new technical skills and also prepares them to deal with a high level of autonomy. If the organizational goal is to have empowered employees, then the design of selection and training programs that ensure technical and social influence skills are mandatory (Conger and Kanungo, 1988).

Wellins et al. (1991) pointed out that the Aid Association for Lutherans (AAL) has a two-year training program, starting with individuals and progressing to training for intact *teams*. As a manager at AAL's Appleton, Wisconsin, headquarters said, "The training load is enormous. Don't underestimate it or you'll end up always playing catch-up" (p. 167).

Their training focuses on broad skill areas. A considerable amount of job-specific technical training usually is provided to ensure that jobs can be rotated among team members (Wellins et al., 1991). This is especially true of pay-for-performance programs. New team members receive policy skills training in the classroom four hours a week. This training is supplemented with an organized on-the-job training program that provides skill competency in all the jobs within a team's area (p. 168). Team members schedule their own hours in a flextime program, assign themselves tasks, and rotate jobs (Hoerr, 1988, November 28).

Teams require massive cross-training because members not only learn each others skills, but they must also learn how to work as a team. Team members are responsible for training which can be informal and on-the-job or more formal which includes learning quality assurance or computer skills (Lee, 1990). On-going training, involving both the formal and informal methods of learning, is crucial to the long-term success of Self-Managed Work Teams.

Decentralization. Decentralization, the extent to which power is dispersed among individuals, is a stimulus for motivation (Lee, 1990). Decentralized organizations are able to respond quickly because the decision-making power is distributed among managers and non-managers at all levels of the organization, according to the type of decision and the location of expertise. The redistribution of power, authority, and responsibility to the people closest to the customer allows self-managed teams to function autonomously, with little or no supervision.

Both self-directed teams and the decentralization of power are efforts to empower all employees by including them in the decision-making process. Empowerment is defined by Goski and Belfry (1991) as the distribution or sharing of responsibility throughout the organization. Devanna and Tichy (1990) believed this challenge can be met by empowering the middle and lower levels in an organization, so all individuals gain greater control over the decisions and resources which control their jobs and lives.

Organizations can facilitate the empowerment of employees, according to Bowen and Lawler (1992) by basing rewards on organizational performance; sharing information about organizational performance; sharing knowledge that enables employees to understand and contribute to organizational performance; and encouraging employees to participate in decisions that influence organizational direction and performance.

Management Strategies

Several researchers have shown that high performance firms encouraged entrepreneurial behavior by being more adaptable, more open in communication, more loosely controlled, more decentralized, and more participatory (Alvesson, 1990; Slevin and Covin, 1990). The following section will consider how the development of specific strategies—better communication, shared values, and trust—can enhance the formation of self-managed work teams.

Communication. Sinetar (1988) listed the following communication guidelines for organizations that want to be more creative and responsive to environmental changes.

- encourage three-way communication—downward, upward, and horizontal
- facilitate immediate feedback

- develop informal, cooperative relationships among diverse, multi-functional work groups

The importance of these guidelines has been confirmed by the work of Shea (1992), Pearce and Ravlin (1987), and Gladstein (1984). Open communication is facilitated by the perception that each contribution made between group members is important and has positive consequences (Shea, 1992). This realization enhances communication between heterogeneous group members and increases the variety of member resources that can be brought to bear on the team task (Pearce and Ravlin, 1987). Gladstein found that group ratings of open communication and supportiveness in the organization were positively associated with group ratings of satisfaction and performance.

Shared values. Pasmore (1988) indicated that successful sociotechnical systems have vision statements that proclaim publicly the intention of management to create an organization which values Theory Y (McGregor, 1960) assumptions. Galagan (1986) suggested that the organizational vision must support values like trust, openness, and a willingness to share information for Self-Managed Work Teams to be successful.

Devanna and Tichy (1990) construed "new way" organizations as flat network structures that have permeable boundaries between people and a strong set of shared values to guide behavior. A shared vision has the power to mobilize emotional energy through enhanced communication and teamwork. Organizations that want effective teams tend to value cooperation over competition. They support training for interpersonal skills,

sharing of information and knowledge, reducing the hierarchical levels, scheduling of frequent meetings, and striving for equal treatment (Pasmore, 1988).

All of these organizational changes tend to encourage team members to be committed to a vision and task, united in their purposes, empowered to accomplish their goals, and encouraged to strengthen their team vision (Tjosvold and Tjosvold, 1991). However, organizational policies and practices that value seniority, information hoarding, and control, are barriers to Self-Managed Work Teams (Lee, 1990). Kinlaw (1991) proposes that superior work teams can accomplish consistently high performance not by following rules but by sharing values. And shared values must reflect a balance between the need for heterogeneity, to promote problem solving and innovation, and the need for organizational and unity of action (Cox and Blake, 1991).

Team members who become completely attuned to the principles of self-direction, empowerment, and diversity as a means of maximizing each team member's contribution often motivate teams to achieve more than members had previously been able to accomplish (Wellins and George, 1991). It is the valuing and utilization of individual strengths within organizational groups that provides the foundation on which self-managed work teams stand.

Trust. Openness and sticking to vision are the best ways to build trust (Lawler, 1986). Devanna and Tichy (1990) perceived the gap that currently exists between the "old machine age" and the "new information age," as basically an issue of developing trust. They suggested that raising the level of trust in an organization is a requirement for moving towards a "self-directed work force." Organizational trust facilitates the dialogue

required to create an organic organization and to promote new skill levels that are demanded in a more democratic environment.

Kinlaw (1991) believed that trust makes it easier to feel included in a group and to become committed to the goals and values of an organization. In environments where people feel respected and trusted, conflict resolution will be easier and more effective. Shea (1992) proposed that by exploring differences in opinion, team members have the opportunity not only to achieve greater interpersonal understanding but to develop more trust when compromises are found. The development of trust tends to foster a more democratic organizational environment that is conducive to participation and shared responsibility (Sinetar, 1988).

Shea (1992), Galagan (1986), and Cummings (1978) all addressed the importance of trust in the successful implementation of self-managed work teams. When employees no longer see management as an adversary, trust becomes a powerful tool that can provide a sound basis for partnership between the individual and the organization. For Self-Managed Work Teams to succeed, employees must be trusted, empowered, and treated as professionals.

Team-Oriented Processes and Characteristics

Once industry becomes convinced of the efficacy of a team approach to providing training to employees, knowledge of team-oriented processes becomes significant for the manager. Although considerable literature addresses the topic of team training, recent reviews have noted the scarcity of behavioral guidance that may be used to develop and model team-training programs (Dubnicki, 1991; Lazes and Falkenberg, 1991). In today's

environments, however, many tasks require application of coordinated teamwork for successful completion. Few of these tasks are actually practiced in team situations or supported by training programs specifically designed to accommodate integrated team performance characteristics (Dumaine, 1994).

Some general guidance relevant to team training and performance does exist in the team process literature; however, concrete statements or guidelines which provide detailed applications for use in designing team training programs continues to be sparse. According to Dumaine (1994, p. 87) "Companies that use teams best generally still pay members individually, but with a significant difference: They make teamwork—a sharing attitude, the ability to deal with others—a key issue in an individual's annual performance evaluation." Dumaine (1994) has suggested that guidelines be developed and integrated with current instructional system development (ISD) procedures, or even that they be provided separately to training managers.

A variety of team-oriented processes and characteristics may be employed in the design and development of team training programs (Hamilton, 1992). Such characteristics may then be used to generate hypotheses for subsequent team training research and/or for the design of team training and procedures.

Commitment to a team concept requires a whole new way of classifying team processes. Swezey et al. (1983) have developed a system for classifying team training guidelines and characteristics. Their system may be used to organize team-oriented guidelines. Four categories of their classification system address team process principles:

- team mission and goals

- motivation and attitudes
- knowledge and skills development
- team training situational issues.

The domain of teamwork deals with process issues—the techniques or means applied to achieve an anticipated outcome. The Swezey et al. (1983) classification system proposes a logical way to organize teamwork guidelines as proceeding from those external aspects of a situation that serve to influence team performance—such as their category which they call mission and goals; through process issues *per se*—such as their motivation and attitudes category; and skills development; and to their fourth category, team training situational issues, which deals specifically with training issues facing teams.

Team Training Techniques

The present study investigated not only team training programs, but also training techniques. The literature concerning various techniques employed in programs that provide training to self-managed work teams will be discussed.

Although self-managed work teams exist in a variety of business and industry settings, these often employ a standard set of team training techniques (Holt, 1990). Although these techniques are basically generic, each industry selects and customizes a set of these techniques to use with their employees, as described below.

Case Discussion

Groups discussing cases is a frequently used training method in which participants, assisted by a training leader, analyze cases or discuss topics (Wellins et al., 1991). Cases provide a medium through which the trainee can study the application of management or behavioral concepts. Short case studies of typical problems faced by team members are presented to a group of three to six members. These individuals are asked to make decisions about problems involving productivity, disputes among fellow team members, worker-safety problems, and tardiness. They submit consensus recommendations for each. The exercise assesses judgment, communication skills, teamwork, and leadership. Colgate-Palmolive used such a group discussion exercise to help staff a facility in Cambridge, Ohio (Wellins et al., 1991, p. 149).

Equipment Operation

Teaching teams proper use of equipment requires specific training in the operation of equipment production methods that are directly related to performing team jobs (Wellins et al., 1991). Equipment operation encompasses all the technical knowledge and skills team members need for success on the job. These may include operating a press, loading software, and troubleshooting equipment. With empowered teams, these skills also can include knowledge of the organization's budgeting process and the ability to make capital equipment requests. Multiskilling makes extensive equipment operation training critical for successful individual and team performance.

In addition to on-the-job training, many companies take advantage of training programs available through state or local agencies. In the early 1970s, several Sun Belt

states began offering technical training as a way to attract industry, and the practice is now spreading to other regions (Orsburn et al., 1990). Georgia and South Carolina, for example, have "quick start" programs, which screen potential employees for a specific company and train them using a mock-up of the actual work setting, complete with equipment. The focus of this training is on the actual tasks the team is responsible for: operating a piece of equipment, processing a claim, and repairing a machine (p. 271). Since team members should continually be adding to their technical skills, technical training goes on throughout the life of a team (Keys and Wolfe, 1988). The specific training programs—and who takes them—grow out of the team's need for certain technical skills and out of individual members' abilities and interests. Technical training usually is a mix of formal classroom instruction, on-the-job training, and, when the team is mature, member-to-member tutoring. Basically, technical training varies according to the specific tasks of each team (Messmer, 1992).

Chaparral Steel, a successful steel company in Midlothian, Texas, encouraged team cohesiveness through promotion of the "Chaparral Process" (Dumaine, 1990). The steel maker strives to create super teams in which each member sees his or her job in relation to the entire organization and its goals. Commitment to cohesiveness and efficiency enables Chaparral teams to perform amazing tasks. Although the purchase and installation of new mill equipment is a highly complicated task for any steel company, and calibrating and fine-tuning the steel-making process can take years, a Chaparral team of four completed the world-wide search, purchase negotiations, shipment, and installation in one year.

Gaining Team Agreement

Sometimes called consensus building, this technique applies skills for group decision making (Wellins et al., 1991). In conventional companies, decision-making authority rests firmly in the hands of the managers who create systems and procedures, set performance standards, control and measure results, and take action. Workers in conventional companies, who lack the authority, skills, and information to make important decisions about their own work, simply carry out limited steps in a grand system they rarely comprehend.

According to Orsburn et al. (1990), the most distinctive and unsettling feature of the transition to self-directed teams is a gradual transfer of operational decision-making authority from managers to work teams. During a typical two-to five-year transition, work teams acquire new skills, use new information, and assume ever-increasing authority to make decisions affecting day-to-day operations.

In a bid to improve both quality and productivity, the auto industry has attempted to introduce work teams into its factories (Turner, 1989). Teams consist of multiskilled workers who are given far greater job-related freedom than in the past. Working together, teams like those at New United Motor Manufacturing, Inc. (NUMMI, a GM-Toyota joint venture at Fremont, California), work with little management supervision under a revolutionary manufacturing system. The Fremont facility already has seen spectacular gains in productivity. The plant was able to cut its work force in half while meeting all production schedules. Now, General Motors is attempting to introduce work teams throughout many of its other facilities. At NUMMI, job classifications are minimized, with

production workers in one category and skilled trade workers in two others. In some automotive plants there may exist over one hundred such classifications. Workers are then divided into small teams (usually of five), each with a leader who is a union member. Team members are trained to perform all the jobs assigned to their unit so that they can help out as the need arises. General Motors believes that this kind of cross-training is the key to having successful work teams. Employees are able to rotate tasks among themselves and reorganize work as needed. In addition, management has greater flexibility in the use of workers, since individual employees no longer are tied to specific jobs. Consequently, qualifications count more than seniority.

Group leaders, the first line of management, oversee several teams (Turner, 1989). They are equivalent to the foremen of a traditional auto plant, although the idea is that they should function as problem solvers rather than as drill sergeants. Team leaders are carefully selected and trained by management. They check parts and equipment, do some repairs, fill in for absent members, keep records, and coordinate work. That includes leading team meetings, looking for ways to foster quality and productivity, and encouraging members to provide suggestions for improving production.

Turner (1989) indicated that team members at Fremont have been given greater authority. Group members schedule work and assign tasks to individual employees. When special problems arise, members of the team meet together to solve the problems and address other issues that might influence the group's activities in the future. Although some work teams have been given the authority to evaluate individual performance and recommend pay increases, GM executives decided that Fremont work teams would

concern themselves only with day-to-day work activities. A majority of workers prefer the new system. One worker summed up the feeling, "we like being treated with respect, working in a clean and efficient environment, and having our advise and opinions actively solicited" (p. 41).

The work team concept has spread well beyond autos, into food processing, electronics, paper, oil refining, and steel making products. The idea is now jumping from manufacturing into financial services and insurance (Hoerr, 1989, July; Manz, Keating, and Donnellon, 1990; and Walton, 1977). At an LTV Steel Company plant in Cleveland, for example, teams of highly trained technicians manage a huge electrogalvanizing line practically by themselves and participate in decisions on hiring, scheduling of work and hours and operations planning (Hoerr, 1989, July).

Leading Meetings

Many executives believe that meetings are notorious time wasters (Jay, 1976). According to Jay, busy executives may spend up to 70% of their time in meetings at which participants doodle, drink coffee, and think about what they could be doing back in their offices.

Meetings need not be unproductive. Most meetings are called to process important information or to solve a problem (Kaplan and Greenbaum, 1989). The key to success is what the chairperson does. Most of the chairperson's contributions are made before the meeting begins. He or she should make sure discussions flows freely and follow up the meeting with agreed-upon actions. "Group meetings result in creative solutions to problems" (p. 426).

Technology can also lend a hand when people need to communicate in groups. Group communication used to take place in person, in the same room, but technology has given people a new degree of freedom. Through teleconferencing (which encompasses audioconferencing and videoconferencing via phone lines and satellite), it is now possible to conduct meetings with people who are scattered across the country or around the globe (Kupfer, 1992).

According to Finley (1991), in more traditional gatherings, when all participants can meet in one location, technology provides an array of presentation tools to make meetings more productive and more interesting. Overhead transparencies are clear sheets of plastic with images printed on them, which can be projected onto a screen for viewing by large audiences. The speaker might utilize a computer-driven presentation in which the computer's display is transferred to a large-screen television. Beyond creating visual materials, technology can even help groups make decisions and formulate plans. The team member can connect everyone through computers using group decision support systems, which range from simple vote-counting systems to advanced tools that help people consider a decision from various points of view.

Maintenance Techniques

There are three approaches to maintenance techniques (Chase and Aquilano, 1985). Preventive maintenance is performed before a breakdown occurs. Remedial maintenance is a complete overhaul, replacement, or repair of the equipment when it breaks down. Conditional maintenance refers to overhaul or repair in response to an inspection and measurement of the equipment's state. When American Airlines tears down

its planes' engines every 1,000 hours, it is engaging in preventive maintenance. When it inspects the planes' tires every twenty-four hours and changes them when conditions warrant it, it is performing conditional maintenance. Finally, if American Airlines' operations policy is to repair lavatory equipment on board its planes only after the equipment breaks down, then it is using remedial maintenance practices. The American Airlines example points out that the type of maintenance techniques depends on the costs of a breakdown. The greater the cost in terms of money, time, liability, and goodwill, the greater the benefits from preventive maintenance. That is, the benefits can justify the costs.

As organizations move toward self-direction, support functions such as maintenance and quality control often undergo a transformation as well. Wellins et al. (1991), have suggested that there are several methods organizations can use to integrate support functions into the team process.

- A considerable number of organizations continue to organize according to traditional support departments. In such cases, however, particular efforts must be made to change focus from a "the-team-serves-us" view to a "we-serve-the-team" attitude.
- A second option is for an organization to maintain separate support departments but establish formal liaisons between the work teams and these departments. In such cases, teams may appoint one member to be a "maintenance coordinator;" another a "safety coordinator;" a third a "training coordinator;" and so on (p. 49). When necessary, these coordinators seek out

the functional experts and take their skills and knowledge back to the work team.

- A third option is to integrate support functions into a work team. In these situations, either the team members learn support functions or an outside expert in the function becomes part of a team. An example would be inclusion of a maintenance expert in a team. The separate maintenance department then ceases to exist in the organization, or it is greatly reduced because a work team performs most maintenance functions. Divisions within IBM and Tennessee Eastman have adopted this third option. GE Rutland is moving in this direction by bringing some maintenance and engineering functions into its work teams. Similarly, Pfizer International, headquartered in New York, formed white-collar teams and incorporated within these teams many of the functions required for a product launch, including medical research, patent registration, and marketing.
- In some cases, support departments are organizing into their own self-directed teams and are implementing plans for multiskilling. In manufacturing operations, it is common for maintenance departments to form themselves into cross-skilled teams. This is true in most new North American Japanese automotive start-up situations such as Toyota in Georgetown, Kentucky; Subaru-Isuzu in Lafayette, Indiana; and CAMI Automotive, a joint venture of General Motors of Canada and Japan's Suzuki Motor Company. Associates in these teams are expected to acquire a full range of maintenance skills, including electrical, welding, and pneumatics (p. 50).

- In a few manufacturing companies, white-collar associates in support departments are also forming their own self-directed teams. Both Corning and Texas Instruments are experimenting with self-directed management information system teams (p. 50).

Making Presentations

Learning effective presentation techniques provides a good example of the importance of timing. Most self-directed team members will make presentations to managers, other teams, customers, suppliers, or others (Kupfer, 1992). Additionally, team members sometimes find themselves making presentations on their team efforts at professional conferences and symposia. Some organizations respond by providing a heavy dose of training in presentation skills as they start or convert to teams—when its value is not appreciated and its impact is diminished by the heavy load of other training provided at that time. It is better to offer presentation skills training when those who are attending have immediate opportunities to apply what they have learned. Individuals who have an opportunity to apply a new skill are much more motivated to learn than those who lack that opportunity.

Production Processes

Production processes are the tools used for implementing what has been termed "just-in-time" team training techniques (Wellins et al., 1991). Some previously discussed techniques—gaining team agreement, leading meetings, and making presentations—and a technique discussed later in this section—selecting team members— are techniques used in the present study to which the "just-in-time" training technique designation applies.

Hewlett-Packard, for example, at its Greeley, Colorado, plant, has created cross-functional committees called "boards of directors" to plan and oversee new projects in such product areas as computer tape drives, optical disks, and desktop publishing options (Ferguson, 1990). Such a "board" rarely includes managers or top executives. Instead, it includes lab engineers, technical writers, marketing representatives, manufacturing people, and even legal staff. Those front-line workers not only make daily design decisions, but even handle such details as product packaging, sales projections, and customer support plans.

Valentino and Christ (1989) showed that RCA is another company that has made innovative use of teams. In 1985, the company's Indianapolis-based Consumer Electronics Division launched an ambitious effort to develop a self-contained computer for its color television sets to improve both picture resolution and sound, and to offer remote control of all functions. Not only was the planned product sophisticated and complex, RCA intended to cut its typical four-year development time down to a record 30 months. To achieve this feat, RCA realized it had to move away from its traditional reliance on the design engineering function as the focal point for all new product development. Instead, the company adopted a team format, creating Natural Work Teams—groups of individuals from different functional units who could address every aspect of the production processes.

Because the work force at the Consumer Electronics Division had always been structured according to functions, rather than around products, management realized that this kind of restructuring would take work (Valentino and Christ, 1989). With the help of

an outside consultant, RCA offered classes in areas such as problem solving, developing design and performance reviews, and conducting effective meetings. The training paid off: With the teams in place, RCA cut its traditional product development cycle in half, and delivered the end product at less cost and with better quality than ever before.

As these examples illustrate, teams can be a potent organizational tool. Under the right conditions, and with the proper support and preparation, they can boost productivity, increase responsiveness, and improve morale. Moreover, those teams that bring together differing views, functions, and roles within the organization can create a broad-based perspective that is ideal for problem solving and decision making in today's complex business world.

Programmed Instruction

Programmed instruction is computer-assisted instruction in which the employee works at his or her own pace to learn material from a text that includes exercises and quizzes to enhance learning (Sutton, 1989). Several aids are available to trainers presenting information. Some aids can be used in many settings and with a variety of training methods. The most common ones are computer-assisted instruction (CAI) and audiovisual aids.

CAI allows team trainees to learn by interacting with a computer. Application of CAI technology is driven by the need to improve the efficiency or effectiveness of a training situation and to enhance the transfer of learning to improve job performance. Computers lend themselves well to instruction, testing, drill and practice, and application through simulation (Szabo, 1993).

Other technical training aids are audio and visual in nature, including audio and video tapes, films, closed-circuit television, and interactive video teleconferencing (Boser, 1991). All but interactive video are one-way communications. They may allow presentation of information that cannot be recreated in a classroom. Demonstrations of machines, experiments, and examinations of behavior are examples. Interactive video capability simple adds audio and video capability to CAI, but uses a touch-screen input instead of typing on a keyboard. These aids also can be tied into satellite communication systems to convey the same information, such as new product details, to sales personnel in several states.

Role Playing

Newstrom and Davis (1993) and Sugar (1990) have defined *role-playing* as a development technique requiring the trainee to assume a role in a given situation and act out behaviors associated with that role. Participants gain an appreciation of the many behavioral factors influencing on-the-job situations. Newstrom and Davis proposed that role-playing is spontaneous acting of a realistic situation involving two or more people under classroom conditions. Dialogue spontaneously grows out of the situation as it is developed by the trainees assigned to it. Other trainees in the group serve as observers and critics. Fotos (1991) observed that role playing is often considered a substitute for experience. He pointed out that in a sense it is more than experience because it permits techniques of observation, discussion, and emphasis that are not customarily a part of experience. Since people assume roles every day, they are somewhat experienced in the art, and with a certain amount of imagination they can project themselves into roles other

than their own. This idea is not new, because dramatics is as old as recorded history. The research suggests that in role playing trainees can broaden their experience by trying different approaches, while in actual situations they often have only one chance. People may, in two hours in a role-playing group, observe as many different approaches to a problem as they would in two years of normal experience. By evaluating these different ways of handling the same situation, they are able to see the strengths and weaknesses of each approach.

Newstrom and Davis (1993) concluded that role playing also has weaknesses that partly offset its strengths. It is time consuming and expensive. It requires experienced trainers because it can easily turn sour without effective direction and subsequent discussion. The trainees may resent it as a childish approach to serious problems unless it is introduced carefully. Some trainees are embarrassed and hesitant to take part. Conversely, other trainees may place more emphasis on acting and showing off than on the problem involved.

Harrington-Mackin (1994, p. 154) conducted considerable research on work team role playing methods, and proposes the following rules:

- Describe the role play as a laboratory setting where people can experiment with new behavior.
- Explain that the trainer may call "time out" any time he or she wishes to start over.
- Allow participants to critique the exercise.
- Allow viewers to give their opinions after the participants have spoken.

Because team members are responsible for detecting and controlling deviations from the design goals, commitment to the goals and acceptance of performance measures foster responsible self-assessment. Such commitment can be enhanced by allowing the designers to participate in goal setting and in creating performance measures (Lawler and Hackman, 1969).

Fotos (1991) extended Lawler and Hackman's research by studying how Continental Airlines is using cockpit resource management techniques in a large-scale training program for its technical and maintenance personnel. The aim of the program, which Continental calls Crew Coordination Concepts (CCC), is to improve safety and efficiency. Fotos surmises that the CCC program attempts to increase communication between team members, whether they are mechanics or pilots, and teach them how to identify the essential problem of a given situation and stick to solving it. If the CCC program is successful, one element in that success will be to convince technical personnel that they can take a more active role in running their own shops. Fotos points out that the two-day Crew Coordination Concepts program for Continental Airlines maintenance and technical personnel combines case studies, role playing, and personality assessments. The program is an attempt to change how people work with colleagues, supervisors, and subordinates.

Selecting Team Members

Research has suggested that the first step in setting up a good selection process is to define carefully the criteria for job success by using some form of job analysis (Goodman, 1986; Hackman and Oldham, 1980; and Wellins et al., 1991). Wellins et al.

conducted a survey which determined that a job analysis generates a list of the behaviors, technical knowledge, skills, and motivational areas that differentiate between successful and unsuccessful performers. A good analysis establishes a clearly defined set of job requirements or selection targets called dimensions against which candidates can be compared. A dimension is a description under which specific behavior, knowledge, or motivational elements that are associated with job success can be classified reliably.

According to Wellins et al. (1991), organizations which do not have an accurate list of well-defined job dimensions will waste time and effort evaluating the wrong attributes of applicants, often including elements related to gender, race, or national origin that are not job related. This causes inaccurate decisions and risks Equal Employment Opportunity problems. Dimensions defined through a job analysis focus on the selection process based on qualifications.

Ray and Bronstein (1995) proposed that if a selection system is being developed for a progressive organization, the job analysis procedure is straightforward. Job incumbents are interviewed about their job activities and challenges, and higher-level personnel are interviewed about the perceived differences between effective and ineffective performers. In large-scale job analyses, the interview data are supplemented with questionnaire responses and occasionally with direct job observation.

Research has shown that team member assessment decisions are based on application forms. One study by Ray and Bronstein (1995) showed that assessment involves private interviews with a sample of managers, employees, and, where applicable, union representatives. This process includes structured interviews done by individuals

outside the organization. Through this process a large amount of very useful information can be gathered and collated, to create an in-depth resource.

In shifting to the team concept, most organizations choose to identify or select their leaders (managers and team leaders) before selecting the team members (Wellins et al., 1991, p. 152). This is a common practice because leaders are often responsible for the technical training of new team members, as well as for other start-up or transition activities.

In gathering their data, Wellins et al. (1991) were disappointed that organizations did not use a more rigorous selection process in choosing their leaders. They found that often senior managers either think that they instinctively know who will make an empowering leader or believe that the leader's technical and organizational expertise is more important than other job-related dimensions. They are often disappointed. Because leaders usually encounter the most stress, and therefore might resort to autocratic behaviors under pressure, Wellins et al. strongly recommend careful assessment of all leader candidates—starting at the top.

Research provided by Ray and Bronstein (1995) concludes that with proper training in the technical aspects of the interview and selection process, teams will do a better job of hiring than traditional managers. In addition, teams have a strong commitment to making the process work and training the new person properly. This alone leads to a much higher probability of individual success and a greater degree of long-term group cohesiveness.

According to Zemke (1982), there is almost no comparative intelligence available for the training trade, but in these unusual economic times, it is sorely needed. Chief executives need standards for comparing the techniques and directions of their organization's training and development efforts. Zemke also stresses that training managers need information in their industry as well as in competing industries to perform their jobs more effectively.

Potential Linkages Between Training Providers and Industry

As the role of business and industry in the continuing education of the workforce has grown, so too have opportunities for cooperation between employers and training providers. However, lacking has been research into ways to sensitize training providers to the training needs and perspectives of business and industry.

Since World War II private sector employers have become a major force in the education of the adult public. According to estimates by Goldstein (1980, pp. 29 and 39), some 6.3 million employees participate each year in corporate-sponsored educational activities and corporate education expenditures amount to approximately $10 billion annually. According to Lusterman (1977), almost all large employers maintain training and development or education departments that provide a wide range of learning opportunities, most of them developed in-house. Smaller companies that lack a training department purchase training services as needed from a variety of suppliers, including both higher education institutions and non-academic organizations.

Higher Education

Educational organizations, particularly the continuing education units of local education agencies and postsecondary institutions, collaborate with business and industry in many ways that are mutually beneficial (Bushnell, 1978). Industry, for example, often requires access to specialized instructional expertise or facilities, and educational organizations are often concerned with tapping new sources of students. Yet despite these and other apparent advantages to increased cooperation, it is generally agreed that the extent of cooperative programming falls far short of what it might be. It is important, therefore, to examine closely what industry perceives as its education and training priorities and the factors that facilitate or impede closer cooperation with educational institutions.

Most of the literature on education-industry cooperation consists of exhortations calling for closer ties between employers and educational institutions and of case studies of jointly sponsored educational programs. Empirical research has been limited to descriptive surveys (Clark and Sloan, 1958; Lohr, 1980; Lusterman, 1977) in which education-industry cooperation has been just one of several topics studied in relation to broader issues of industrial education and education-industry alliance.

In general, these studies found that jointly sponsored adult educational activities are widespread and diverse in their purposes and forms. Lusterman (1977) in a national survey of businesses and industries employing 500 or more persons, found that three-quarters of these companies utilized "outside education-training resources during working hours for purposes of employee education. While no information was reported on the

relative importance of these outside resources, Lusterman (1977) noted that the role of colleges and universities is undoubtedly great, particularly since the bulk of the training was provided for managerial and professional-technical employees.

Strobach (1976) foresaw linkages between the private sector and higher education institutions as becoming increasingly important for companies, organizations, education, and our society. Clearly, educational institutions play a prominent role in the continuing education of the nation's workforce through cooperative programming with business and industry (Craig and Evers, 1981; Peterfreund, 1976). However, industry's perceptions concerning fertile areas for cooperative ventures and of factors that deter or facilitate linkages with educational institutions have not yet been carefully examined. Research targeted specifically on these questions could be of value to continuing educators who wish to initiate, expand, or improve cooperative programming with private sector employers.

Darkenwald (1983) stated, "Educational organizations ... collaborate with business and industry in many ways that are mutually beneficial. Industry, for example, often requires access to specialized instructional expertise or facilities, and educational organizations are often concerned with tapping new sources of students" (p. 233). Learning can occur at any time, in any place. The attempts of higher education and business to assume some larger degree of responsibility for the quality and content of individual learning in nontraditional settings can be seen as either assistance to or as intrusion on the efforts of individuals to find their ways in the world. Individuals are

intimately affected by the ways in which higher education and business carry out their respective responsibilities.

Lynton (1981) portrayed the world of corporate education and training. Summarizing the 100-year history of employer initiated education and training programs, he demonstrates that the "shadow education system" is coming to claim its rightful place as a major component of a larger adult learning system. He emphasized that the dramatic growth of this system during the 1970s reflected the increasing importance of training to corporate planning and development. As this function increases in importance, the desire of management to exercise close control over the content, staffing, scheduling, and costs of training also increases. Similarly, the importance of training also increases the visibility of training managers and staff within their organizations. Lynton makes a strong case for collaboration based on more open communications and greater use of a needs assessment approach to corporate-campus program development.

Garrison (1987) and Lusterman (1977) examined university roles in creating technological change and generally improving the process of technological innovation. Focusing on the role of technology in education, they reveal that continuing education must seriously consider the capabilities of various technologies and their role in the adult learning process. Garrison and Lusterman believe that there is an intimate relationship between living and learning, i.e., there must be a correlation between the real world of work and the learning process and the content of the curriculum.

After briefly reviewing the history of relationships between business and higher education, this section of the chapter will discuss the present setting for such alliances

from the perspective of two basic functions that characterize business-higher education collaboration: (1) A need for business-higher education collaboration and (2) examples of business-higher education collaboration. Issues and strategies for the future will then be presented.

According to Veysey (1965, p. 348), the 1890s marked the first time that student recruitment strategies were employed. Researchers catered to a wider clientele bearing such titles as "The Practical Value of a College Education," and "Does College Education Pay?" This period initiated the credentialing function of higher education and "old boy networks" that have become such core elements of the higher education-business human resource system. The core of the problem, and the critical element differentiating business-higher education relations eighty years ago from those of today, is that business and education were less equal institutions then, with few goods on either side worth exchanging. They spoke entirely different languages and envisioned for themselves entirely different purposes. Higher education could confer some legitimacy on those it touched but had few direct benefits of real scale to offer industrialists. Similarly, business and industry had little to offer higher education other than financial support of worthy research projects.

Strobach (1976) pointed out that a complex network of relationships has developed, and continues to develop, between business and higher education. The interconnections are interpersonal, interinstitutional, and intellectual in nature. The big universities are as affected as the community colleges and technical schools. Key factors in the creation of this network are:

- Corporate presence on the boards of trustees of colleges and universities, private and public, and domination of corporate staffs since World War II by college and graduate school trained managers and technicians.
- Consultant services provided by faculty members and extensive use of real-world sites and learning experiences for students.
- Availability of corporate and union tuition assistance.
- Ability of community colleges to penetrate the market for all types of occupational training, in part creating that market while transferring costs from employers to individuals and taxpayers.
- Improved career guidance, student placement, and employee recruitment processes that attempt to make postsecondary education more of an integrated function for the career advancement of individuals.

Without this intermixing of ideas and people, institutional collaboration would be impossible to achieve. Taken together with common interests in solving economic, production, and technological problems, these relationships form the basis for coalition building (Strobach, 1976).

Yet, all available evidence still reveals the modest influence of these relationships on the present activities of colleges, universities, and technical schools. Corporations account for only about 3% of campus-based basic research (Lusterman and Gorlin, 1980). With a few notable exceptions, few higher education institutions have made off-campus internships, cooperative education, and other experiential learning programs central methods within their curriculum. Career planning and placement information systems are

only beginning to have effects. While corporations may stand ready to be used more often as learning sites, their potential is relatively untapped . Use of tuition-assistance programs by nonmanagement employees rarely exceeds 3% of the eligible work force. The corporation that actively encourages management and other employees to pursue continuing education beyond immediate work-related training is exceedingly rare (Strobach, 1976). The great bulk of corporate human resource education and training thus far is performed in-house or through consultants and very little through campus-corporate programs.

There are many compelling reasons for employers and educators to seek collaboration. The nation needs a skilled, competent work force. The investment that employers make in skill development is becoming an increasingly significant factor in the price of goods and services. Colleges and universities are facing drastic change because of falling enrollments and criticism of quality performance. Obvious benefits would accrue to all—schools, employers, individual students, and workers, and the nation—if industry and education would turn some considerable attention to collaboration in serving work-force training and education needs.

The need for better relations between higher education and industry must be addressed. The task of meeting the educational needs of today's work force is larger than either can easily accomplish alone. In fact, the roles of educators and employers actually are in very little conflict. For example, there are substantial needs for continuing education and training for the employees of small businesses, which account for most of the nation's jobs. Yet a small business does not have the economy of scale to provide its own

employee education and training. This kind of need presents opportunities for local educational institutions to work with local employers and their employees. Community colleges have been foremost in meeting such needs, but the overall demand is large and, to a great extent, still unserved.

It is essential to start from a local perspective with an assessment of local needs, perhaps for a specific industry group. A small community in the Southwest may have vastly different needs from a large Northeastern city. And education-work relationships in the electronics industry may be vastly different from those in the health care industry.

One of the many potential avenues to enhance basic research and stimulate industrial innovation is strengthening the linkages between research and innovation and between the principal institutions involved in these activities—universities and industry. To focus explicitly on this subject, Prager and Omenn (1980) convened a small meeting of university, industry, and government representatives to obtain their perspectives on the status of, and potential for, formal university-industry research relationships of these kinds. The purpose of the study was to assess the potential for increased numbers of such relationships and enumerate the incentives for barriers to their establishment.

The Prager and Omenn study concluded that the time appears to be ripe for major improvements in university-industry relationships in science and engineering. The federal government can play a facilitative role in fostering university-industry cooperation primarily by providing incentives to such interaction. However, strengthening university-industry linkages—and thus enhancing the research-innovation process—will result principally from specific initiatives taken by individual universities and companies.

Ultimately, progress in this endeavor will depend on substantive interaction among academic and industrial scientists and engineers whose common interest in solving specific technical problems overcomes institutional barriers to university-industry cooperation.

The M.I.T. Polymer Processing Program was one of three centers established under the National Science Foundation (NSF) University Industry Cooperative Research Centers Experiment in 1973. One other center was established at North Carolina State University. The M.I.T. program has been successful in terms of eliciting industry support, gaining acceptance by the university, and producing tangible results. The program, which began with $500,000 in seed money from NSF, involved twelve firms that paid membership fees ranging from $29,000 to $100,000 per year, depending on their size and involvement. Over $500,000 was contributed to support approximately twenty-five primarily applied research projects (Prager and Omenn, 1980).

Industrial participants in strengthening the linkages between industry and universities include Eastman Kodak, General Motors, Goodyear, ITT, and Xerox (Baer, 1980). M.I.T. staff, faculty, and students meet quarterly with member firms to discuss problems, strategies, potential research projects, and results.

Although the firms suggest research projects, M.I.T. made the final decision on projects to be initiated (Brodsky, Kaufman, and Tooker, 1980). Research results were first shared with the firms to give them an opportunity to develop the ideas. Publications are encouraged as rewards for faculty. A committee of member firms and M.I.T. staff advises on policy matters including fees and patent policies. All patents are owned by M.I.T., which can license member firms.

According to Prager and Omenn (1980), the university and the member firms profit from this program in a number of ways:

> M.I.T. views this program as an excellent learning experience for students; a stimulus for faculty and students to innovate, a means of rapid technology transfer from research to application, a stimulus for broader university-industry interaction, and a means of opening up new disciplines. Industry benefits from new ideas and processes, a source of competent manpower at relatively low cost, timely assessment of current industrial practices, and having a bases for comparative evaluations of internal R&D (p. 382).

An example of corporate funding of university basic research by a single firm is the Harvard University-Monsanto Corporation program begun in 1975 (Prager and Omenn, 1980). Monsanto agreed to provide $20 million over a twelve-year period for basic cell research on the biochemistry and biology of organogenesis. Monsanto initiated this project because it lacked expertise in biology research. As a result of its long-range planning, Monsanto decided to commit resources to Harvard to explore this field while developing its own expertise in this area.

A charter agreement allows Harvard to use the funds for any project that fits under the general goals of the program (Prager and Omenn, 1980). Currently the money supports the work of personnel from several disciplines and departments. Each partner contributes specific resources to the relationship. Harvard provides a knowledge base in this field, personnel, and training. Monsanto suggests research directions and provides laboratory facilities and equipment. In effect, Harvard controls the research phase, while Monsanto controls the development and marketing phases.

A unique variation of consulting relationships involving students is described by Hencke et al., 1976). The program involved a visit by Yale graduate students to the

Texaco Research Center at Beacon, New York. The visit included in-depth discussion of current research problems with Texaco staff and a tour of laboratory facilities. A six-person student team was then given three days to prepare a report of recommended actions, which was subsequently presented to Texaco staff for evaluation and feedback. The project lasted one week and each student was paid a nominal fee. The students felt the program provided a new experience in teamwork and increased their understanding of industry problems. Faculty felt the program provided a rich addition to the basic graduate experience and an opening for future contacts with Texaco. Texaco received useful ideas and an opportunity to expose students to their needs.

Students in the Department of Industrial and Manufacturing Engineering (IME) of Western New England College (WNEC) are required to complete a three-credit design project during their senior year (Haffner and Maleyeff, 1995). These projects involve local companies and provide students with an outstanding hands-on, real-world, problem solving experience. In contrast to cooperative programs or internships, with these projects a student and a faculty advisor act as a consultants to the host company, helping it to solve a specific problem or to improve a portion of its operations. The project starts during the fall semester with the student formulating the project scope and objectives, as well as the specific steps required in the design effort. This effort culminates in a written proposal that must be approved by the college faculty and company sponsor. Each student, working with a faculty advisor throughout the entire project, must spend twenty to forty hours on the project proposal. The proposal is implemented and the project is completed in the spring semester. In early May the entire ICE faculty reviews the final written report.

Following their review, they submit the report to the company, and the student makes an oral presentation on-site. More than twenty local companies have participated in these design projects.

Haffner and Maleyeff's study (1995) showed that these partnerships have had a subtle but important impact on the curriculum. For instance, many classroom examples are derived from industry-based projects. Professors also take tangible examples (parts, components, subassemblies) to class to illustrate theoretical concepts. For example, a lecture on tolerance stacking is enhanced by studying assemblies and their components. A lecture on planning production for electronics plants is facilitated by examining raw silicon wafers and processed silicon wafers.

Haffner and Maleyeff reported that this partnership approach has taught professors at WNEC several important lessons. For this approach to be effective:

- faculty must remain involved in all activities
- activities must be interrelated
- activities must adhere to the educational goals of the department
- the scope must be controlled so that they complement students' knowledge

Continuing education activities are another category of university-industry exchange mechanisms. Continuing education activities include courses tailored to individual company needs and the establishment of university programs on or near company locations. For example, in 1950, Syracuse University established an off-campus graduate program for IBM employees (Brodsky, et al., 1980). The merging of computers and telecommunications in the early 1970s has resulted in the increased use of computer

conferencing (online education) and two-way (audio-visual) interactive telecommunications for academic use (Lusterman, 1977).

The essential point behind these examples is that the educational institution and the employee involved are addressing needs together. To do that, they have to communicate those needs to each other. Probably the most frequent criticisms of traditional education heard from training managers are lack of basic writing and speaking skills, curricula not relevant to current needs, and unrealistic career expectations of entry-level employees just out of school. Traditional educators have expressed fears about a dilution of academics and a loss of academic freedom. The only way for the concerns of both groups to be dealt with effectively is for them to explore education-work needs jointly to determine their relative roles and areas for collaboration.

One encouraging indicator is the growing collaboration of some of the educational societies, most of which are based in Washington, D.C., with constituencies involved in preparing people for jobs and careers (Haffner and Maleyeff, 1995). A good example is ASTD. ASTD held two invitational conferences for higher education representatives on the "Academic Preparation of Practitioners in Training and Development/Human Resource Development," one in 1979 and another in 1981.

Another area of potential collaboration lies in tuition assistance programs, perhaps the best-known tie between business and higher education. Such programs actually are used very little, despite the fact that most large employers offer some form of assistance to pay for courses taken outside of the organization—80% to 90% (Goldstein, 1980; Lusterman, 1977).

All the reasons for lack of participation are not clear, although there are many contentions about the barriers, depending upon the viewpoint of the group. Training managers often say that the courses are not appropriate (Lynton, 1981). Pro-labor groups sometimes say that management does not provide enough incentive or support. And employees often cite situational barriers, such as lack of time, child care, or transportation.

Nonacademic Sources of Training

A considerable variety of nonacademic sources provide industry with training of self-managed work teams. These include industry's own in-house training capability, outside consultants and trainers, outside seminars and conferences, and technical and vocational institutions.

In-house training. The popularity of in-house training has increased with the economic pressures that have accompanied a declining economy. Previously, it had been customary for many organizations to utilize out-of-house training programs (Nadler, 1976) offered by a variety of organizations. The training facility may be a local motel or an elaborate conference setting.

Reduction in available travel funds has forced industry to limit its contracts for public seminar activity (Nadler, 1976). Many of those organizations offering public seminars were forced to cancel well-advertised programs featuring national figures. For instance, the Jack Tar Hotel in San Francisco had one conference booking 300 rooms for five nights. When the meeting was actually held, only 16 rooms were used (p. 9).

To economize, organizations have turned inward to look for ways they can sponsor programs within their own organization. The internal Human Resources

Department (HRD) of one nationwide insurance company is virtually swamped (Wellins et al., 1991). Previously, the units of the organization (with decentralized HRD operations) would send personnel to out-of-house programs. Now they are asking their own internal HRD staff to meet their needs. The result is that this particular staff has been promised at least a 10% increase in budget and staff next year to meet the increased demand (Nadler, 1976, p. 9).

Employers provide programs of instruction in virtually every job-related knowledge and skill for employees from entry level through management (Craig and Evers, 1981). They employ instructors and other professionals to design, select, deliver, and administer the programs, which often are presented in employer facilities devoted solely to learning activities. Employers evaluate their programs and methods for effectiveness, and a growing number of larger employers' courses are recognized for college credit. Hundreds of tuition assistance programs also are made available by employers to their employees. In short, employers are the source of what amounts to a growing education system for their employees.

Nadler (1976) surmised that it is important for management to assess each external HRD experience, as related to each individual and as to its specific target within HRD. According to Nadler, where there is a lack of congruency among management, the trainee and the seminar leader as to whether the experience is training, education or development, it is highly likely that someone will be confused and disappointed.

As noted above, the reaction to reduced travel funds and other economic problems, should not be a reduction in HRD activity, but rather, should be a shift to meet

the need (Harrington-Mackin, 1994). In-house training is especially effective for (1) mid-sized organizations that cannot afford outside professional training for all levels of employees and that do not have an in-house training staff, and (2) people who enjoy being trained by their peers who can relate to their needs and concerns. Motorola, Macy's, and Texas Instruments are examples of companies that appreciate the importance of thorough training to remain competitive in the global marketplace. The popularity of self-directed work teams has led to new ideas in training (Messmer, 1992). "Cross-discipline" training enables employees to understand the relationship of their job to others so that everyone works toward the common corporate goal. "Integrative learning" uses team exercises to establish and reinforce effective teamwork habits (p. 26).

While the major portion of education and training expenditures are made by large corporations, middle-sized and small firms increasingly depend upon both "in-house" education and training and purchased programs or materials to maintain and upgrade the competence of their work forces (Craig and Evers, 1981). It is not unusual for firms with 200 to 300 employees to have their own training programs. Public employers—federal, state, and local governments—are heavily involved in employee training, too.

When more programs are being done internally, more internal resources must be provided. There are many reports of various organizations going back to an old technique—once again relying on supervisors and other line personnel to conduct HRD programs (Nadler, 1976; Wellins et al., 1991). According to Nadler, non-HRD personnel can be very effective, particularly where experience or technical know-how are crucial to the learning program. However, when an organization decides to utilize this approach

(sometimes called "training the nonprofessional trainer") they are actually buying into a complex system. It is more than just assigning line personnel to conduct sessions. Nonprofessional HRD personnel cannot be expected to utilize material, equipment, and exercises which have been designed for use by professional HRD persons. Provision of special training or education must be implemented for those who will be expected to conduct the learning programs. Further, feedback must be obvious so that the HRD unit can automatically assist the nonprofessional in conducting the program (Harrington-Mackin, 1994).

HRD training programs within organizations have moved in two directions: increased use of media and increased use of modules (Nadler, 1976). The increased use of media will require management decisions regarding the availability of financial resources. Media costs money! The increased use of modules means different kinds of programs and scheduling than previously. The scheduling of employees to participate in programs is usually a reflection of management policy regarding HRD. It may be necessary to re-think the existing in-house training policies.

Nadler's study points out that HRD programs are on the upswing. He concluded that organizations are re-examining their in-house training activities. The results appear to be increased rather than decreased activity.

Outside consultants and trainers. In determining whether or not to use an outside consultant or trainer, many organizations depend on organizational committees (Orsburn et al., 1990). It may be that conversation, reading, seminars, site visits, personal experience, and native intelligence give the committee members everything they need to

oversee a thorough feasibility study. When consultants are called in, the risks associated with disruption increase. Consultants have no vested interest in the organization. Unlike managers, they do not have to experience the pain of discarding old habits or the stress of personally leading others to accept new value systems (White and Wooten, 1983). However, an experienced consultant can point out the pitfalls, provide periodic feedback on progress, and in general help management avoid reinventing the work team (Harrington-Mackin, 1994). If, like most companies, management decides to bring in a consultant (Orsburn et al., 1990), management must be aware that finding a good one takes time. It is recommended that management examine available expertise within the company, ask various sites to recommend external people, and put out feelers through its internal network.

Outside seminars and conferences. Outside seminars and conferences can be used in both job-related and developmental training. Lectures and discussions are a major part of this training (Mathis and Jackson, 1994). Many organizations send employees to externally sponsored seminars or public short courses. These programs are offered by many colleges and universities and by professional associations such as the American Management Association (p. 303).

Some nonacademic entities associated with universities offer outside seminars and conferences for the study of work teams. This is often done in partnership with industries that utilize self-managed work teams. Such an organization is the Center for the Study of Work Teams (*Conferences, Research, Education*, 1991), located on the campus of the University of North Texas (UNT). The Center strives to establish working relationships

between researchers and practitioners, and to build an effective, worldwide network for dealing with work team issues. In 1988, in partnership with Texas Instruments, members of the UNT university community began designing an international conference on self-managing work teams.

In 1990, the UNT Center for the Study of Work Teams and Texas Instruments co-hosted the first International Conference on Self-managed work teams (*Conferences, Research, Education*, 1991). The interest and enthusiasm generated from the first conference indicated that the concept of self-managed work teams was being widely embraced as a new way of organizing work. Along with their enthusiasm about self-managed work teams, participants at the first conference expressed a strong desire to access more information on the team concept and to establish a source to which they could direct tough questions on the problems they faced implementing and developing teams.

A second major conference was conducted in 1994. Goals of this conference were to expand knowledge, build an information network, and link theoretical and practical aspects of self-managed work teams (The 1994 International Conference on Work Teams Proceedings, 1994). These conferences have become so much in demand that they now are held twice each year, in May and September. They recently were expanded from two days to three days, and present discussion sessions dealing with numerous issues related to self-managed work teams. Papers are presented by representatives from industry, consulting firms, governmental agencies, and universities as a means of sharing ideas at the

leading edge of research and implementation of work teams. They continue to be jointly sponsored by the Center for the Study of Work Teams at UNT and Texas Instruments.

The Third Annual UNT Symposium on Work Teams, conducted in 1995, focused on team leadership. Ten outstanding conceptual or theory papers from around the world were presented on various aspects of leadership (*Team Leadership: A Symposium*, 1995). In addition, special guest discussants from public and private organizations focused on practice by talking about the relationship of the theories to leadership issues in their organizations. Topics included transfer of leadership roles to team members, developing the skills of team members for leadership, self-leadership, superleadership, leadership and performance, changing the leadership paradigm in the organization, the changing role of the supervisor/manager, and the relationship between culture and leadership. A panel of experts shared their perceptions of the ideas presented each day and responded to questions from the audience. This advanced conference is appropriate for internal and external consultants and trainers, managers and supervisors, team facilitators and team leaders, and academics focusing their teaching and research on teams and leadership.

Many organizations encourage continuing education by paying for employees to take remedial or college courses. Employees often take courses at night, after their regular workday ends (Mathis and Jackson, 1994).

In a study by Townsend and Ryfun (The 1994 International Conference on Work Teams Proceedings, 1994) to evaluate skill levels in plant, the Test of Adult Basic Education (TABE Test) was administered to all employees at Heatcraft Industries, Buffalo, New York. The instrument measured employee mastery levels in math and

reading skills. Results showed that 50% of the plant was below eighth grade levels in math, and ninth grade in reading. Additional investigation also revealed that twenty-five percent of the employees had not completed requirements for either a high school education or a general equivalency diploma (GED). Additionally, as team training efforts started it became apparent that many employees had very low self esteem and little knowledge of the behavior that would be required in the future.

Technical and vocational institutions. Technical and vocational institutions are a state's premier provider of advanced technical education and technical assistance to industry (Lusterman, 1977). These institutions are responsible for developing and delivering exemplary instructional programs for the application of current and emerging technologies. Training opportunities are provided to blend theory and practice in technical areas by combining students with experienced faculty (Marland, 1974). As a result, technical-vocational students (as distinguished from degree-seeking students at the same institutions) master technical and interpersonal job skills. Students also acquire the abilities to think critically, make decisions and communicate effectively. Technical institutions place many graduates in positions of responsibility in business and industry due to their high level of technical knowledge, skill, and work ethic (p. 180).

Besides its technical education programs, technical-vocational institutions provide assistance to business, industry, and state agencies for community and state economic development (Marland, 1974, p. 185). Assistance includes assessment of employee training needs, new plant start-up and expansion training. Technical-vocational institutions

also provide work place literacy and new technology training, as well as retraining for displaced workers.

With the development and consumer commercialization of the computer, information and communication processes continue to change strikingly (Texas State Technical College Waco/Marshall, *College Catalog*, 1995). Utilizing the power and capabilities of computers, they control budgets, inventory, manufacturing processes, communication modes, transportation paths, environments, and even life-support systems. Literally, computers are involved in every aspect of life, and with ever-growing interdependence on computers, the need for fast resolution of complex problems that are associated with computer systems becomes critical—as does the need for skilled computer systems/networking technicians (p. 55).

Issues and Strategies for the Future

For the first time since the era of scientific management, a fundamental change is taking place in the way work is performed (Green, Amenkhienan, and Johnson, 1990). Fueled by global competition, new technologies, shortened product life cycles, and a philosophy of continuous improvement and higher expectations, some U.S. firms are experimenting with high-commitment sociotechnical systems that go beyond anything tried in the past. The new paradigm emerging from this effort is team-based management.

A government report on economic change and the American work force stated that the competitive workplace today is a high-tech environment requiring people who are skilled and technically competent (U.S. Department of Labor, 1992). The evidence

indicated that a higher level of education than usual is essential in self-managed work teams for them to be successful.

The Celcor division of Corning's Blacksburg, Virginia plant has been selected for numerous studies because of its national recognition. Its experience with self-managed work teams has been reported in *The New York Times*, *The Wall Street Journal*, *The Washington Post*, *Business Week*, *Time Magazine*, and industry trade journals.

Corning (a glass manufacturer) makes a strong commitment to its employees. The first six months consist of extensive training in technical and interpersonal skills. As much as 25% of all on-the-job hours are devoted to training (Hoerr, 1990). The level of responsibility increases rapidly. At the end of six months, all new hires, managers, and associates sign a prominently displayed board agreeing to abide by Corning's mission, values, and beliefs. New hires unable to adapt or keep pace during the first six months are "deselected" without prejudice. By the end of two years, all employees are expected to have mastered three skill modules. Job security is assured for those who continue to learn new skills.

Some of the extensive training received by team members (known as operations associates) takes place during off-shift hours (Hoerr, 1990). Associates are paid for time spent in training programs both on and off site. The ramifications are far reaching. In addition to Corning, companies such as IBM, Motorola, Xerox, Ford, AT&T, General Electric, Boeing, Kodak, Cummings Tractor, Polaroid, and Proctor & Gamble operate some teamwork plants. Juran (1991) cites team management and employee involvement as

the most important contributors of success emerging from a study of companies receiving the Malcolm Baldrige National Quality Award.

A Labor Department report referred to earlier (U.S. Department of Labor, 1992) stated that the increased need for education in the work place has created a polarization of high income, skilled workers realizing numerous benefits while a vast number of lesser skilled applicants receive low wage, temporary, or part-time work, or no work at all. Meredith and Shell (1988) observed that even if U.S. industry remains competitive, there is likely to be a significant decrease in manufacturing employment. Production jobs of the future are not likely to go to high school dropouts or marginal graduates. The United States, according to Hoerr (1990), is the only industrial nation that does not have a system for certifying the skills of high school graduates and linking school with the work place. College and technical school graduates, in fewer numbers, are replacing the lower skilled production workers of the past.

Several trends suggest that other firms are likely to be hiring more college-educated men and women for the factory floor. One of these trends involves the recognition that self-managed work teams require members with a greater range of learning capability (Offermann and Gowing, 1990). Persons with two to four years of postsecondary education have already demonstrated their ability to learn. Moreover, nearly all forecasts of work in the years to come project an increase in the level of skill needed to perform well. A Hudson Institute study determined that "more than half of the 18 million jobs expected to materialize by the end of the twentieth century will require advance skills, not a baccalaureate necessarily, but at least some training after high school"

(Fierman, 1991, p. 214). The effectiveness of work teams is largely determined by the employees' range of skills. For example, team members in another of Corning's ceramics plants in Erwin, New York are expected to progress through four levels of increasing skill mastery. Failure to complete the second level within two years will result in dismissal.

Corning and other firms are finding that for teams to be self-managing, members need to learn several different jobs within their teams and in various parts of the organization. They have to master certain jobs in considerable depth and are also expected to develop organizational and interactive skills typically reserved for managers (Wellins and George, 1991). The combination of new technologies, team skills, social skills, operational skills, and continuous improvement roles places a much higher level of expectation on members of self-managed work teams. While postsecondary education may not be a requirement for these positions, employers searching for the best candidates (and offering the best opportunities) are likely to be seeking graduates of vocational, technical, and community colleges, and even four-year institutions, in greater numbers.

Government reports indicate that traditional jobs for college graduates will fall short of demand by 30% in the current decade (Kleiman, 1992). Two studies by Department of Labor economists pointed to a continuing rise in the percentage of college graduates employed in jobs that do not normally require a college degree (Koretz, 1992). Coupled with demographic indications of an oversupply of college-educated men and women is the shifting of managerial and other responsibilities to front-line workers. A survey of more than 800 executives nationwide revealed that more than half will be organizing their work forces into self-directed teams within five years (Wellins and

George, 1991). Another survey, of 476 Fortune 1000 companies, yielded similar results. Half the companies surveyed indicated that they will rely more on self-directed work teams in the coming years (Schilder, 1992). Fundamental changes in the work place have coincided with a surplus of college educated youth. Today's high-tech factories require a different breed of worker. In the words of Michael Harrington, "... smart machines work much better if they are run by smart people (Goodno, 1991, p. 24).

It may be too early to conclude that Corning's example will be followed by other industries in the manufacturing sector. Few young people envision future work in a factory when they register for classes and pursue a college degree (Marshall, 1990). Too often, a mind set exists that people either work with their minds or work with their hands. The prospect of doing both has not caught on in most colleges and universities, and factory work is still regarded as an underutilization of educated talent. It may be necessary to reform schools and training programs so that future graduates are ready for the quality, productivity, and flexible demands of knowledge-intensive technologies and team based production.

Summary

With the impressive amount of energy, time, and money that is spent by corporations on education each year, employer-sponsored education touches the lives of a significant number of workers throughout organizational America. Companies have been reassessing the most effective and economic approach to providing these educational services to employees (Brody, 1987; *The Role of Training at 3M*, 1976; *The Role of*

Training at U.S. Steel, 1976;). Only by examining priorities and trends in training can one realistically explore the possibility for creating linkages between organizational training and other entities in the future.

Changes in the available workforce on an ever-increasing basis require industry to establish new training priorities, devise innovative ways to provide employee training, revise training budgeting paradigms, implement new training methods, and grant higher levels of autonomy to workers who are products of societal changes.

Commitment to a team concept requires a whole new way of classifying team processes, to include specifying a work team's mission and goals, increasing motivations and improving attitudes, knowledge and skills development, and practical considerations for developing effective team training situations. A variety of team-oriented processes and characteristics were proposed for the design and development of team training programs.

Beyond the commitment to a team concept is the need to find new approaches to organizational design that places a high priority on self-managed work teams. The intrinsic organic structure of the organization itself may require reengineering to emphasize formalization of teams, socialization within the corporate culture, assurance that training includes the how-to's of working together as a team, and redrawing organizational charts to reflect an intentional decentralization of power, deliberately dispersing it among workers at *their* levels.

Once industry makes the decision to commit its resources to provide team training, they are left with the question of what are the most effective and cost-efficient ways to provide that training. The "standard" set of techniques from tradition may not be the best

for today's workforce. A variety of team training techniques, employed by both higher education and nonacademic sources, were examined in detail.

Considering the changes in the American business environment, along with the economic challenges faced by industry, the opportunity for forming creative and more effective linkages between industry and providers of training has greater potential than ever before. The realization of the benefits and advantages both industry and training providers could receive in a productive partnership is an exciting possibility for the future of each. Such linkages do exist. This present study provides information that will help lead to more productive partnerships in the future.

CHAPTER 3. METHODS OF PROCEDURE

The major purpose of this study was to determine how a sample of self-managed work team members and leaders, in three selected segments of the manufacturing industry, rated the effectiveness of self-managed work team training programs (higher education and nonacademic sources), and techniques used in those programs. Specific purposes were (1) to compare the perceived overall effectiveness of higher education *programs* with nonacademic programs; and (2) to compare the perceived effectiveness of various work team training *techniques* employed in training by higher education and by nonacademic sources.

Construction of Questionnaire

The study consisted of surveys of self-managed work team members and leaders. These surveys were conducted by administration of a questionnaire designed specifically for this research project.

Development of the Questionnaire

A questionnaire, focusing on training issues with respect to team-building skills, was used as the survey instrument (Appendix B). The items used in the instrument were developed from "U.S. Training Census and Trends Report" (*Training*, 1983); "Developing Self-Managing Work Teams: An Approach to Successful Integration" by William Pasmore and Susan Mlot (1994); and "Measuring the Performance of Work Teams" by Jack Zigon (1994).

The questionnaire was divided into the following three parts:

- Part A provided general personal information including job title and function, education, salary, work experience, age, sex, urban location, and asked four opinion questions relating to corporate support of team training.
- Part B identified respondents' perceptions of the effectiveness of two different *program* providers as sources for work team training. Perceptions of effectiveness of training programs provided by higher education (two-year and four-year colleges, as well as universities) were compared with those same perceptions about nonacademic sources of training (in-house training, outside consultants/trainers, outside seminars/conferences, and technical/vocational institutes).
- Part C identified respondents' perceptions of the effectiveness of ten types of training *techniques*. Ratings of training techniques were assessed separately with sub-scores tabulated for higher education-provided training and for nonacademic sources of training. Training technique evaluations were also tabulated, to form a composite score for each technique.

A Likert Scale was constructed to assess each subject's perceptions. The Likert Scale is based on a format originally developed by Remsis Likert, and consists of a series of evaluative statements (or items) concerning an attitude object (Parasuraman, 1986). Each statement typically has a five-point agree-disagree scale, although the number of alternatives may range from three to nine (Zikmund, 1989). There are no standard descriptors and no standard scales. The scale designed for the questionnaire used in the

present study was composed of four equal interval steps: "Extremely ineffective," "Ineffective," "Effective," and "Extremely Effective."

Validity

The survey is considered a valid research instrument on the basis of the following specific validation steps which were taken during the design phase of this research project:

1. The researcher developed the three research questions and two hypotheses (cf. Chapter 1) upon which the content of the questionnaire was based.

2. A survey instrument was designed to provide information to answer the three research questions and test the hypotheses.

3. The questionnaire was reviewed for clarity and language by authorities in the field of questionnaire design and statistical analysis. Recommended changes were made to the instrument at this point.

4. Next, the questionnaire's content and format were checked by a pilot-test conducted in the field. A special version of the questionnaire (Appendix D), with evaluation items interspersed with questionnaire items and room for comments at the end, was utilized for this purpose. Thirty-five team leaders and team members at the Texas Instruments plant in Temple, Texas, became the pilot-testers. These individuals were knowledgeable about the information contained in the survey that was pertinent to the questions and the hypotheses of this study. They also had backgrounds identical with those who subsequently would be included in the study. The investigator conducted the pilot test with test subjects assembled in one room. A prepared script (Appendix C) was read to pilot test subjects to explain pilot test procedures. No feedback from pilot-testers

indicated any conceptual difficulties with the form or substance of the instrument, although such feedback was solicited (see Appendix D). However, the pilot-testers were extremely helpful in suggesting terms and phraseology which would be more familiar to those to be surveyed. They also were allowed to ask procedural questions of the researcher, and their questions were carefully noted so that directions to be printed in the final survey could be clarified. Every suggestion was carefully weighed and most were utilized in some way to improve the survey format and wording. Since pilot-testers were so typical of those who would become subjects, a comment, suggestion, or question from even one of the 35 pilot-testers likely could be representative of several, or even many, in the ultimate subject group. The instrument was fine-tuned based on feedback from this pilot test procedure.

5. The refined instrument was distributed to an independent panel of experts in the field of higher education (Appendix F). They evaluated it for face validity[1], content validity[2], and clarity. This panel consisted of 15 doctoral-level faculty members from the Schools of Business and Education at the University of Mary Hardin-Baylor.

6. Based on these procedures, it was determined that the survey instrument had sufficient validity to be administered to the sample to be studied.

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[1]Face validity means that the instrument appeared to those evaluating it to measure what it was supposed to measure, that the instrument in fact did solicit answers to the research questions and information to test the hypotheses (Lefrançois, 1991, p. 373).

[2]Content validity means that those evaluating it concluded that the *content* of the instrument did sample all important objectives of this study (the research questions and hypotheses) in proportion to their importance (Lefrançois, 1991, p. 373).

Sample Selection

The sample group utilized in this study consisted of 132 employees, each of whom was a self-managed work team member or leader. With 195 questionnaires delivered to training managers and assumed to be delivered to eligible respondents, the composite rate of return was 67.7%[3]. The sample was stratified across seven separate industrial facilities, representing three different segments of the manufacturing industry. The organizational structure of various industries cooperating with this study, and the relatively small number of employees whose functions qualified them to serve as subjects, made random sampling impossible. However, the subjects depicted a *representative* group of leaders and members of self-managed work teams.

Data Collection Sites

In selection of sites for data collection, this researcher initially consulted a list of attendees at a Symposium on Work Teams (Team Leadership: A Symposium, 1995). Initial selection was limited to organizations within the state of Texas. Telephone calls to some of the larger Texas organizations distinguished those which already were utilizing self-managed work teams from those companies which had no active teams as yet. An

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[3]This response rate was deemed acceptable for four reasons. First, in every cooperating organization responding to the survey was voluntary for the employee. The very nature of self-managed work teams gives them much autonomy, and their managers by design do not have the ability to require survey completion. Second, anecdotal information indicates that some potential respondents who had never attended college, or who attended but did not graduate, judged themselves inadequate to rate provider sources or training techniques, in spite of questionnaire instructions urging them to do so anyway. Third, according to Isaac and Michael (1987), the key condition to acceptability of a response rate is that the sample must represent, in all important respects, the parent population (p. 132), a requisite this study has been shown to meet. Finally, the resulting sample size of 132 statistically allows for a margin of error of ±8% (Rea and Parker, 1992, p. 131, Table 6.1). Although opinions vary, one author believes "a response rate of 50 to 60% can be considered satisfactory for purposes of analysis and reporting findings" (p. 85).

IBM manufacturing and development facility in the United States (but which requested anonymity with respect to location), also became a research site.

Three different types of industries were selected. They were chosen primarily because each of them utilized self-managed work teams.

- computer hardware manufacturing (Texas Instruments and IBM)
- software development (PDI)
- industrial electronics remanufacturing (Sunbelt Transformer)

As reported in Table 1, nearly three-fourths of the subjects represented the computer hardware manufacturing industry. Another one-fifth worked in software development. Computer-related industries, considered together, accounted for 91.6% of the sample.

Table 1

Industrial segment classification

Industrial Segment	Number	Percent of Sample
Computer hardware manufacturing	96	72.7
Software development	25	18.9
Industrial electronics remanufacturing	11	8.4
Total	132	100.0

Figure 1 shows graphically that the preponderance of subjects were employed in computer hardware manufacturing.

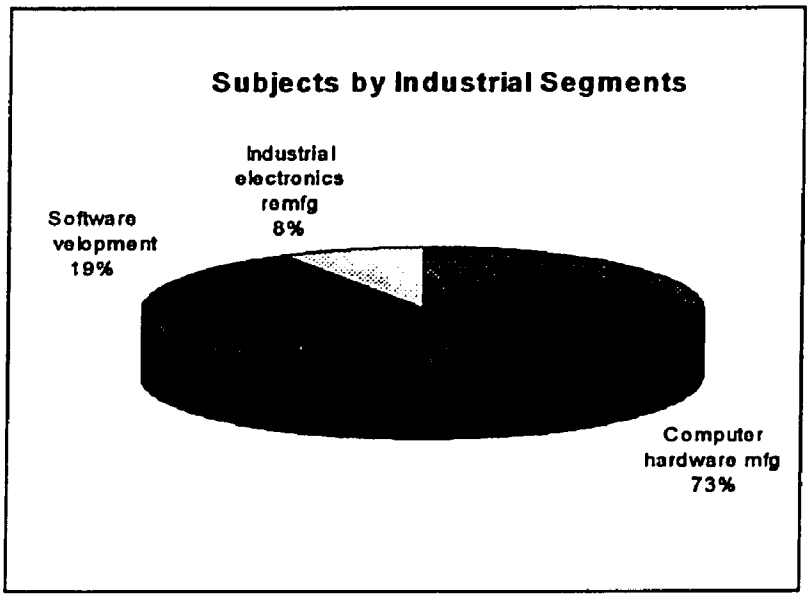

Figure 1. Proportions of the three types of industries from which subjects were selected

Participating Organizations

Each of the companies that provided research subjects will be described briefly, and the number of employees both eligible and available to participate in the study in each respective organization will be shown.

Texas Instruments. Manufacturing plants at Austin, Dallas, Sherman, and Temple; Texas, cooperated. Of the 120 surveys sent to TI plants, 69, or 57.5%, were returned.[4] Texas Instruments (TI) is at the forefront of the electronics industry with global strengths in the design, manufacture, and sale of semiconductors, defense electronics, computer systems, industrial control systems, electrical controls, and consumer electronics (*Job Choices: 1994 in Science and Engineering*, 1994). Headquartered in Dallas, Texas, TI

[4]One hundred questionnaires that were mailed to a TI location in the Dallas area were never made available to qualified respondents due to the training manager's sudden reassignment out of the country. Another 40 were delivered to TI in Houston, but before being distributed to potential subjects the training manager reconsidered her commitment to participate and withdrew from the study.

employs over 60,000 people worldwide, and maintains sales or manufacturing operations in more than 30 countries (p. 280).

IBM. An IBM manufacturing and development facility in the United States (but which requested anonymity with respect to location), participated. Of the 30 eligible subjected surveyed at this location, 27 (90%) were returned.

IBM is one of the world's most respected organizations. It is a leading innovator of advanced technology, with a well-known commitment to excellence (*Job Choices: 1994 in Science and Engineering*, 1994). IBM is in the business of information technology—with a range of products designed to help record, process, store, retrieve, and communicate information. Its products and services help solve problems for business, education, government, science, space exploration, education, and medicine (p. 92). Besides being such a large employer, IBM is a significant consumer of educational and training programs (see descriptions of its training involvement earlier in this chapter).

PDI. The corporate headquarters of this computer software developer made 30 subjects available, 25 of whom (83%) returned completed surveys.

PDI is the trade name of Professional Datasolutions Incorporated, a wholly-owned subsidiary of the McLane Corporation. They are a developer of computer software for other industries. Their staff consists of 95 employees in the Temple location surveyed (Adam HerrNeckar, personal communication, October 7, 1995). Their mission statement includes the challenge to be the leading provider of innovative systems and services. The product/project teams at PDI are organized as a team of peers based upon the Microsoft Development Framework. The training of teams at PDI is focused on the individual needs

of each group member. Beyond team building exercises, or infrequent team meetings discussing program design and structure, formal training is often provided at PDI as a function of the individual's motivation. The first day of employment is spent with an employment coordinator discussing company policies, procedures, etc. Cross-training or new hires lacking in experience are then provided with a self-paced, sample oriented in-house training regimen. This phase typically lasts two or three weeks, depending on the individual.

Sunbelt Transformer. This remanufacturer of power and electrical distribution transformers made 15 subjects available, and 11 (73%) responded.

This company has a total of 57 employees at the Temple, Texas, location which was surveyed (Dawson Clark, telephone interview by author, 26 October, 1995). Their mission statement described their company as a "team of qualified professionals dedicated to providing quality products and services to our customers, internal and external." Their owner informed this researcher that they are committed to continuous improvement through training and education, with creation of positive change being their goal (Randall Maddox, personal communication, September 12, 1995). Employees at Sunbelt are trained primarily through on-site workshops. The primary team training is accomplished through a 15-session course entitled "Quality Education & Training." The course consists of 15 two-hour sessions, which are generally conducted over a period of 10-12 weeks with a class numbering 8-12 students. The course is very interactive and the students actually divide into quality work teams to select, understand, analyze, and recommend changes to an existing problem within the company. Additional training at Sunbelt is conducted through

outside seminars conducted by local trade/professional organizations and national seminar companies. Most of their technical training for shop employees is conducted on-the-job, with infrequent special sessions led by agencies such as the Texas A&M University's Engineering Extension Service or product vendors.

Characteristics of the Sample

All survey subjects were serving as self-managed work team members or leaders at the time they were surveyed by questionnaire. They included both "white collar" and "blue collar" employees, and a representative cross-section of the types of industries that utilized self-managed work teams. This chapter presents several analyses according to gender since that is a very sensitive and relevant issue in today's work place. It will be shown in Table 10 and Figure 9 that there were only slightly more males than females in the research sample (53% male, 47% female). Nothing surfaced in the literature review to suggest what role gender plays in self-managed work teams, either with respect to interaction within groups, or with the choices made concerning group leaders. Since the sample in this study provides a very close balance between females and males, various analyses by gender provide interesting insight into this issue with respect to teams.

Job Positions. Titles reported by the subjects were examined to ascertain the administrative levels of positions within the work team structure. As shown in Table 2, exactly two out of three subjects were team members.

Table 2

Job Position of Subjects

Job Position	Number	Percent of Sample
Work team leader/facilitator	44	33.3
Work-team member	88	66.7
Total	132	100.0

Among the subjects were 88 (66.6%) who were serving as members of a self-managed work team, and 44 (33.3%) who functioned as team leaders (Figure 2). This resulted in a much higher proportion of leaders than hoped for. A 3:1 ratio was an objective of this study.

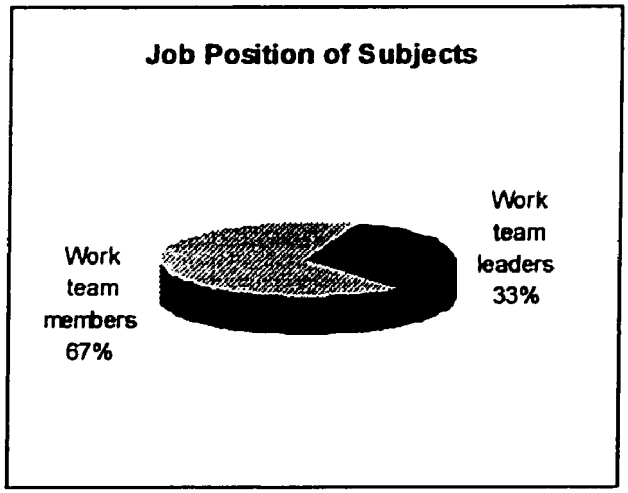

Figure 2. Job position of subjects

Education. Table 3 shows the number and percentages of respondents by levels of education. The category of educational preparation covered a wide spectrum from no high school diploma to a doctorate.

Table 3

Highest Educational Level of Subjects

Education	Number	Percent of Sample
No high school diploma	2	1.5
High school diploma	25	18.9
Attended college less than 1 year	12	9.1
Attended vocational school less than 1 year	3	2.3
Attended college 1 to 4 years but did not graduate	15	11.4
Attended vocational school 1 to 4 years but did not graduate	0	0.0
Graduated from vocational school	3	2.3
Graduated with an associate's degree	13	9.8
Graduated with a bachelor's degree	35	26.5
Graduate study without degree	9	6.8
Master's degree	14	10.6
Doctorate degree	1	0.8
Total	132	100.0

About one in four (26.5%) held baccalaureate degrees. Another 11.4% had attended college but did not graduate. Nearly as many (10.6%) held master's degrees, and

another 6.8% had attended graduate school. Less than 5% had ever attended a vocational school.

Because of the specificity of reporting items concerning educational level in the questionnaire, it is helpful to combine similar items to be able to see at a glance the major groupings. Figure 3 shows that three-fourths of all subjects had attended or graduated from college, with many having obtained part or all of a graduate education. This was a very well educated group.

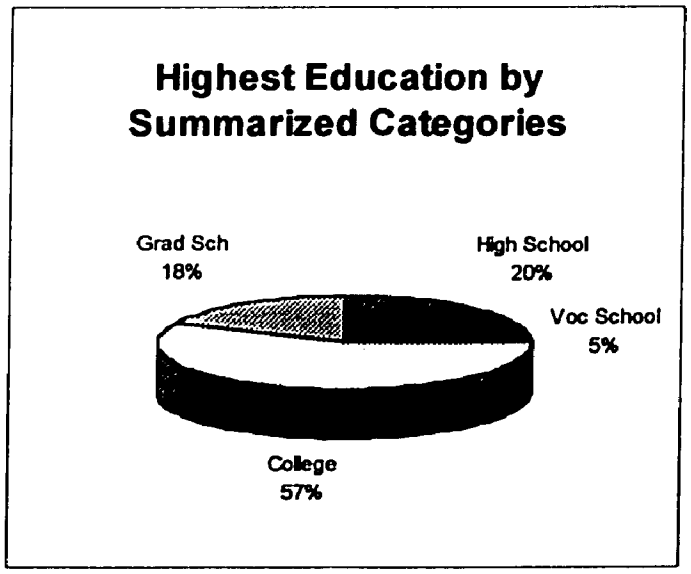

Figure 3. Highest educational level of subjects. The largest group had earned a bachelor's degree, while the second largest group of subjects were high school graduates.

When highest education data are analyzed according to gender (Figure 4), it becomes apparent that considerably more males than females benefitted from higher education. A high school diploma was a terminal graduation for three times as many female respondents as males. Approximately 10% more males had the advantage of college than females, and nearly 5% more males reported graduate education. It is

interesting to note that about the same number of females and males attended vocational school.

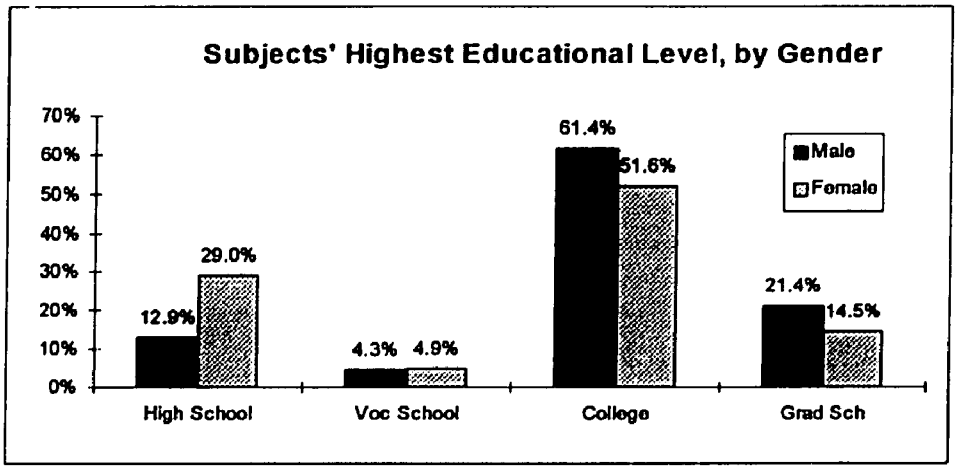

Figure 4. The education by gender chart shows that males achieved higher educational levels. Three times more females than males did not obtain formal education beyond high school graduation.

Salaries. With respect to salaries reported by the sample group (Table 4), the largest category was the $30,000-$39,000 range (*N=34*; 29.6%). Forty percent of the total sample made less than $30,000, and the number making less than $20,000 and those in the $20,000-$29,999 range were approximately equal.

When viewed graphically (Figure 5), the data reveal a distribution skewed from the highest category, $30,000-$39,999, to the lowest. However, about three out of ten subjects reported incomes in excess of $40,000.

Table 4

Annual Salary Range of Subjects

Annual Salary Range	Number	Percent of Sample
$10,000-$19,999	22	19.1
$20,000-$29,999	24	20.9
$30,000-$39,999	34	29.6
$40,000-$49,999	14	12.2
$50,000-$59,999	12	10.4
$60,000 and over	9	7.8
Total	115	100.0

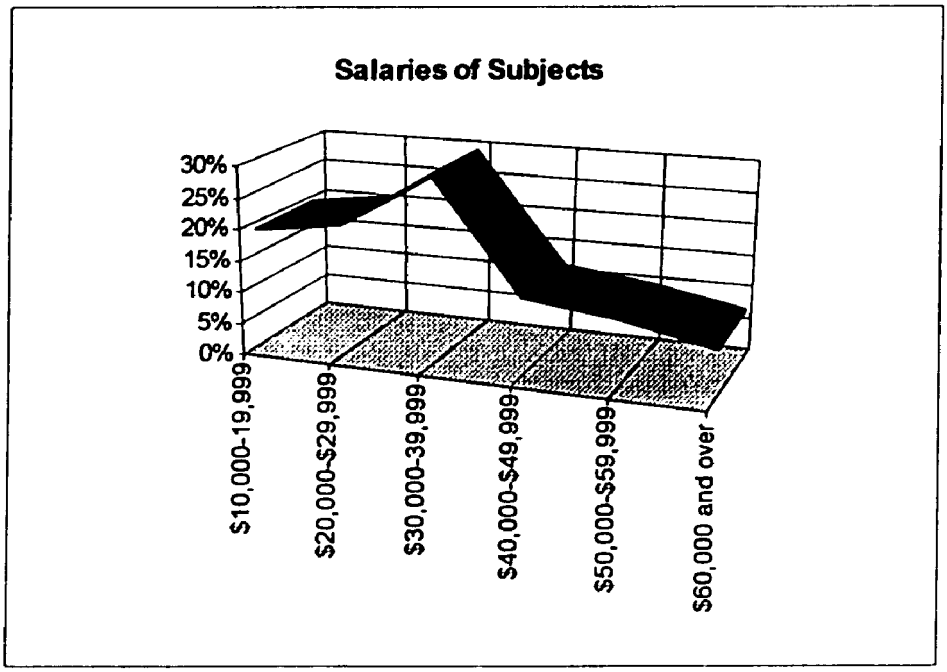

Figure 5. Salaries of subjects. The largest salary category was the $30,000-$39,999 range.

Since about half the subjects were female, the salaries of subjects were examined by gender (Figure 6). An inverse relationship existed between females and males in the $20,000-$29,999 range. Three out of ten females fell in this range, compared to only one in ten males. Salary equity seemed to exist in the largest salary category, $30,000-$39,999. Beyond that, however, the male subjects made considerably more money.

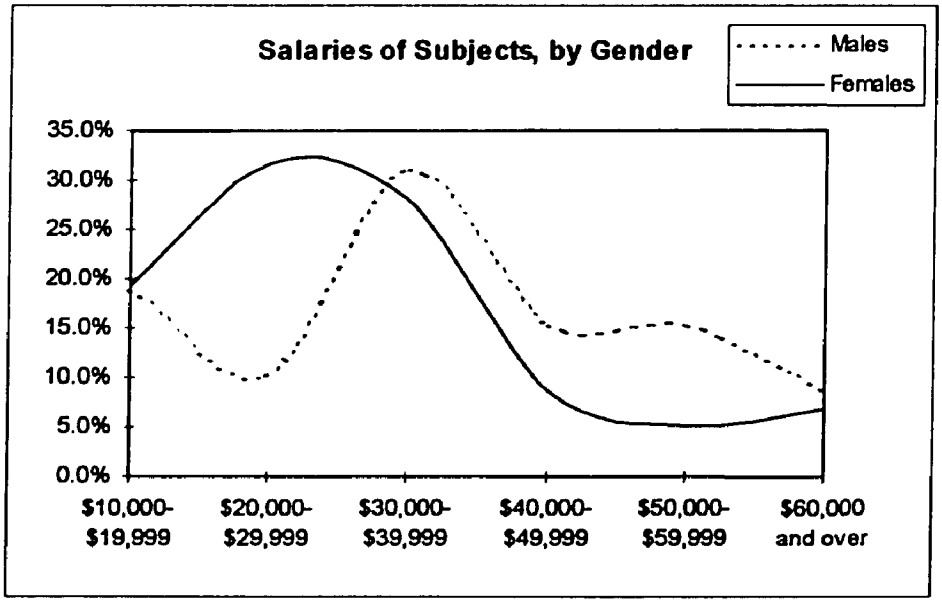

Figure 6. Gender comparison of salaries shows considerably higher salaries for male subjects than females.

Work Team Experience. Table 5 shows that the "average" work team member had nearly five years' experience, compared to about four years' mean team leader experience for the sample. The large standard deviation for the members indicates a much more diverse group with respect to experience. It may be assumed that there were some highly experienced team members, but also more than a few highly *in*experienced team members.

The team leader group appeared much more homogeneous with respect to their experience factor.

Table 5

Experience (Years) as a Work Team Leader or Member (Central Tendencies)

Job Position	Mean	Standard Deviation	Median	Mode
Work team leader	3.8	3.3	3	3
Work team member	4.8	5.2	3	3

Table 6 shows the work team experience as both members and leaders of a team for the sample group. The most frequently reported range of total number of years experience for team members was the 3+ years range, 36.5%, compared with 40.7% of the leaders. The second largest category of members were those with between two and three years of experience, while the most junior leaders (a year or less) were the second largest leadership group. Although about one in five members and leaders had been in their positions a year or less, the remainder of the sample reflect sufficient experience for respondents to be able to have informed opinions about the questionnaire items.

Data suggest that both the leaders and members were relatively inexperienced in self-managed work teams. As may be seen in Figure 7, there were many "junior" leaders with respect to experience. Most team members had three or fewer years' experience in self-managed work teams. Almost one in four leaders had less than a year experience.

Table 6

Years Experience as a Work Team Member/Leader (Categorized)

Years Experience	Team Member		Team Leader	
	Number	Percent of Sample	Number	Percent of Sample
One year or less	19	18.3%	12	22.3%
Over one year up to two years	15	14.4%	10	18.5%
Over two years up to three years	32	30.8%	10	18.5%
Over three years	38	36.5%	22	40.7%
Total	104	100.0%	54	100.0%

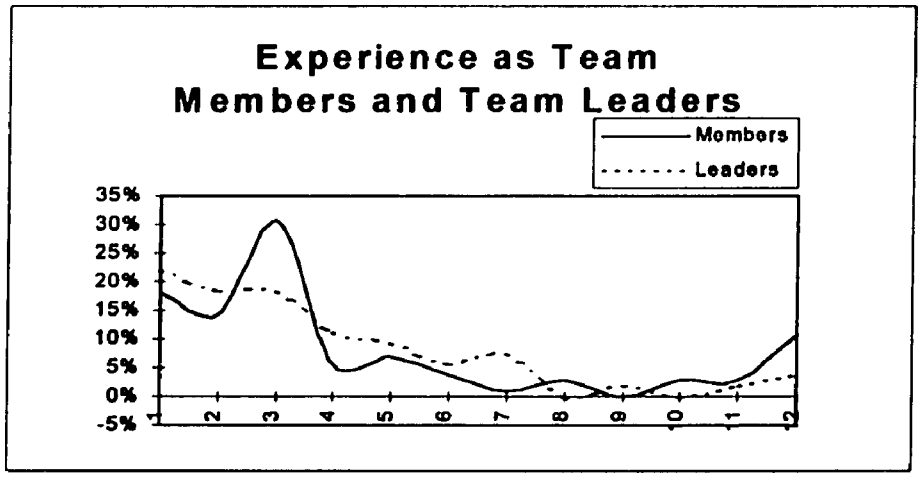

Figure 7. Experience compared for work team members and leaders.

Formal Job Training Experience. Table 7 shows the measures of central tendency for the distribution of the amount of formal job training respondents reported having received. The mean of 2.39, with median (middle score) and mode (most frequently occurring score) both being one year, all point to a lack of formal job training among the subjects.

Table 7

Years Experience in Formal Job Training (Central Tendencies)

Mean	Standard Deviation	Median	Mode
2.39	3.4	1	3.00

Table 8 reports the number of years in formal job training for respondents (in any employment). Examination of the individual data points shows that over half the subjects had a year or less of formal job training.

Table 8

Years Experience in Formal Job Training (Categories)

Years Experience in Formal Job Training	Number	Percent of Sample
One year or less	52	53.6%
Over one year up to two years	13	13.4%
Over two years up to three years	17	17.5%
Over three years	15	15.5%
Total	97	100.0%

The chart in Figure 8 demonstrates graphically the comparative formal job training inexperience of the subject group. About 13% had between one and two years of training; and 17.5% had up to three years formal training. Only 15.5% had more than three years of

training. Beyond that, frequencies fell off sharply, partially explaining the exceptionally large standard deviation in relation to the mean that is reported in Table 7.

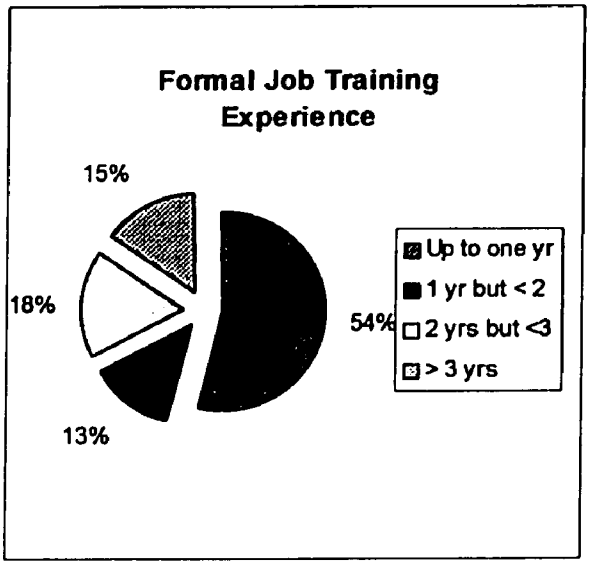

Figure 8. Formal job training experience of subjects

Since "formal job training" includes on-the-job training as well as off-the-job training, it may be inferred with considerable certainty that, as a group, the subjects had spent relatively little time in a formal job training program. The majority of respondents (53.6% of the sample) reported having had the benefit of only one year or less formal job training.

Age. There is evidence that the sample is a chronologically mature group. There were no subjects under 20 years of age, and about 70% of subjects were 30 and over (Table 9). The largest group (35.5%) of respondents (question 8) were in the 30-39 years age bracket, with almost as many (31.1%) in the 20-29 year range. The 40-49 year range accounted for 26.6%. Therefore, there was a fairly even balance among each of the predominant age categories. Only about 7% were over age 50.

Table 9

Age Characteristics of Sample

Age	Number	Percent of Sample
Under 20 years	0	0.0%
20-29 years	41	31.1%
30-39 years	47	35.5%
40-49 years	35	26.6%
50-59 years	7	5.3%
60 and over	2	1.5%
Total	132	100.0%

Gender. Among the 132 subjects who indicated their gender in responding to the questionnaire, there were only slightly more males (53%) than females (47%) in the sample (Table 10 and Figure 9).

Table 10

Gender of Subjects

Gender	Number	Percent of Sample
Female	62	47.0%
Male	70	53.0%
Total	132	100.0%

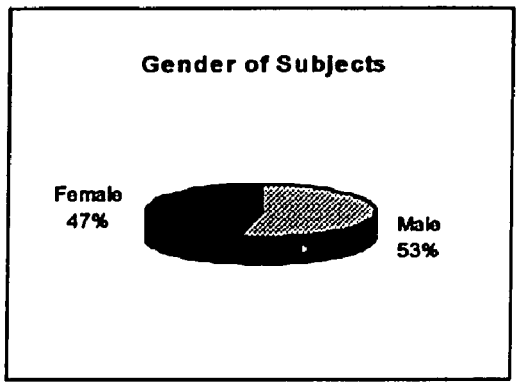

Figure 9. Gender of subjects showing males only slightly outnumbered females in the sample group

The data were examined to see how gender related to team leadership (Table 11). There essentially was a balance between female (51%) and male (49%) constituency of work team *members*. However, a different pattern emerges among group *leaders*. When data are analyzed from a gender perspective, it become apparent that there were considerably more male leaders than female leaders, at an approximate three-to-two ratio. Although the gender balance among team *members* closely resembles the proportion of males-to-females in the sample group (53% males, 47% females), a male dominance among leaders is clear (61% males, 39% females).

Table 11

Leadership Characteristics of Sample According to Gender

Gender	Team Leaders		Team Members	
	Number of Subjects	Percent of Sample	Number of Subjects	Percent of Sample
Male	27	61.4%	43	48.9%
Female	17	38.6%	45	51.1%
Total	44	100.0%	88	100.0%

Data Collection Procedures

Within every cooperating manufacturing facility a contact person, in each case a training manager, was selected. Because of contact persons' practical knowledge of the self-managed work teams in their respective organization, they were instructed in the sampling methods employed in this research and asked to select a well-balanced representative sample of work team members and leaders, maintaining a ratio of 3:1. To promote survey completion, all respondents were granted anonymity by requesting no information that could identify the individual. Surveys were distributed by the contact person and anonymously returned to the contact person, who in turn returned them as a group to the researcher. The contact persons were told:

> Each participant may complete the survey on their own and return it to you. But timing is crucial! All surveys must be completed and returned to me, via FedEx Next Day Delivery, in just *three business days* from the date of this letter. The enclosed mailing envelope is pre-addressed, and shipping charges are prepaid (Appendix E).

Comments from some contact persons indicate that the pre-paid return method was a key to their cooperation.

One hundred ninety-five survey instruments were distributed to individuals who function as either self-managed work team leaders or members. Of those, 132, or 67.7%, were returned. Figure 10 shows the response rates according to the various industries. The highest return rate was provided by the software developers (83.3%). The lowest (64.0%) resulted from the computer hardware manufacturing facilities.

Personal visits and telephone calls were made to training managers to explain the purpose of the study and to solicit their cooperation and encouragement of the participants. This appeal was reinforced by contents of a cover letter (Appendix E) which accompanied delivery of questionnaires to each plant.

Completion of the questionnaire generally required no more than 20 minutes. The time period for the collection of data phase of the investigation was limited to from three to five days at the survey locations. A total of 132 of the 195 (67.7%) distributed surveys was returned. Figure 10 shows the return response rate by specific types of industries.

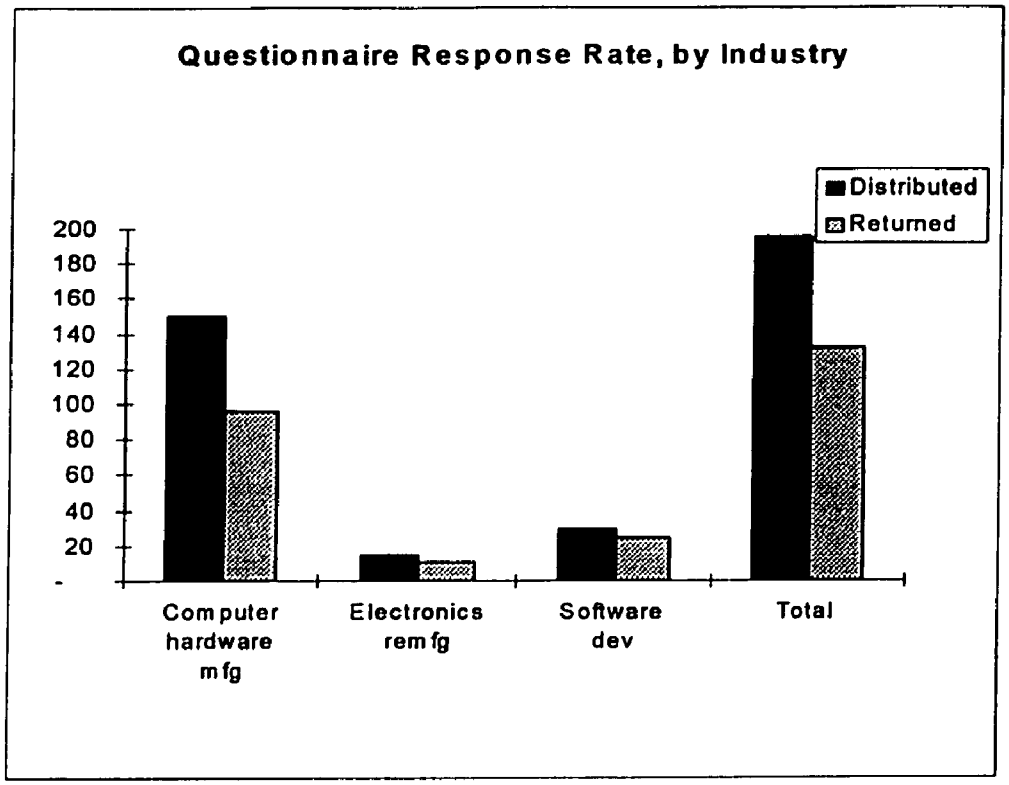

Figure 10. Response rate viewed by industry

Summary

Chapter 3 has identified the methods of procedure used by this study to achieve its purposes. The specific purposes were to determine how a sample of self-managed work team members and leaders, in a selected segment of the manufacturing industry, rated the effectiveness of (1) training *programs* offer by both higher education and nonacademic training providers, and (2) ten specific training techniques used by each type of provider. Construction of the survey instrument, sample selection, characteristics of the sample, and data collection procedures have been described. The next chapter presents an analysis of the data.

CHAPTER 4. ANALYSIS OF DATA

The data resulting from the research procedures described in the preceding chapter will now be presented. The methods used to analyze the data are described. Then, analyses of the sample and of the survey results are presented. Each of the two research hypotheses is evaluated in terms of the statistically analyzed results. To make it possible to consider the relationships among effectiveness evaluations of all techniques in the context of all other techniques, a weighted sum analysis of all ten techniques is depicted and discussed. Next, a detailed analysis of effectiveness ratings of each of the ten team training techniques is described. Finally, ratings given by subjects of their management's support for team training are summarized.

Method of Analysis

Statistical analysis of data relating to the research hypotheses included a Wilcoxon matched pairs signed-ranks test, correlated (paired) *t*-tests, frequency distributions and percentages of responses. Given time requirements, budget, and the magnitude of the consequences of drawing incorrect conclusions from the sample, this researcher selected a 95% level of confidence (5% chance of error).[5]

For data collected in Part B of the research instrument, a Wilcoxon matched pairs signed-ranks test was conducted to determine whether higher education or nonacademic

[5]The *level of confidence* is the risk of error the researcher is willing to accept in the study (Rea and Parker, 1992, p. 126).

sources (as paired data) was statistically the "greater," i.e., ranked higher by subjects (Siegel and Castellan, 1988). The *z* statistic was used for significance testing in Part B.

For data collected in Part C of the research instrument, correlated (paired) *t*-tests were utilized.[6] These correlated (paired) *t*-test analyses tested for significance of differences between subscale scores for higher education-provided training, and similar ratings of training provided by nonacademic training sources to include in-house training, outside consultants/trainers, outside seminars/conferences, and technical/vocational institutes. To compute these additive totals, valid responses had to be received for both higher education and nonacademic sources.

For the analysis of perceived effectiveness of training techniques, valid responses to at least seven of the ten items for both higher education and nonacademic sources were essential to calculate an estimated subscale score for any respondent. Reliability analysis employing Cronbach's Alpha[7] is provided for all subscale scores derived from Part C of the questionnaire.

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[6]A *t*-test is a statistical test for detecting differences between a population means. The correlated (paired) *t*-test is a "parametric test for the difference between two means when the two samples are not independent because the pairs of observations are linked" (Ott, Larson and Mendenhall, 1987, p. 321). Statistical treatment of paired data tests hypotheses functions basically in the same way as when there are two independent groups. For each pair, the difference between the two values was computed (Norušis, 1986, p. 220). However, instead of a normal distribution, a *t*-distribution, which is very similar, was used to accommodate the fact that standard deviations of the research population are unknown and must be estimated from the sample (Norušis, 1986, p. 200). The *.05* level of significance was used for both paired *t*-tests.

[7]Cronbach's "Alpha is perhaps the most widely used reliability coefficient" (Hull and Nie, 1981, p. 256). A response item is called *reliable* when there are valid reasons for believing the item to be stable and trustworthy (free of chance error). The correlation of test instrument with itself is called the *reliability coefficient* of the instrument (Garrett, 1958, p. 337).

Analysis of Sample

A total of 195 surveys was delivered to training managers at each cooperating industrial site, with the request that they make every effort to have the surveys completed voluntarily by eligible employees. Of the 195 distributed, 132 were returned completed and became the research sample, a response rate of 67.7%. Work team members comprised 66.7% of the sample (88 subjects), while work team leaders/facilitators accounted for 33.3% of the sample (44 subjects).

Analysis of the Survey Results

This study was designed to analyze how self-managed work teams in three selected segments of industry rate the effectiveness of team training programs and techniques used in those programs — provided by both higher education and nonacademic sources. Responses to questions regarding training program effectiveness and to various team training techniques were sought from the respondents in the field. The survey results are presented in this chapter and are focused on the two previously stated hypotheses. It should be noted that each of the hypotheses is stated as null to conform to the statistical rationale.

Hypothesis 1

> There is no significant perceived difference in effectiveness between the following work team training programs: (a) higher education, to include two-year colleges, four-year colleges, and universities; and (b) nonacademic, to include in-house training, outside consultants/trainers, outside seminars/conferences, and technical/vocational institutes.

Nonparametric mean comparisons. The Wilcoxon matched-pairs signed-ranks test was used to determine the statistical significance of the observed differences (Table 12). The mean rank, number of cases, matched signs (negative, positive, and ties) are shown. The negative ranks occur when the nonacademic source effectiveness is less than the higher education effectiveness. Out of the 117 who rated both sources, 16 considered nonacademic source effectiveness less than higher education effectiveness, 55 rated nonacademic source effectiveness greater than higher education effectiveness, and 46 said that nonacademic source effectiveness was equal to higher education effectiveness.

Table 12

Wilcoxon Signed-Rank Test Applied to Matched-Pairs

Mean rank of absolute value of differences	Number of cases	Sign	Matched Pairs		
			Source	Comparison	Source
36.4	16	minus	nonacademic	less effective than	higher education
35.9	55	plus	nonacademic	more effective than	higher education
	46	tie	nonacademic	equally effective as	higher education
	117				

z=-3.9880 Two-tailed $P = 0.001$ H_0 is rejected since $-1.96 > z > 1.96$

The most important finding is the 55-to-16 ratio of those who thought nonacademic training source effectiveness superior and those who considered higher education effectiveness the better. The value of z, corrected for ties, and a two-tailed

probability level are also shown in Table 12. In this case, the obtained probability level is .001, which is far lower than the .05 level of significance chosen for this study. Thus there is sufficient statistical basis to reject the null hypothesis and assert that (1) higher education effectiveness is viewed *differently* than nonacademic source effectiveness, and (2) nonacademic source effectiveness is viewed *more favorably than* higher education effectiveness. Figure 11 shows clearly that subjects had a strong preference for nonacademic sources of training.

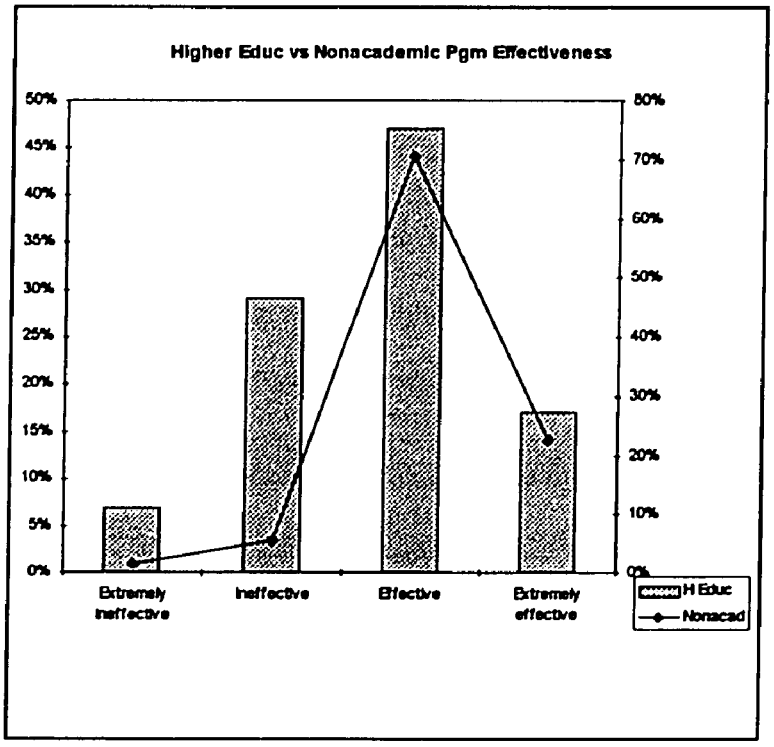

Figure 11. Effectiveness of higher education and nonacademic sources—a side-by-side comparison of the ratings

Subjects were asked to rate the differences in perceived effectiveness of work team training programs offered by higher education and nonacademic sources. The descriptors on the Likert scale in the questionnaire were labeled "Extremely Ineffective," "Ineffective," "Effective," and "Extremely Effective." Throughout the following

discussion the phrase "rated negatively" refers to the combined scores of the "Extremely Ineffective" and "Ineffective" categories; likewise, the phrase "rated positively" refers to the combined scores of the "Effective" and "Extremely Effective" categories. Most often, the discussion will cite the numbers in each specific (not combined) category.

Higher education. This item was given a response by 88.6% of subjects; 15 subjects (11.4%) left it blank. Of those 117 responding, 64% rated it positively (47.0% "Effective" and 17.1% "Extremely Effective" (Table 13). Three out of ten rated it "Ineffective," and 17% rated it "Extremely Effective."

Table 13

Ratings of Effectiveness of Higher Education Training Sources

Rating	Frequency	Percent
Extremely ineffective	8	6.8
Ineffective	34	29.1
Effective	55	47.0
Extremely effective	20	17.1
	117	100.0

Although more than six out of every ten subjects considered work team training programs provided by higher education to be positive in effectiveness, about three in ten rated it "Ineffective," and eight subjects, 6.8%, described it as "Extremely ineffective" (Figure 12).

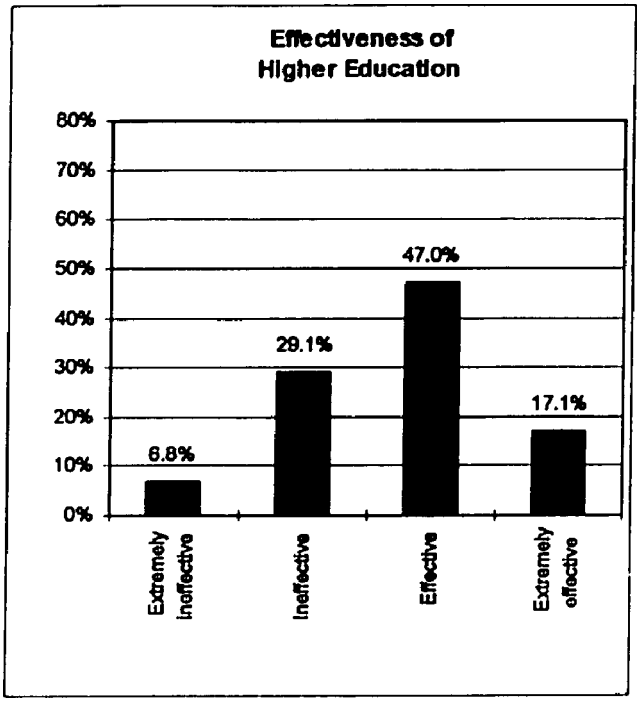

Figure 12. Ratings of effectiveness of higher education training sources

Nonacademic training sources. This item was given a response by 97.7% of all subjects, with only 3 subjects (2.3%) leaving it blank. Of the 129 who rated these sources, 70.5% rated them "Effective" and 22.5% rated them "Extremely effective" (Table 14).

Table 14

Ratings of Effectiveness of Nonacademic Training Sources

Rating	Frequency	Percent
Extremely ineffective	2	1.6
Ineffective	7	5.4
Effective	91	70.5
Extremely effective	29	22.5
	129	100.0

Only 7% described nonacademic sources negatively. Two people rated it "Extremely Ineffective" and 7 subjects rated it "Ineffective" (Figure 13.)

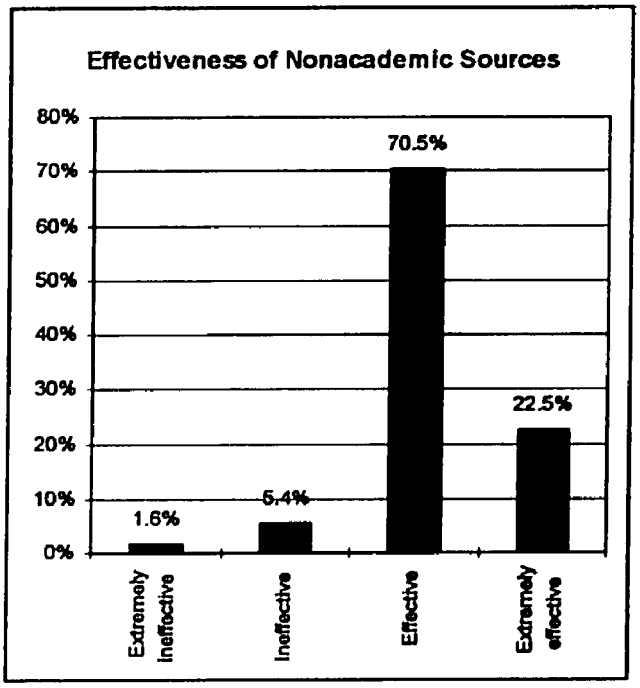

Figure 13. Ratings of effectiveness of nonacademic training sources

Does familiarity with a particular training source, as a function of one's own personal educational experience, appear to have a bearing on how a subject rates the effectiveness of a training source? To answer this question, effectiveness of each of the

Table 15

Higher Education Effectiveness Examined by Subjects' Educational Level

	Extremely Ineffective		Ineffective		Effective		Extremely Effective	
Subjects' Highest Educ Level	*N*	Percent	*N*	Percent	*N*	Percent	*N*	Percent
High School	4	19.0	2	9.5	14	66.7	1	4.8
Vocational School	0	0.0	2	33.3	2	33.3	2	33.3
College	3	4.2	18	25.4	34	47.9	16	22.5
Graduate School	1	5.3	12	63.2	5	26.3	1	5.3

two sources was examined in terms of the highest educational level categories of subjects (Table 15).

No consistent relationships appear to exist, but rather some puzzling anomalies were observed (Figure 14). Vocational school attendees accounted for the largest number of highest ratings given to higher education effectiveness, "Extremely Effective"; college alumni accounted for the second highest percentage of top ratings given higher education. Most subjects with a college background rated higher education "Effective." However, those who attended or graduated from high school assigned the largest number of "Effective" ratings to higher education. Graduate school attendees were critical of higher education training sources, and were the largest group to rate them "Ineffective." Another interesting pattern is that of vocational school attendees, a nearly equal number of whom rated higher education in each of the upper three categories, from "Ineffective" through "Extremely Effective."

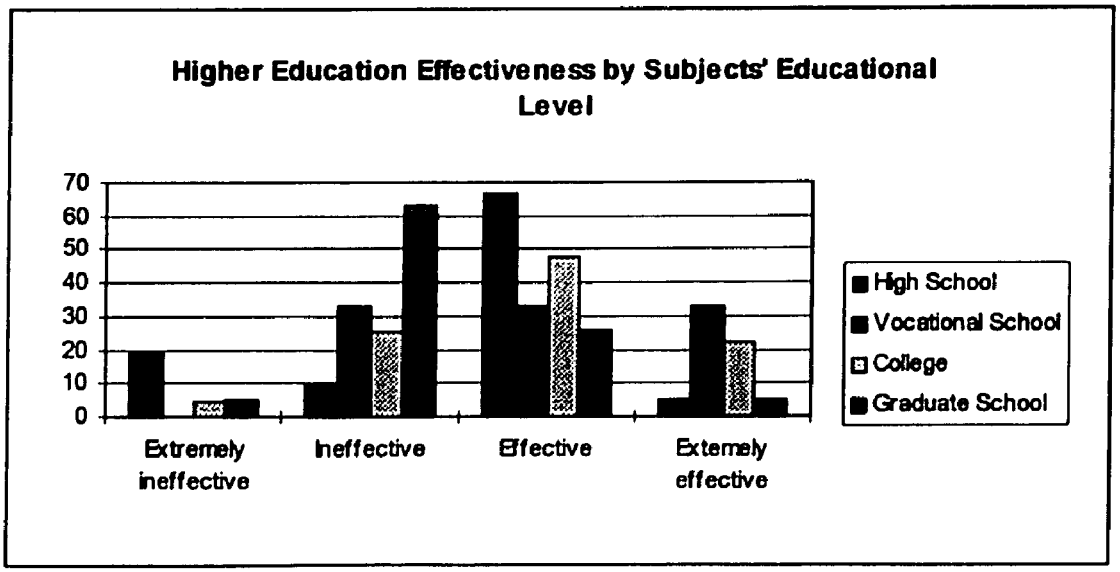

Figure 14. Higher education effectiveness by subjects' educational level

When nonacademic source effectiveness was examined by subjects' own educational level (Table 16), the homogeneity of responses in the "Effective" and "Extremely Effective" categories possibly obscures any strong rating patterns. However, two patterns were found in common in the analyses of both higher education and nonacademic sources, with vocational school alumni being the subjects most generous with their use of the highest category, "Extremely Effective," to express their opinions of both sources. High school alumni were those who most frequently chose the "Effective" rating to describe both training sources.

Table 16

Nonacademic Source Effectiveness Examined by Subjects' Educational Level

	Extremely Ineffective		Ineffective		Effective		Extremely Effective	
Subjects' Highest Educ. Level	*N*	Percent	*N*	Percent	*N*	Percent	*N*	Percent
High School	1	3.8	1	3.8	19	73.1	5	19.2
Vocational School	0	0.0	0	0.0	4	66.7	2	33.3
College	1	1.4	5	6.8	52	70.3	16	21.6
Graduate School	0	0.0	1	4.3	16	69.6	6	26.1

Neither alumni of higher education nor nonacademic sources demonstrated any undue bias in favor of the training source with which they were most personally experienced (Figure 15). Those who had attended graduate school appeared eager to express some disdain for higher education training experiences.

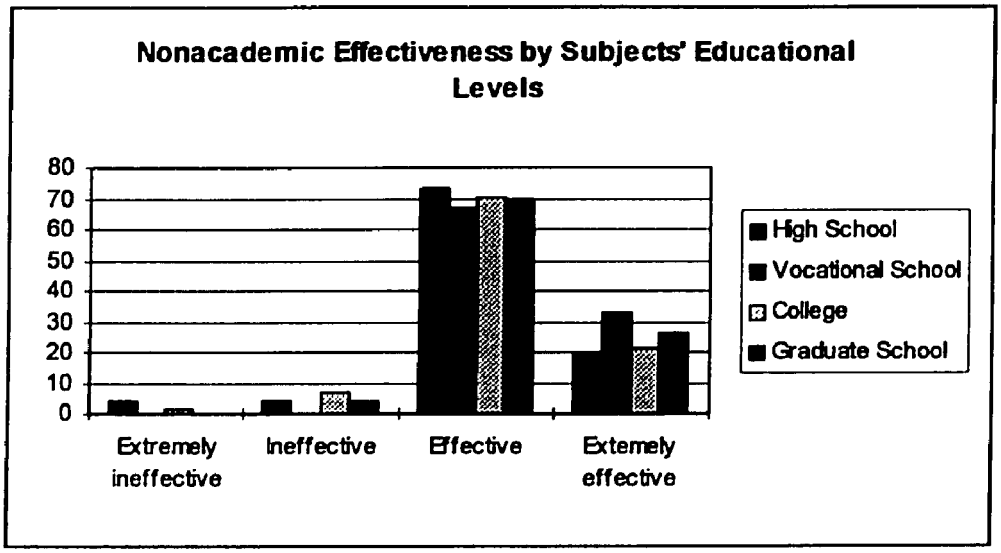

Figure 15. Nonacademic effectiveness ratings examined by subjects' own educational level

Hypothesis 2

> There is no significant perceived difference in effectiveness of various work team training techniques, provided by (a) higher education, to include two-year colleges, four-year colleges, and universities; and (b) nonacademic sources, to include in-house training, outside consultants/trainers, outside seminars/conferences, and technical/vocational institutes.

Part C of the survey questionnaire identified respondents' perceptions of the effectiveness of ten types of training techniques. Ratings of training techniques are assessed separately with subscale scores tabulated for higher education-provided training and also nonacademic sources of training. Training technique evaluations also are tabulated to form a composite score for each of the ten techniques.

In analyzing the results of Part C, correlated (paired) *t*-tests were utilized for detecting differences between the means. The *.05* level of significance was used for both

paired *t*-tests. These correlated (paired) *t*-test analyses tested for significance of differences between subscale scores for higher education-provided training, and similar ratings of training provided by nonacademic training sources. Then, reliability analysis employing Cronbach's Alpha was conducted for subscale scores derived from Part C of the questionnaire.

The range of the computed subscale scores is 10 to 40. Therefore, a parametric test procedure was chosen over a nonparametric procedure. For purposes of analysis, it was assumed that all distributions of Part C data were normal, that variance was homogeneous[8], and the data were continuous on an interval scale (range of 1 through 4 on the Likert scale). Therefore, a paired samples *t*-test was utilized to analyze these data relating to training techniques.

To compute these additive totals (subscales), valid responses had to be received for both higher education and nonacademic sources. For the analysis of perceived effectiveness of training techniques, valid responses to at least seven of the ten items for both higher education and nonacademic sources were essential to calculate an estimated subscale score for any respondent.

There were 121 subjects who answered 7 questions or more in Part C. As illustrated in Table 17, the subscale means are 29.3 for the higher education subscale total and 31.2 for the nonacademic total. Standard deviation is 5.46 for higher education total and 3.71 for nonacademic total. The difference between the two means is -1.9057. This

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[8]Homogeneity of variance is the assumption of equal variance on the basis that the null hypothesis asserts that the population means are equal. An implication is that for practical purposes, it may be assumed that the obtained means came from the same population (Kazmier, 1988, p. 222).

reflects the fact that the mean of subscale scores for higher education is 1.9057 points less than that same value for nonacademic sources. A two-tail correlation probability of .288 indicates that the correlation between higher education total and nonacademic totals in Part C is statistically significant at the .001 level. The obtained significance is far below the .05 level of significance established for this study. Thus there is sufficient statistical basis to reject the null hypothesis and conclude that self-managed work teams in the manufacturing industry view nonacademic sources as *significantly better than* higher education as providers of team training techniques.

Table 17

Paired Sample t-Test Analysis of Training Technique Subscale Scores

Training Source	*Cases (N)*	Subscale Means	Standard deviation
Higher education	121	29.3	5.46
Nonacademic sources	121	31.2	3.71
Overall		30.3	5.66
t=-3.71	df=120	Two-tail *P*=.001	

Training Techniques

Each of the ten training techniques which respondents were asked to rate in terms of effectiveness was analyzed. These techniques are among those used by both higher education and nonacademic training sources when providing self-managed work team training.

Weighted sum analysis of techniques. To facilitate comparisons among all the techniques, a weighted sum analysis was performed (Table 18). To obtain a weighted sum for each technique, the frequency of ratings for each of the four points on the questionnaire rating scale were multiplied by a weight, and then the results were summed. The weights assigned were -2 for "Extremely Ineffective," -1 for "Ineffective," +1 for "Effective," and +2 for "Extremely Effective." A zero would normally be used as a weight for a neutral point on the scale, but by design the scale used in this study had no neutral point.

Table 18

Weighted Sum Values and Ranks for All Techniques and Both Training Sources

Training Technique	Higher Education Weighted Sum	Ranks for Higher Education	Non-academic Weighted Sum	Ranks for Non-Academic Sources	Total Weighted Score	Total Rank
Case Discussion	76	4	108	8	184	6
Equipment operation	21	9	161	1	182	7
Gaining agreement	74	5	135	4	209	2
Leading meetings	66	7	138	3	204	3
Maintenance techniques	16	10	146	2	162	10
Making presentations	141	1	114	6	255	1
Production processes	52	8	129	5	181	8
Programmed Instruction	113	2	76	10	189	5
Role playing	105	3	88	9	193	4
Selecting team members	67	6	109	7	176	9
Mean	73.1		120.4		193.5	
S.D.	39.07		26.34		25.45	

The contrast of effectiveness ratings of training techniques used in higher education, in comparison to those same techniques used in nonacademic training settings, is strongly apparent in Figure 16. The weighted-sum mean of the ten techniques used in higher education was 73.1, compared to a mean of 120.4 for nonacademic sources. The

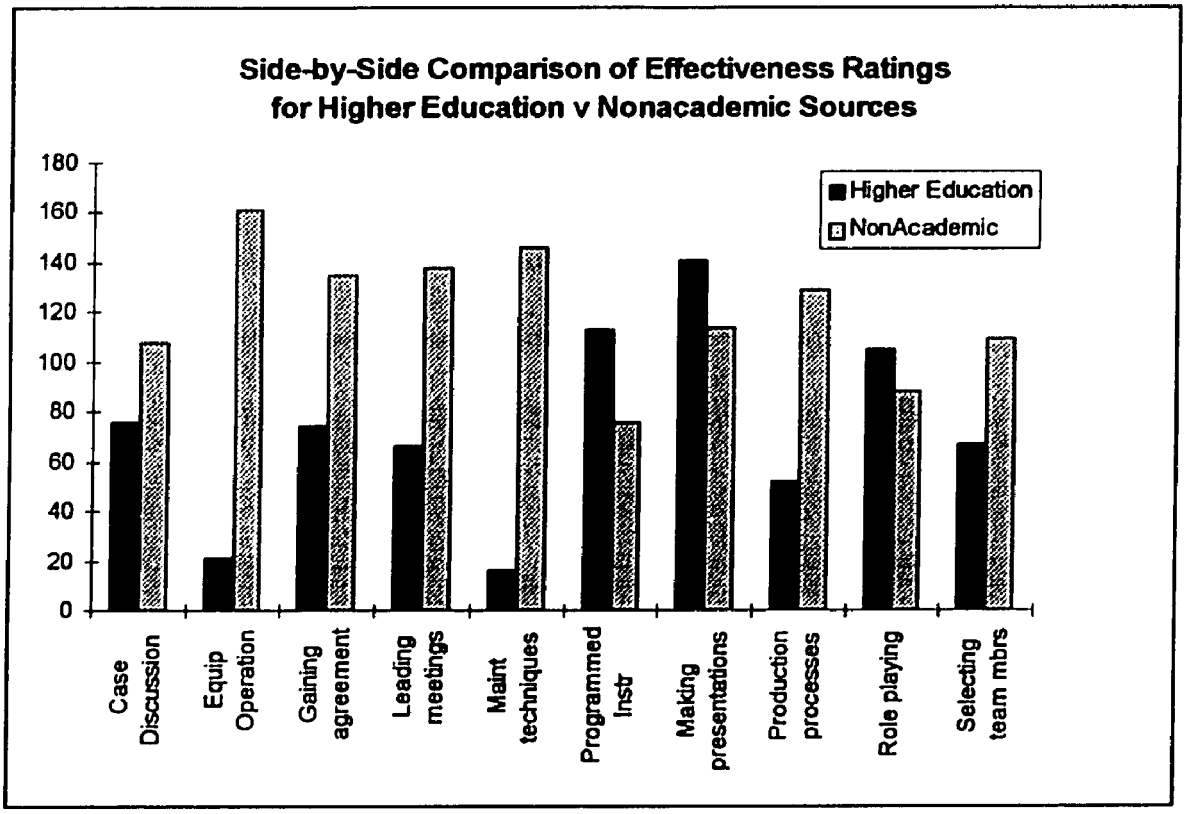

Figure 16. Weighted sum comparisons of techniques by source

standard deviation provided some insight into the relative agreement of subjects for each training source. The standard deviation of 39.07 for higher education, compared with a standard deviation of 26.34 for nonacademic sources, shows that there was much more agreement among subjects about the effectiveness of nonacademic sources. Taken as a group, subjects were far less in general agreement about the comparative effectiveness of the ten techniques when offered by higher education training courses.

The relative strengths of nonacademic sources are examined next, with the weighted sums shown in parentheses. Highest rated among nonacademic sources was teaching equipment operations (161). Rated very closely were the next four highest, in

descending order of rank: maintenance techniques (146), leading groups (138), gaining agreement (135), and production processes (129). Nonacademic sources did not receive any very low effectiveness ratings in their teaching of any technique. The two with the comparatively lowest rankings were programmed instruction training (76) and role playing (88). It is interesting to note that they were rated much lower than the eighth-ranked technique among nonacademic sources, case discussion (108).

The relative strengths of higher education sources are discussed next, with their weighted sums shown in parentheses. Higher education received ratings superior to nonacademic sources in only three techniques. The highest-rated higher education technique was teaching students how to make presentations (141, or 25% higher than the second-ranked technique). Next highest was programmed instruction (113), which includes computer-related methods, followed by teaching role playing (105). All other seven techniques received notably lower ratings, ranging from weighted sums of 76 down through 16). It may be noted that higher education's fourth-highest rated technique had the same weighted sum as nonacademic sources' tenth-highest rated technique, again calling attention to the fact that the very same techniques, when employed in higher education training programs, were considered far less effective.

Figure 17 is an area chart which allows it to show quite clearly (1) the total evaluation of each technique, and (2) what proportion of the total evaluation is accounted for by each of the two training sources. The techniques rated most different between the two sources were equipment operations and maintenance techniques. The techniques rated

most similar between the two sources were role playing, making presentations, and case discussion.

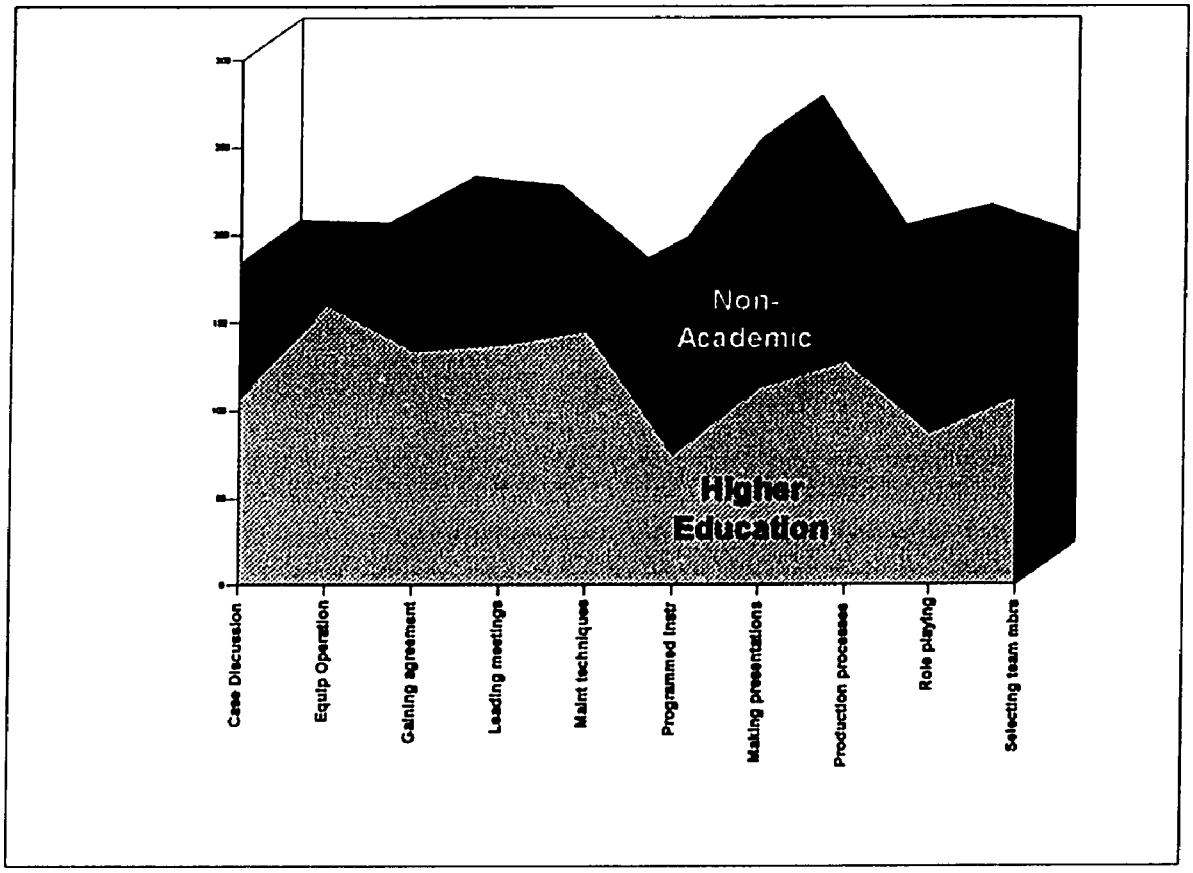

Figure 17. Weighted values of training techniques, showing proportions and cumulative totals

The foregoing analyses provide an overall comparison of the ten training techniques. Results for each technique individually will be presented. For each technique both a table and a graph show the effectiveness ratings of use of the technique by higher education compared with use of the technique by nonacademic sources. Frequencies and percentages for each of the four Likert scales from Part C of the questionnaire are reported.

Case discussion. This technique was rated fourth in higher education, eighth in nonacademic sources, fifth overall). Most subjects rated it "Effective" (Table 19). More considered it effective in a nonacademic source delivery system (63.9%) than when case discussion is taught in higher education (51.8%).

Table 19

Case Discussion Training Effectiveness Comparisons

	Higher Education		Nonacademic Sources	
Rating	Frequency	Percent	Frequency	Percent
Extremely ineffective	6	5.3%	1	0.8%
Ineffective	23	20.2%	18	14.8%
Effective	59	51.8%	78	63.9%
Extremely effective	26	22.8%	25	20.5%
	114	100.0%	122	100.0%

Just over one in five considered it "Extremely Effective" in both settings (Figure 18). Five times more subjects judged higher education "Extremely Ineffective" though the total number of subjects choosing this category was small. One in five found case discussion "Ineffective" when taught by higher education, compared to 15% finding it "Ineffective" in a nonacademic setting.

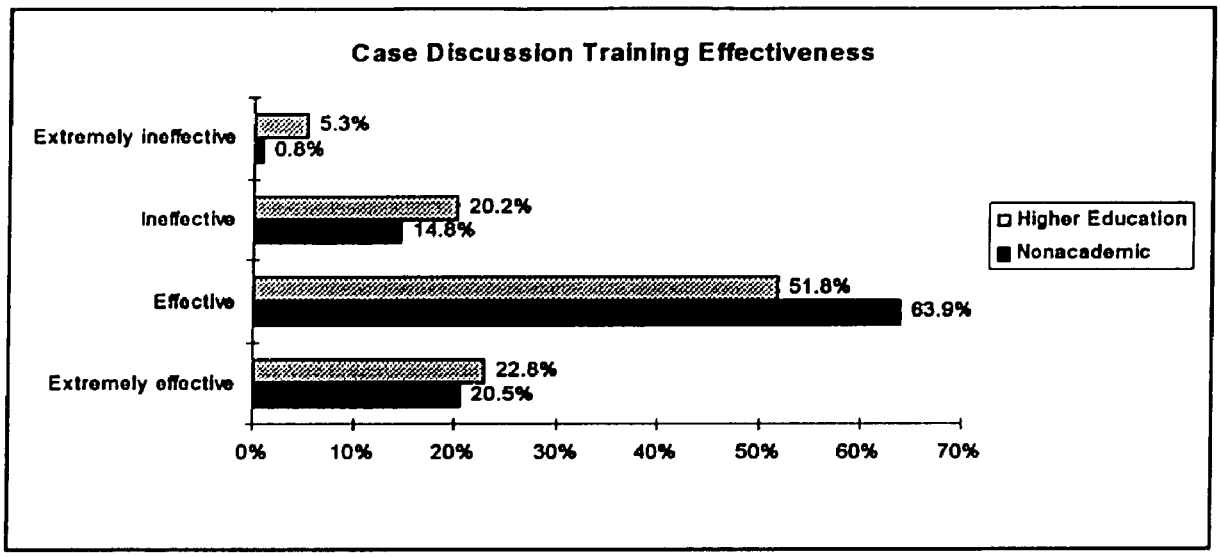

Figure 18. Case discussion training effectiveness compared by source

Equipment operation. Ratings were so high for nonacademic sources that this technique was nonacademic sources' highest-ranked technique, compared to ninth among higher education sources, and seventh overall. An overwhelming 94.4% of all subjects rated this an "Effective"or "Extremely effective" technique in nonacademic settings, compared with only 56.9% positive ratings awarded to its use in higher education (Table 20).

Table 20

Equipment Operation Training Effectiveness Comparisons

	Higher Education		Nonacademic Sources	
Rating	Frequency	Percent	Frequency	Percent
Extremely ineffective	13	11.2%	2	1.6%
Ineffective	37	31.9%	5	4.0%
Effective	48	41.4%	66	52.8%
Extremely effective	18	15.5%	52	41.6%
	116	100.0%	125	100.0%

Clearly, nonacademic sources are considered to have a competitive edge with respect to teaching equipment operation (Figure 19). Overall, it seemed clear that subjects would much prefer to learn these team skills from a nonacademic source provider. Three out of ten subjects criticized it as "Ineffective" in higher education, compared with only 4% in nonacademic settings. Similarly, 11.2% selected the "Extremely Ineffective" category to describe higher education's teaching of equipment operation.

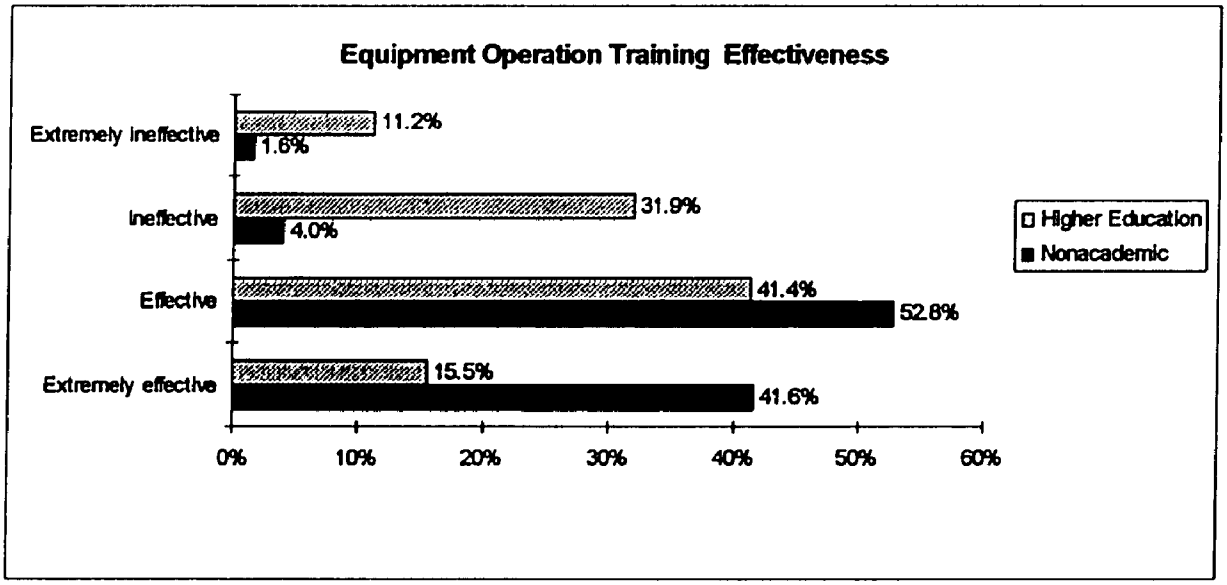

Figure 19. Equipment operation training effectiveness compared by source

Gaining agreement. This technique was ranked second-highest overall, was ranked fourth among nonacademic sources and fifth among higher education sources. A combined 91% (Table 21) assigned a positive ranking to this being taught in nonacademic settings, compared with 71% in higher education.

Table 21

Gaining Agreement Training Effectiveness Comparisons

	Higher Education		Nonacademic Sources	
Rating	Frequency	Percent	Frequency	Percent
Extremely ineffective	6	5.1%	0	0.0%
Ineffective	28	23.9%	12	9.4%
Effective	52	44.4%	83	65.4%
Extremely effective	31	26.5%	32	25.2%
	117	100.0%	127	100.0%

Both sources were rated about equally in the "Extremely Effective" category. (Figure 20). No subject described nonacademic sources' instruction in gaining agreement as "Extremely Ineffective," although 5.1% applied that description to higher education.

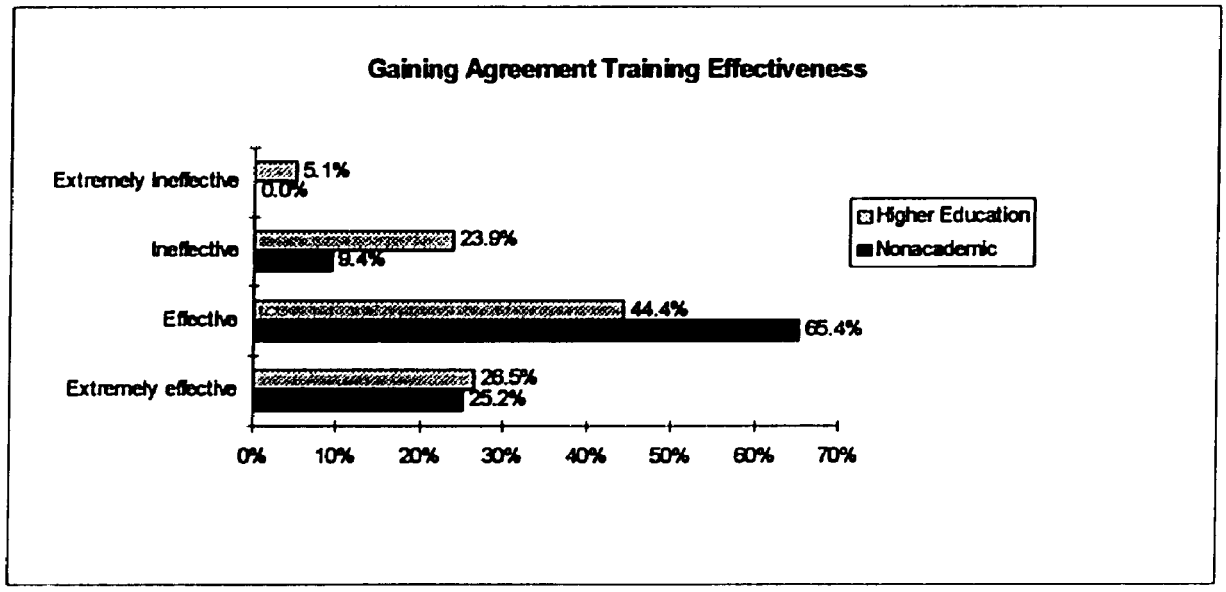

Figure 20. Gaining agreement training effectiveness compared by source

Leading meetings. This technique received the third-highest overall rating, third-highest among nonacademic sources, and seventh place among higher education

programs. About one-fourth of all subjects rated both training sources "Extremely Effective" at teaching this skill (Table 22). However, beyond the top rating category, the positive votes were assigned to nonacademic sources.

Table 22

Leading Meetings Training Effectiveness Comparisons

	Higher Education		Nonacademic Sources	
Rating	Frequency	Percent	Frequency	Percent
Extremely ineffective	5	4.1%	1	0.8%
Ineffective	37	30.3%	10	7.7%
Effective	47	38.5%	88	67.7%
Extremely effective	33	27.0%	31	23.8%
	122	100.0%	130	100.0%

Nearly twice as many rated nonacademic sources "Effective" in training work teams how to lead meetings, compared with higher education. Thirty percent assessed higher education "Ineffective" in providing this instruction, in contrast to only 7.7% using that same category to describe nonacademic sources (Figure 21).

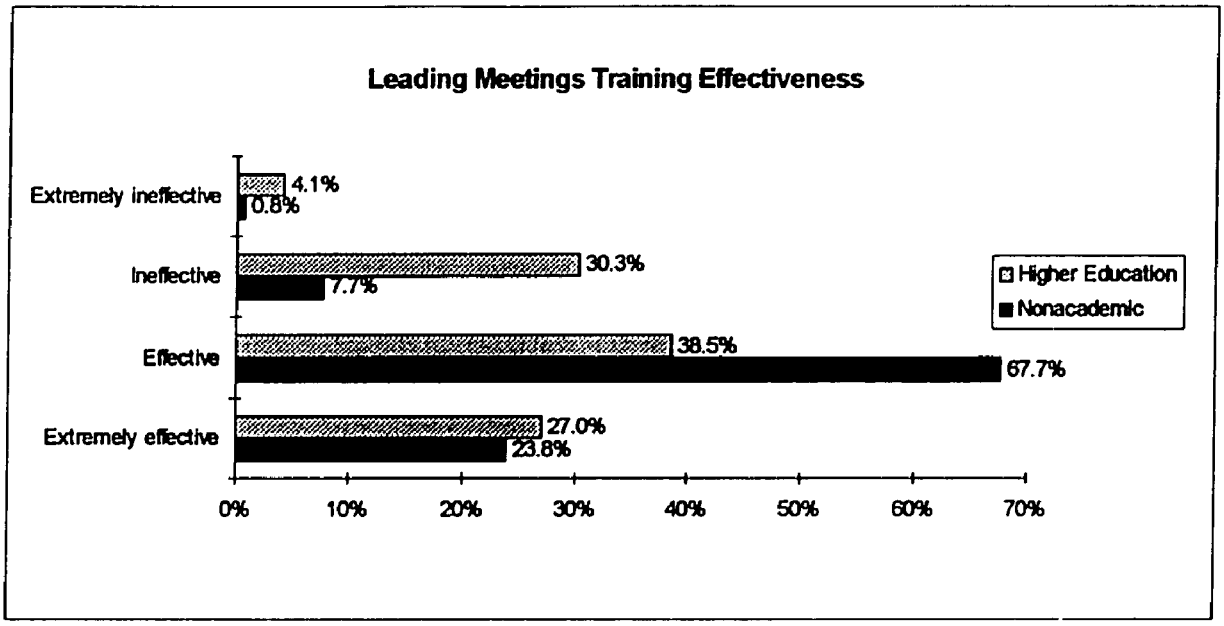

Figure 21. Leading meetings training effectiveness compared by source

Maintenance techniques. Over 90% of all subjects considered nonacademic sources clearly superior at teaching maintenance techniques (Table 23), making it that training source's second-highest rated technique. In that light it is somewhat surprising to find that 42.2% believed higher education "Effective" in this area. Yet, almost as many (35.3%) reported higher education to be "Ineffective," and 9.5% used "Extremely Ineffective" to describe this training source with this technique (Figure 22).

Table 23

Effectiveness of Maintenance Techniques Training

	Higher Education		Nonacademic Sources	
Rating	Frequency	Percent	Frequency	Percent
Extremely ineffective	11	9.5%	2	1.7%
Ineffective	41	35.3%	9	7.5%
Effective	49	42.2%	59	49.2%
Extremely effective	15	12.9%	50	41.7%
	116	100.0%	120	100.0%

These somewhat contradictory ratings result in this being higher education's lowest-ranked training technique, in tenth place. The overall total rank of maintenance techniques was also last place (tenth).

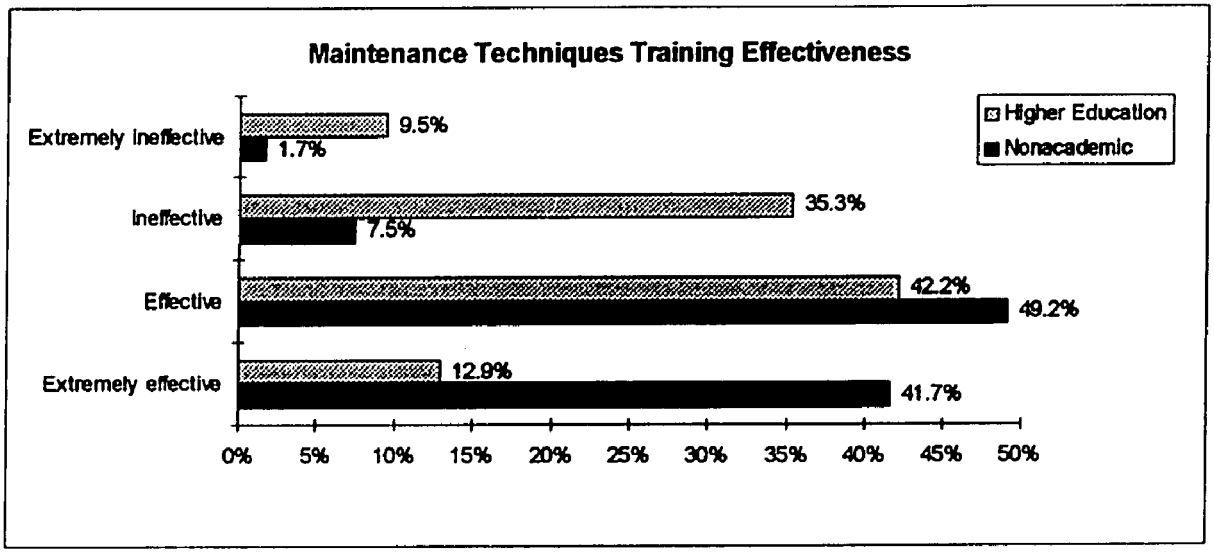

Figure 22. Maintenance techniques training effectiveness compared by source

Making presentations. This was higher education's highest-ranked technique, compared to nonacademic sources' sixth-highest. It also was the highest-ranked category overall, suggesting that subjects believe it to be a skill of crucial importance to be taught in training programs.

Teaching the skills of how to make presentations is an area in which higher education sources are considered to excel. Fifty percent of all subjects praised higher education's abilities to teach students to make presentations by choosing the "Extremely Effective" category (Table 24). Another 34.7% chose "Effective" to describe the effectiveness of this source.

Table 24

Making Presentations Training Effectiveness Comparisons

	Higher Education		Nonacademic Sources	
Rating	Frequency	Percent	Frequency	Percent
Extremely ineffective	2	1.7%	1	0.8%
Ineffective	17	14.0%	22	17.5%
Effective	42	34.7%	68	54.0%
Extremely effective	60	49.6%	35	27.8%
	121	100.0%	126	100.0%

Only three subjects used the "Extremely Ineffective" scale. However, nearly as many applied the "Ineffective" descriptor to both sources (Figure 23).

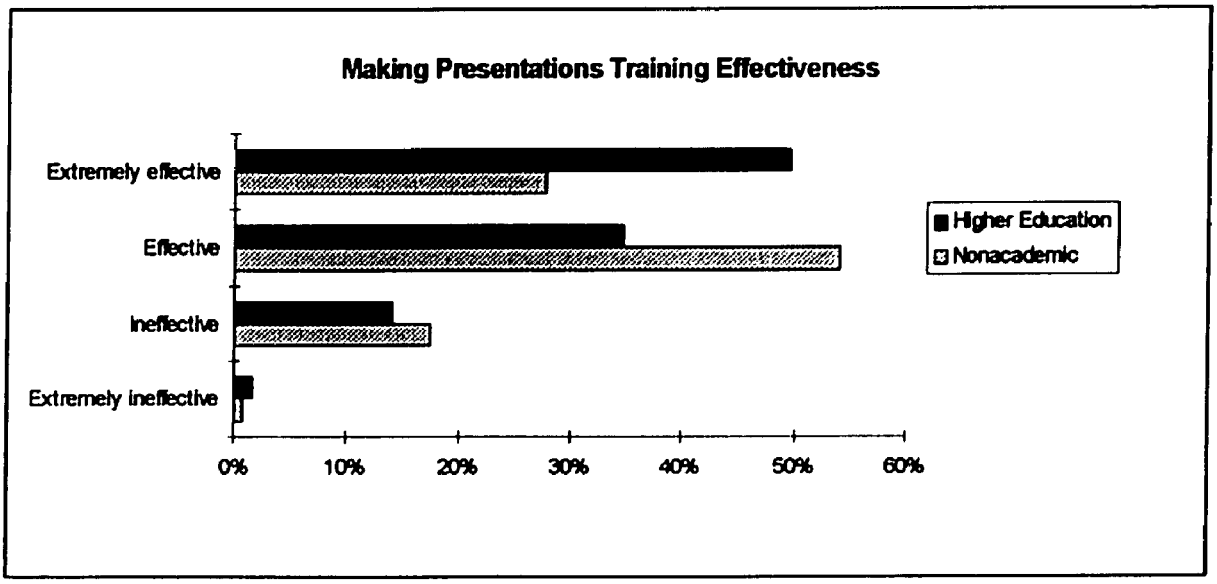

Figure 23. Making presentations training effectiveness compared by source

Production processes. This technique was ranked eighth in effectiveness for higher education sources and also in overall total ranking. It was ranked fifth among nonacademic sources. There was not a large difference between sources selecting the

"Extremely Effective" phrase to rate this technique (20.2% higher education and 26.7% nonacademic sources) (Table 25).

Table 25

Production Process Training Effectiveness Comparisons

	Higher Education		Nonacademic Sources	
Rating	Frequency	Percent	Frequency	Percent
Extremely ineffective	9	8.3%	1	0.8%
Ineffective	26	23.9%	10	8.3%
Effective	52	47.7%	77	64.2%
Extremely effective	22	20.2%	32	26.7%
	109	100.0%	120	100.0%

One and a half times as many subjects rated nonacademic sources "Effective" compared to higher education (Figure 24). Nearly one in five considered higher education to be "Ineffective" in providing this type of training.

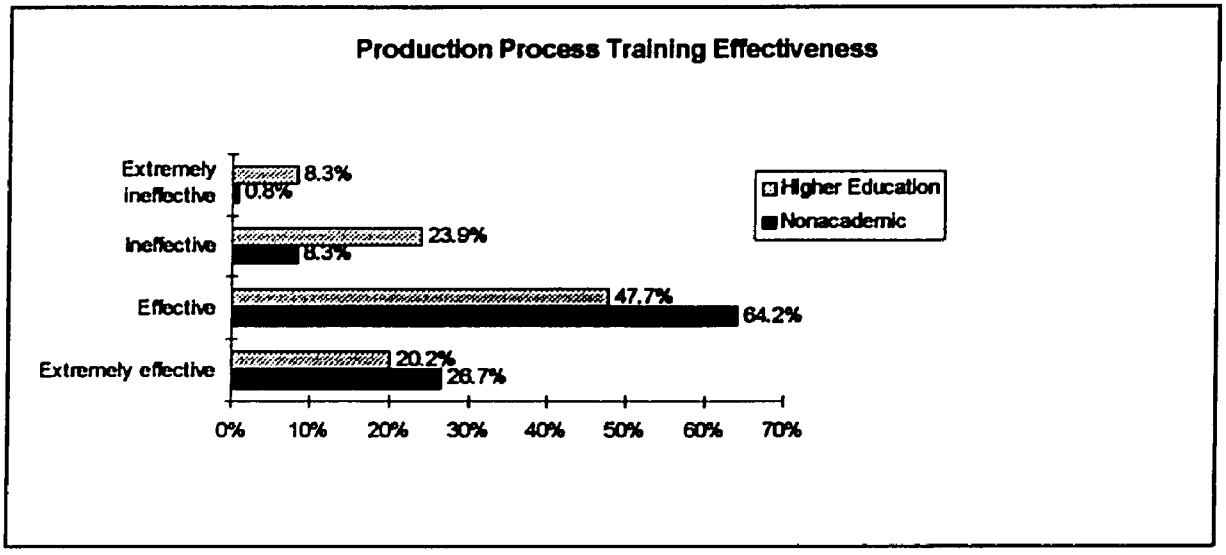

Figure 24. Production processes training effectiveness compared by source

Programmed instruction. This was higher education's second-highest ranked technique, and nonacademic sources' lowest-ranked technique (tenth place). Its total ranking was fifth overall. Programmed instruction was ranked positively by 77% of all

respondents when it is taught in higher education. Despite its low relative rank-order among nonacademic sources, 74% of the subjects gave positive description ratings to its use by nonacademic sources (Table 26). Therefore, it is considered low in effectiveness among nonacademic sources only by comparison with nonacademic sources' other training strengths.

Table 26

Programmed Instruction Training Effectiveness Comparisons

	Higher Education		Nonacademic Sources	
Rating	Frequency	Percent	Frequency	Percent
Extremely ineffective	4	3.3%	3	2.3%
Ineffective	24	19.7%	30	23.4%
Effective	43	35.2%	78	60.9%
Extremely effective	51	41.8%	17	13.3%
	122	100.0%	128	100.0%

Four times as many of those surveyed rated higher education sources "Extremely effective" than they similarly rated nonacademic sources (Figure 25).

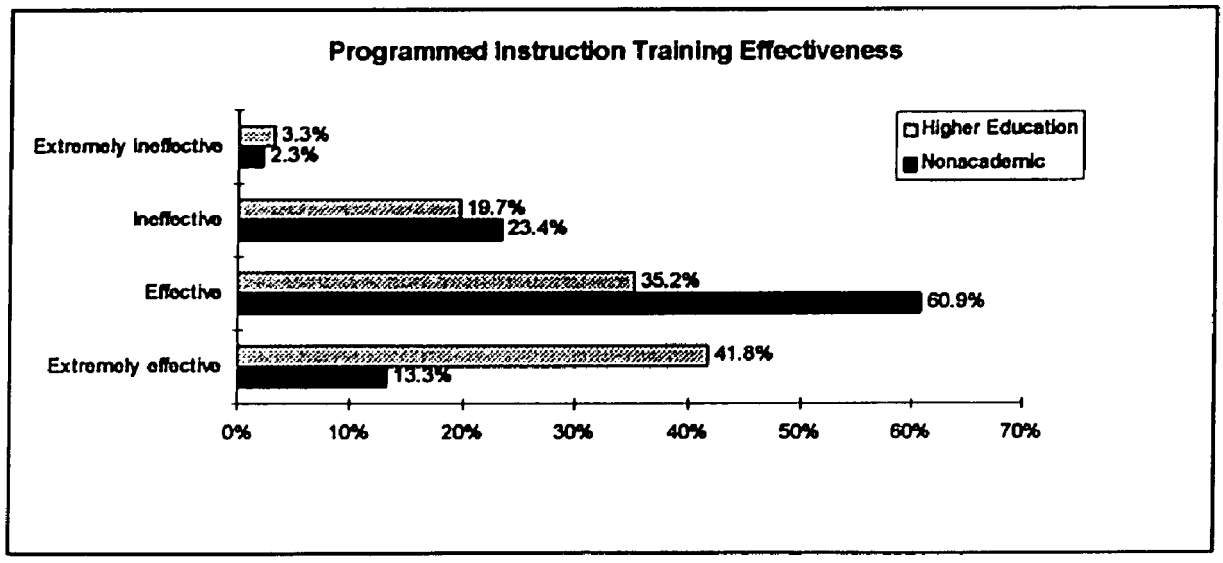

Figure 25. Programmed instruction training effectiveness compared by source

Role playing. As shown in Table 27, a similar number of positive ratings were awarded to each source with respect to the role playing training technique. About one-fifth of the "Ineffective" marks were equally distributed between the two providers.

Table 27

Role Playing Training Effectiveness Comparisons

	Higher Education		Nonacademic Sources	
Rating	Frequency	Percent	Frequency	Percent
Extremely ineffective	4	3.3%	6	4.8%
Ineffective	22	18.3%	25	20.0%
Effective	53	44.2%	63	50.4%
Extremely effective	41	34.2%	31	24.8%
	120	100.0%	125	100.0%

There also were nearly the same number of negative ratings assigned to each provider (Figure 26). This technique was higher education's third-highest ranked technique, and nonacademic sources' ninth-highest. It ranked fourth overall. It should be noted, however, that the weighted sum for higher education was 105, and was only 17 points lower for nonacademic sources. Therefore, despite the differential in rankings, the two training sources are quite similar in their abilities to teach role playing, according to subjects.

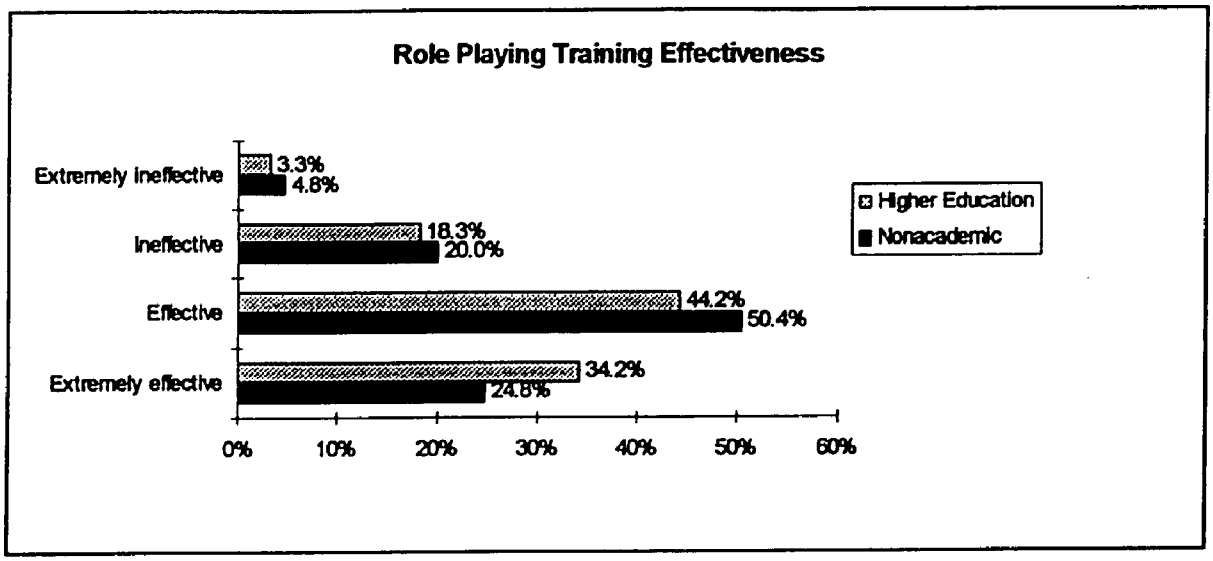

Figure 26. Role playing training effectiveness compared by source

Selecting team members. Results were almost identical at the two extremes—"Extremely Ineffective" and "Extremely Effective" (Table 28). Twice as many "Ineffective" descriptions were applied to higher education.

Table 28

Selecting Team Members Training Effectiveness Comparisons

	Higher Education		Nonacademic Sources	
Rating	Frequency	Percent	Frequency	Percent
Extremely ineffective	3	2.6%	3	2.4%
Ineffective	38	32.5%	21	16.8%
Effective	41	35.0%	66	52.8%
Extremely effective	35	29.9%	35	28.0%
	117	100.0%	125	100.0%

One and a half times as many respondents reported nonacademic sources "Effective" in contrast to higher education. Applications of the "Extremely Ineffective" phrase were negligible for both training sources (Figure 27).

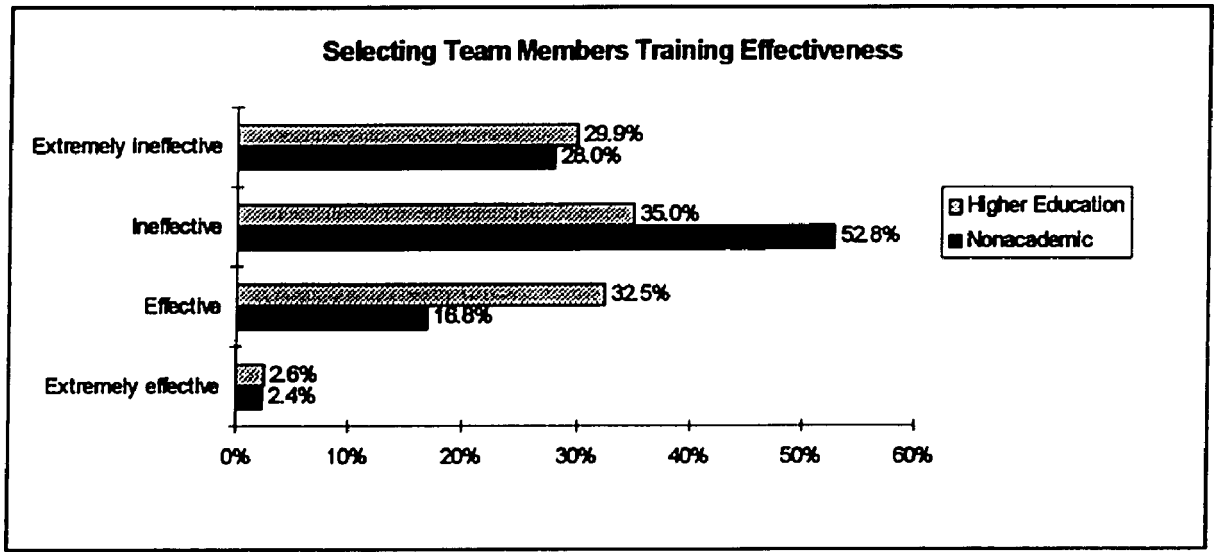

Figure 27. Selecting team members training effectiveness compared by source

Neither source was rated very effective in teaching this skill. It was nonacademic sources' seventh-highest rated technique, and higher education's sixth-highest. It was ranked ninth overall.

Ratings of Management Support For Team Training

Questions 12 and 13 of survey instrument asked respondents to give their opinions about how management (1) has supported work team training since 1990, and (2) will respond to team training support during the next three years. The results of those opinion surveys appear in Table 29. All subjects responded to the "since 1990" question, and all but one projected management support over the next three years. Subjects seemed more conservative in their retrospection than in their projection, but in both instances the subjects were positive. Over half gave a "Strong" rating to their management's support of team training since 1990, 44% considered it "Average," and one in four rated it "Weak."

Table 29

Subjects' Assessment of Management Support for Team Training

Rating	Management Support Since 1990		Management Support in Next 3 Years	
	N	Percent	*N*	Percent
Strong	55	41.7%	72	55.0%
Average	44	33.3%	27	20.6%
Weak	27	20.5%	31	23.7%
None	6	4.5%	1	0.8%
	132	100.0%	131	100.0%

Six percent reported managerial support to have been nonexistent (Figure 28). The subjects were much more optimistic in their forward glance toward the next three years. Three in four said it would be "Strong." One in four said it would be "Average," and three out of ten predicted it would be "Weak."

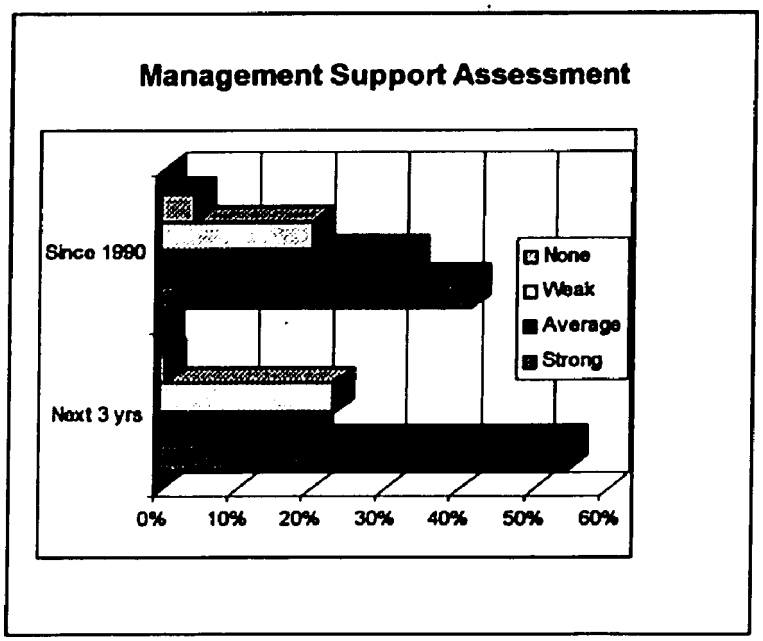

Figure 28. Assessment by subjects of management support for team training

Summary

The findings of the study have been presented in this chapter. A total of 67.7% of distributed surveys was returned—providing a sample size of 132. An analysis of the sample and survey results was conducted for each of the hypotheses. The Wilcoxon matched-pairs signed-ranks test was used to determine if there were significant differences between work team training programs and work team training techniques provided by higher education and nonacademic sources. The results of the Wilcoxon matched-pairs signed-ranks test showed that there were statistically significant differences associated with these variables.

The work team leaders/facilitators surveyed indicated that they preferred team training programs and team training techniques to be provided by nonacademic sources. The overall assessment and composite score data substantiate the effect. In Chapter 5, a summary of the conclusions and some recommendations for further research are presented.

CHAPTER 5. SUMMARY, FINDINGS, CONCLUSIONS, IMPLICATIONS FOR PRACTICE, AND RECOMMENDATIONS FOR FURTHER STUDY

This chapter contains a summary of the purpose, the hypotheses, and the procedures followed for this investigation to determine how self-managed work teams in three selected segments of industry rate the effectiveness of team training programs, and techniques used in those programs, provided by both higher education and nonacademic sources.

Findings with respect to each research hypothesis have been reached. In addition, findings made as a result of frequency distributions, cross-tabulations, and measures of central tendency are presented. Conclusions have been drawn based on a review of the literature and the findings of this study. Based upon each conclusion, the implications for practice are offered. Finally, recommendations for future research, related to the perceived effectiveness of team training programs and team training techniques offered by higher education and nonacademic sources, conclude the chapter.

Summary of this Study

The main purpose of this study was to determine how self-managed work team members and leaders, in a selected segment of the manufacturing industry, rate the effectiveness of programs, and techniques used in those programs, provided by higher education and nonacademic sources.

An in-depth review of literature examined issues related to self-managed work team training programs and techniques: (1) trends and priorities in training; (2) self-

managed work teams—a response to workforce change; (3) team training techniques; and (4) potential linkages between training providers and industry.

Hypotheses

Two hypotheses were formulated and tested. The first hypothesis was designed to test for perceived differences in effectiveness between work team training *programs* offered by both higher education and nonacademic sources. The second hypothesis was aimed at testing perceived differences in effectiveness of various work team training *techniques* utilized by both higher education and nonacademic team training sources.

Procedures

A questionnaire, designed specifically for this study, surveyed leaders and members of self-managed work teams to determine how they rate (1) the overall effectiveness of higher education and nonacademic training programs, and (2) each of ten work team training techniques utilized by both higher education and nonacademic team training sources (Appendix B). The questionnaire was designed by the researcher after careful review of the literature. The questionnaire was reviewed for clarity and language by authorities in the field of questionnaire design and statistical analysis. Next, the questionnaire's content and format were checked by a pilot-test conducted in the field. The refined instrument was evaluated for face validity, content validity, and clarity by an independent panel of experts in the field of higher education. Based on these procedures, it was concluded that the survey instrument had sufficient validity to be administered to the sample to be studied.

The survey instrument contained 27 questions divided into three major parts. Part A provided general personal data; Part B identified respondents' perception of the effectiveness of two different program providers as sources for work team training; and Part C identified respondents' perceptions of the effectiveness of ten types of training techniques.

The sample of this study consisted of 132 employees, each of whom was either a member in or a leader of a self-managed work team. Of 195 surveys distributed, 132 were returned, a composite rate of return of 67.7%. The sample was stratified across seven separate industrial facilities, representing three different segments of industry. The organizational structure of these various industries, and the relatively small number of employees whose functions qualified them to participate as subjects, made random sampling impossible. However, the subjects qualified as a representative group of self-managed work team members and leaders.

Findings

Based upon the results of the statistical tests and responses to the questions presented in Chapter 4, findings with respect to each research hypothesis have been reached in sections 1 and 2 below. In addition, findings made as a result of frequency distributions, cross-tabulations, and measures of central tendency are presented:

7. There is sufficient statistical basis to reject the first null hypothesis and conclude that (a) higher education effectiveness is viewed *differently from* nonacademic source effectiveness, and (b) nonacademic source effectiveness is viewed *more favorably*

than higher education effectiveness. Work team leaders and members overwhelmingly rated nonacademic sources as the more effective training program.

8. There is sufficient statistical basis to reject the second null hypothesis and conclude that there is a marked perceived difference in the effectiveness of work team training *techniques* utilized in the above-referenced training programs. Only three training techniques were rated more effective in a higher education-provided training program, listed in descending sequence of effectiveness ratings: teaching making presentations skills, programmed instruction, and role playing. The two techniques rated most ineffective in higher education training were maintenance procedures and equipment maintenance. All seven techniques rated inferior in higher education programs received notably lower ratings—in each instance *much* lower than the same technique delivered by nonacademic sources. Nonacademic sources are considered best at teaching equipment operation techniques. Rated very closely were the next four highest, in descending order of rank: maintenance techniques, leading groups, gaining agreement, and production processes. Nonacademic sources were not rated very low in their effectiveness in teaching any technique. Only by comparison with other techniques were role playing and programmed instruction training rated less effective.

9. Subjects viewed positively their management's support of team training, both retrospectively and prospectively. Over half gave a "Strong" rating to their management's support of team training since 1990, and 44% considered it "Average." The subjects were much more optimistic in their forward glance toward the next three years, with three in

four predicting it would be "Strong." One in four said it would be "Average," and three out of ten predicted it would be "Weak."

10. Most subjects (three-fourths) had participated in self-managed work team training provided by nonacademic sources, while only about one-fourth had any higher education-provided training experiences.

11. Tremendous disparity existed between female and male wages and salaries. Females were the lowest paid among subjects and almost saturated the lowest wage scale. Beginning in the second tier and remaining so throughout, the percentage of each range accounted for by salaries of males was much higher than that accounted for by females. As salaries increased, the percentage gaps widened until the highest tier, where the disparity was only slightly less dramatic.

12. Three times as many women than men did not continue their education beyond high school. Ten percent more males than females went to college, and a graduate education was pursued by 5% more males.

Conclusions

Based upon the findings in this study and the review of the literature, the following conclusions have been reached:

1. There is a clear preference among self-managed work teams in the manufacturing industry for training *programs* which are provided by nonacademic sources. Team members and leaders consider them far more effective than training programs provided by higher education.

2. Self-managed work team member and leader respondents view training *techniques* provided by nonacademic sources as much more effective than training programs provided by higher education.

3. The training strengths of nonacademic sources are teaching equipment operation and maintenance techniques. They are least effective in providing role playing and programmed instruction training.

4. Higher education is best at teaching people how to make presentations, to learn by using programmed instruction methods, and in using role playing as a teaching methodology. Higher education's strengths—teaching work team participants to make presentations and role play—were rated only slightly higher than nonacademic sources' abilities to impart the same knowledge. Academic institutions appear to be least effective in teaching maintenance techniques and equipment operation, which are vocational/technical in nature rather than academic. Although teaching by the case method is generally thought to be prevalent in academic settings, subjects rated nonacademic sources better at using the case method.

5. There is evidence of quite strong management support for self-managed work team training. Subjects report that support is good and getting better. The conclusion is that management gives a healthy perception of being supportive of self-managed work teams and in providing necessary training.

6. Since just over one in four work team leaders and members had ever participated in higher education-provided team training, compared to three out of four who had experienced nonacademic source training, it may be concluded that nonacademic

source training is by far the more popular source of choice. Higher education is not competitive with nonacademic sources in providing work team training.

7. Gender equity in leadership positions is far from being realized among the subjects in this study. This suggests that even among self-managed work teams, males tend to be selected for leadership far more often than similarly qualified females.

8. Gender equity in salaries and wages is far from being realized among the subjects in this study. Our conclusion is that this trend parallels the wage disparities that historically have existed between men and women in the work place. Self-managed work team settings do little to correct gender-based salary inequities.

9. Gender equity in education is far from being realized among the subjects in this study. Societal gender-based patterns of males being given more opportunities for education beyond high school, or of females not making that choice for themselves, is apparent among work team participants in manufacturing.

Implications for Practice

Based upon the conclusions in this study, the following implications for practice are set forth:

1. Self-managed work team members and leaders may view nonacademic *sources* more positively because, as shown in this study, work teams in the manufacturing industry are heavily involved in training that is provided by nonacademic sources. That is the basis of their experience and hence familiarity. A prudent policy for industry training managers to follow, when given the choice, is to choose nonacademic sources in general. The

implication for higher education is that this is not an area where colleges and universities are considered to be very effective. Specific self-improvement efforts, followed by marketing strategies aimed at convincing training managers and directors of these new directions, would be necessary for higher education to become competitive with nonacademic sources in this arena.

2. Self-managed work team members and leaders may view training *techniques* utilized by nonacademic sources to be more effective because of work team familiarity with training provided by nonacademic sources. The implication for industry is to choose nonacademic sources for training in these subjects. Conversely, the implication for higher education is to develop more effective curricula and methods for providing work team training.

3. Since nonacademic sources' strengths were found to be teaching equipment operation and maintenance techniques, industries may want to look to nonacademic sources for such training. It should not be too difficult for nonacademic sources to strengthen their ability to teach role playing and programmed instruction training, about the only areas where they were found lacking.

4. Higher education should capitalize on its rated superiority at teaching people how to make presentations, to learn via programmed instruction methods, and to role play. Higher education may decline opportunities to compete in the vocational/technical areas in which they were rated least effective, but focus instead on improving techniques more closely aligned with higher education's academic purposes. Considering that teaching people how to make presentations was rated most important by respondents,

followed closely by teaching people how to gain agreement and lead groups, higher educational institutions would profit from more flexibility in the type of curriculums they choose to market to industry. Rather than being drawn into the traditional confines of academia, industry wants training which can accomplish its goals economically and effectively. Without sacrificing quality, higher educational institutions must be more flexible in the design and format of training and instruction provided for industry. It is not surprising that higher education is considered least effective at teaching hands-on vocational skills. This probably is an area that higher education would best avoid—except for vocational-technical programs at two-year community colleges. The more surprising observation is that two of higher education's strengths—making presentations and role playing skills—were rated barely higher than nonacademic sources' abilities to impart the same knowledge. The implication for higher education is to further strengthen these training areas. Although teaching by the case method is generally thought to be prevalent in academic settings, the fact that subjects rated nonacademic sources better at using the case method points to a need for higher education to use this method more often in providing work team training. Nonacademic sources, considered least effective in teaching role playing and using programmed instruction training, may want to improve their instructional techniques in these two particular areas. When a representative from a postsecondary institution is marketing educational services to the manufacturing industry, he or she should be aware of what type of team training program is found most effective by work team leaders/work team members, and why it is considered the most effective. Often credit and formal types of non-credit courses are considered a low priority, and

because these types of educational services are most commonly associated with higher education, this fact could account for industry's apparent declining use of colleges and universities as viable options in providing training services. Since this study revealed that work team leaders and work team members, to a large degree, are less willing to utilize higher education for training than nonacademic sources, it would behoove educational institutions to make themselves and their training capabilities more acceptable to the business community. Hopefully, this would begin to establish more effective linkages between higher educational institutions and industry in training self-managed work teams.

5. If the respondents are correct, in the next three years there will be a marked increase in levels of support given by management to team training. This presumption has implications for training providers, since with such support will come a widening market for training programs, such as those offered by higher education and nonacademic source providers. There is a clear implication that higher education, rated less effective and therefore less preferred for providing work team training than nonacademic sources, should move quickly to capitalize on the opportunities that could become available to them within the coming three years.

6. Subjects as a group were far more knowledgeable—from firsthand experience—about nonacademic source-provided work team training than about higher education-provided training. Although the literature review indicated considerable higher education involvement in forming strategic alliances with industry in providing work team training, the implications are that the preponderance of such training is provided by nonacademic sources. The question for higher education is not unlike the behavioral

challenge of increasing desired behavior to a measurable level so it can be positively reinforced: how can higher education provide team training experiences to enough work team participants for these individuals to become sufficiently familiar with higher education to be able to recommend it, or rate it as effective. It may be the subjects' unfamiliarity with higher education-provided training that led them to rate it so ineffective by comparison with nonacademic source-provided training.

7. The so-called "glass ceiling" appears to be in place among self-managed work teams in this segment of the manufacturing industry. It could be hoped that self-managed work team models would be constructive toward erasing or greatly reducing gender bias in the workplace, since work team participants have the opportunity to work together in a self-managed environment where, presumably, one's contributions to the mission take priority. Yet, the finding of male-dominated leadership in a predominant female sample group discounts the value of work teams in promoting gender equity in the work place.

8. Although gender disparity among salaries is not a particularly surprising finding, the magnitude of the disparity is cause for concern. Industry officials have the power to take corrective steps in providing "equal pay for equal work." If women are considered capable of holding the same positions as men in a self-managed work team environment, the implication is that they should be similarly compensated.

9. Since gender stereotypical patterns were noted in educational preparation, industry should make a concerted effort to encourage women employees to avail themselves of college-level educational opportunities. It may be necessary for industry to make it possible for day-shift female workers to earn college credits during work hours, or

on extended lunch hours. Industry-provided child care while women employees pursue a college education would go far in enabling them to raise their educational level as a group.

Recommendations for Further Research

Certain recommendations are appropriate as an extension of this study. The following recommendations are made for further study:

1. A follow-up study should explore training managers' perceptions of the same training *sources* and examine their reasons for their perceptions of effectiveness and ineffectiveness.

2. A follow-up study should explore training *managers'* perceptions of the same training *techniques* and examine their reasons for their perceptions of effectiveness and ineffectiveness.

3. Colleges and universities should proceed cautiously with respect to placing a higher emphasis on developing and marketing to industry educational services which are geared to enhance tangible, technical skills instead of interpersonal and academic skills. Difficulties may ensue with respect to accreditation issues, reputation, and academic integrity.

4. Colleges and universities should be aware of the attitudes reported by subjects in this study if they desire to compete successfully for the training dollars being spent annually by industry to prepare self-managed work teams.

5. The present study has shown the need for higher education to make some strategic changes to become a viable training provider to industry. This researcher is of the

strong opinion that higher education has much to offer in the way of providing training for industry. There are academic dimensions which higher education can uniquely bring to a training classroom. Yet, the most common complaint in building partnerships between industry and higher education was reported to be the inflexibility and resistance of educators to change and adapt new strategies (Lynton, 1981). According to Lusterman (1977), colleges and universities must be willing to incorporate certain practices recommended by persons in industry. Some of these practices, which may be generalized to nonacademic sources as well, include revising course material when the business expresses a need; regularly evaluating faculty and course content and share with the business organization; conducting on-site registration and instruction and training employees on company equipment; becoming more flexible in scheduling courses; designing curricula to meet company-specific needs; being flexible in giving college credit for job-required skill training.[9]

6. Further study on a larger sample, over a broader spectrum of the manufacturing industry, should be conducted.

7. A statistical analysis should be performed to determine whether there is a significant difference in the ratings of academic programs by team members and leaders that have and have not had training provided by higher education. A similar comparison could be made for ratings of nonacademic programs.

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[9]For assistance in developing such strategy, training providers may consult publications such as *Three Thousand Futures: The Next 20 Years for Higher Education* (Carnegie Council on Policy Studies in Higher Education, 1980) and the National Institute of Education's *Higher Education Planning: A Bibliographic Handbook* (Halstead, 1981).

8. It would be beneficial to perform the statistical analysis using only the subset of the respondents who had both academic and nonacademic training. This would address the possibility that low ratings were given to academic programs only because of unfamiliarity. Since a subset of the data would be used, it is possible that further data collection would be needed to provide an adequate sample size.

9. Since this study's findings were consistent with those reported in the review of the literature, only by examining priorities and trends in training can one realistically explore the possibilities for creating more effective linkages between organizational training and higher education. This study identified some changes that may be necessary in the role of higher education in providing self-managed work team training. Further study should be done to validate these changes and future changes in the role of higher education.

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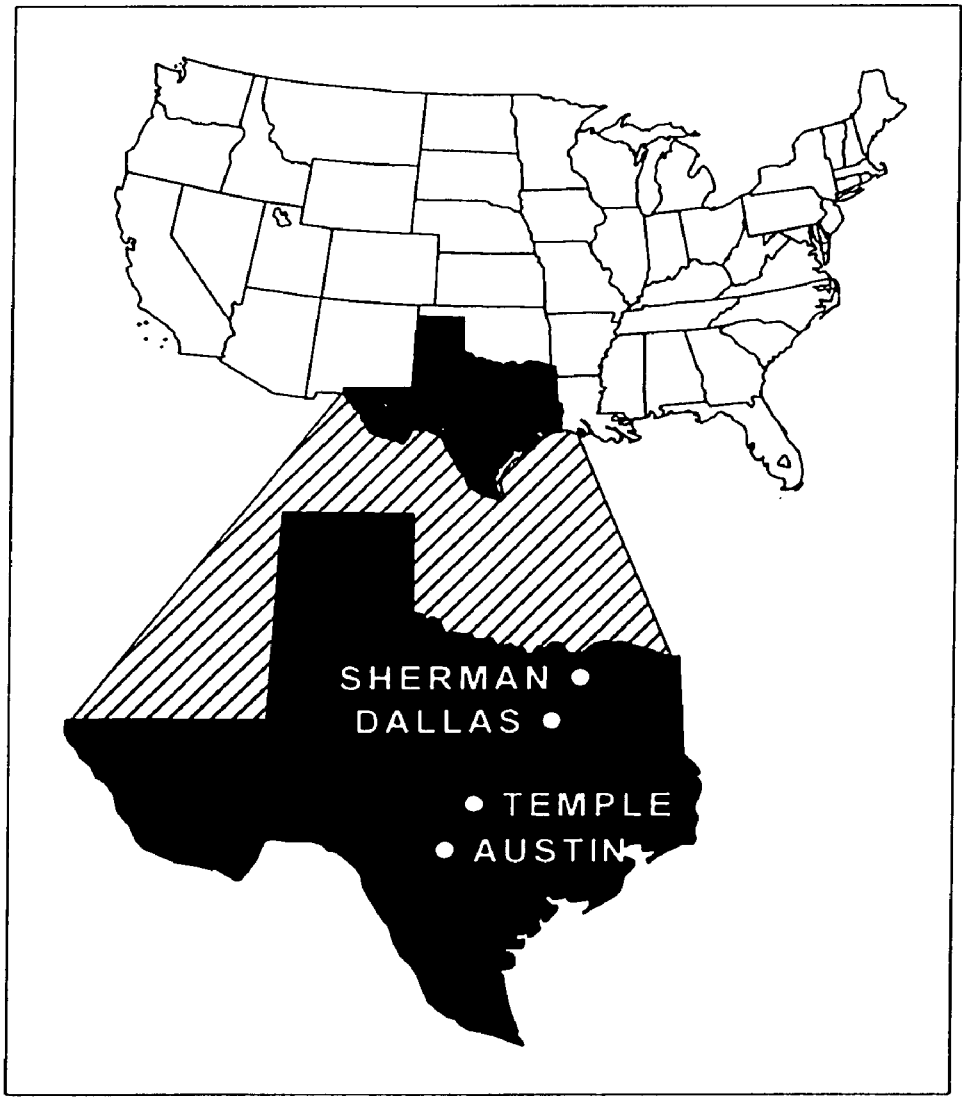
APPENDIX A

Data Gathering Sites



APPENDIX B

Survey Instrument

TRAINING PROGRAMS AND TECHNIQUES

QUESTIONNAIRE

You have been selected to participate in this study because of your experience with self-managed work teams. This is part of a study to determine how you, and others with similar work team experience, rate the effectiveness of programs and techniques used to train self-managed work teams.

So far as we can determine, this is the first time such a study has ever been conducted. So in a real sense, you are helping us to "make history."

Your answers will be kept confidential. It will not be possible for anyone to identify you or your department since only aggregate statistics will be reported in the completed study. This survey should take no more than 20 minutes to complete.

VERY IMPORTANT NOTE: We value your opinion!! In the survey you will see references to "higher education" and "nonacademic" sources of training. Whether or not you personally have ever experienced team training from either "higher education" or "nonacademic" sources of training, please indicate your opinion about training provided by each source. Select "No Opinion" only if you truly have *no opinion* whatsoever about the question being asked.

THANK YOU!

Howard L. Horton, Principal Investigator
Ph.D. Candidate, ETSU

A. JOB TITLE, FUNCTION, AND PERSONAL DATA

1. Job Title:_____

2. Your primary job position:

   ☐ Work Team Leader/Facilitator ☐ Work Team Member

3. Highest level of education which you have completed (circle one):

   A. No high school diploma
   B. High school diploma or equivalency
   C. Attended college less than 1 year
   D. Attended vocational school less than 1 year
   E. Attended college 1 to 4 years but did not graduate
   F. Attended vocational school 1 to 4 years but did not graduate
   G. Completed (graduated from) vocational school
   H. Graduated with an Associates Degree
   I. Graduated with a Bachelor's Degree
   J. Graduate study without degree
   K. Master's degree
   L. Doctorate degree

4. Annual salary range (circle one):

   A. $10,000 - $19,999
   B. $20,000 - $29,999
   C. $30,000 - $39,999
   D. $40,000 - $49,999
   E. $50,000 - $59,999
   F. $60,000 and over

5. How long have you been a work team member (in any employment)?
   _____ **days, weeks, months,** or **years**? (circle one):

6. How long have you been a work team *leader* (in any employment)?
   _____ **days, weeks, months,** or **years**? (circle one):

7. How long have you been in formal job training (of any kind in any employment)?
   _____ **days, weeks, months,** or **years**? (circle one):

8. Your Age:

   A. Under 20
   B. 20 - 29 years
   C. 30 - 39 years
   D. 40 - 49 years
   E. 50 - 59 years
   F. 60 years and over

9. A. Male
B. Female

10. How is your work team identified (such as name)? _____

11. Work team location

☐ **Austin** ☐ **Dallas** ☐ **Sherman** ☐ **Temple**

12. In your opinion, since 1990, how has management supported team training?

A. Strong commitment
B. Average commitment
C. Weak commitment
D. No commitment

13. In your opinion, how *will* management respond to team training support during the next three years?

A. Strong commitment
B. Average commitment
C. Weak commitment
D. No commitment

14. Have you ever participated in self-managed work team training that was provided by a higher educational institution, to include two-year and four-year colleges and universities? Yes____ No____

15. Have you ever participated in self-managed work team training that was provided by a nonacademic sources, to include in-house training, outside consultants/trainers, outside seminars/conferences, and technical/vocational institutions? Yes____ No____

B. YOUR RATINGS OF TRAINING PROGRAM EFFECTIVENESS

Please circle the number which describes how you rate the overall effectiveness of each of the following training programs.

Whether or not you personally have ever experienced team training from either "higher education" or "nonacademic" sources of training, please indicate your opinion about training provided by each source.

Select "No Opinion" only if you truly have no opinion whatsoever about the question being asked.

	Explanation	Extremely Ineffective	Ineffective	Effective	Extremely Effective	No opinion
(16) In your opinion, how effective is Team Training provided by **HIGHER EDUCATION**?	*Includes:* *two-year colleges* *four-year colleges* *universities*	1	2	3	4	☐
(17) In your opinion, how effective is Team Training provided by NON-ACADEMIC SOURCES?	*Includes:* *In-house training* *outside consultants and trainers* *outside seminars and conferences* *technical and vocational institutions*	1	2	3	4	☐

C. YOUR RATINGS OF VARIOUS TRAINING TECHNIQUES

Please circle the number which describes how you rate the overall effectiveness of each of the following work team training techniques. Definitions of "higher education" and "nonacademic sources" are the same as in Part B.

<u>Whether or not you personally have ever experienced team training from either "higher education" or "nonacademic" sources of training</u>, please indicate your opinion about training provided by each source.

Select "No Opinion" only if you truly have no opinion whatsoever about the question being asked.

Techniques	Explanation	Provided by	Extremely Ineffective	Ineffective	Effective	Extremely Effective	No opinion
Case Discussion	(18) Real or fictitious cases discussed in small groups	Higher Education	1	2	3	4	☐
		Nonacademic sources	1	2	3	4	☐
Equipment Operation	(19) Training in operation of equipment directly related to performing team jobs	Higher Education	1	2	3	4	☐
		Nonacademic sources	1	2	3	4	☐
Gaining Team Agreement	(20) Applying skills for group decision making and consensus building	Higher Education	1	2	3	4	☐
		Nonacademic sources	1	2	3	4	☐
Leading Meetings	(21) Developing leadership skills required for teams that are moving to shared leadership	Higher Education	1	2	3	4	☐
		Nonacademic sources	1	2	3	4	☐
Maintenance Techniques	(22) Learning basic machine preventive and total maintenance	Higher Education	1	2	3	4	☐
		Nonacademic sources	1	2	3	4	☐
Making Presentations	(23) Preparing and delivering formal presentations to customers or managers	Higher Education	1	2	3	4	☐
		Nonacademic sources	1	2	3	4	☐

Techniques	Explanation	Provided by	Extremely Ineffective	Ineffective	Effective	Extremely Effective	No opinion
Production Processes	(24) Developing Just-In-Time (JIT) systems and material requirements planning	Higher Education	1	2	3	4	☐
		Nonacademic sources	1	2	3	4	☐
Programmed Instruction	(25) Self-paced lessons using text or computer	Higher Education	1	2	3	4	☐
		Nonacademic sources	1	2	3	4	☐
Role Playing	(26)Trainees act out roles, simulating on-the-job experiences	Higher Education	1	2	3	4	☐
		Nonacademic sources	1	2	3	4	☐
Selecting Team Members	(27) Using targeted behavior-based interviewing and assessment skills	Higher Education	1	2	3	4	☐
		Nonacademic sources	1	2	3	4	☐

APPENDIX C

Script to be Read to Pilot Testers

Thank you for taking your valuable time to assist in this important research project. Because of your experience with self-managed work teams, you are one of 25 TI professionals selected to participate in a pretest to quality-check the research project questionnaire before it is distributed to more than 200 research participants at other TI facilities.

So far as we can determine, this is the first time a study has been conducted at TI—or anyplace else, for that matter—to measure how team leaders and team members rate the effectiveness of programs and techniques used in team training. I believe your experience with self-managed work teams is so important that it is the subject of my doctoral dissertation.

In just a few minutes, I'll ask you to fill-out the questionnaire, as if you are one of the research participants. As you are completing the questionnaire, I'd appreciate your careful critique of the way the instructions are worded, as well as the way the questions are asked. After you finish a Section, there will be critique questions which only you — as the only pilot testers of this questionnaire — will be asked. Look for such things as difficulties with question wording, problems with leading questions, vague questions, and terms that may be difficult for future participants to deal with. I will welcome any and all help you can give me in suggesting ways to improve the questionnaire.

I'll be glad to answer any questions you may have at this time....

THANKS VERY MUCH!

APPENDIX D

Survey Instrument Pilot Test

Inventory of Training Programs and Techniques

PILOT TEST QUESTIONNAIRE

Because of your experience with self-managed work teams, you have been selected to be one of 25 TI professionals at your plant to participate in this study. This is part of a study to determine how your selected segment of the electronics industry rates the effectiveness of programs and techniques used to train self-managed work teams.

So far as we can determine, this is the first time such a study has ever been conducted. So in a real sense, you are helping us to "make history."

Your answers will be kept confidential. It will not be possible for anyone to identify you or your department since only aggregate statistics will be reported in the completed study.

This survey should take 20-30 minutes to complete. There is space on the last page for you to make comments about any item.

THANK YOU!

Howard L. Horton, Principal Investigator
Ph.D. Candidate, ETSU

A. JOB TITLE, FUNCTION, AND PERSONAL DATA

1. Job Title_____

2. Your primary job position (circle one):

   A. Work Team Leader/Facilitator
   B. Work Team Member

3. Highest level of education which you have completed (circle one):

   A. No high school diploma
   B. High school diploma or equivalency
   C. Attended college less than 1 year
   D. Attended college 1 to 4 years but did not graduate
   E. Graduated with an Associates Degree
   F. Graduated with a Bachelor's Degree
   G. Graduate study without degree
   H. Master's degree
   I. Doctorate degree

4. Annual salary range (circle one):

   A. $10,000 - $19,999
   B. $20,000 - $29,999
   C. $30,000 - $39,999
   D. $40,000 - $49,999
   E. $50,000 - $59,999
   F. $60,000 and over

5. How many years have you been in your present position? _____ years

6. How long have you been involved in a formal job training program (of any kind)? _____

7. Does that number reflect **hours, days, weeks, months,** or **years**? (circle one):

8. Your Age:

   A. Under 20
   B. 20 - 29 years
   C. 30 - 39 years
   D. 40 - 49 years
   E. 50 - 59 years
   F. 60 years and over

9. A. Male
   B. Female

10. How is your work team identified (such as name)? _____

11. Work team location? (Please circle:) Dallas Houston Lubbock Sherman

12. In your opinion, since 1990, how has management supported team training?

    A. Increased commitment B. Decreased commitment C. Remained the same

13. In your opinion, how *will* management respond to team training support during the next three years?

    A. Increased commitment B. Decreased commitment C. Will remain the same

14. In your opinion, since 1990, how has management supported team training?

    A. Increased commitment B. Decreased commitment C. Has remained the same

15. In your opinion, how *will* management respond to team training support during the next three years?

    A. Increased commitment B. Decreased commitment C. Will remain the same

B. YOUR PERCEPTIONS OF TRAINING PROGRAM EFFECTIVENESS

Please check the response which describes your rating of the overall effectiveness of each of the following training programs:

		1	2	3	4	5
HIGHER EDUCATION: two-year colleges, four-year colleges, universities	**CREDIT AND NON-CREDIT COURSES**					
	(16) How effective do you perceive Team Training *credit and non-credit courses* provided by two-year and four-year colleges and universities?	Extremely Ineffective ☐	Ineffective ☐	Effective ☐	Extremely Effective ☐	No Opinion ☐
	WORKSHOPS AND SEMINARS					
	(17) How effective do you perceive Team Training *workshops and seminars* provided by two-year and four-year colleges and universities?	Extremely Ineffective ☐	Ineffective ☐	Effective ☐	Extremely Effective ☐	No Opinion ☐
NON-ACADEMIC SOURCES: in-house training, outside consultants-trainers, outside seminars and conferences, and technical-vocational institutions	**CREDIT AND NON-CREDIT COURSES**					
	(18) How effective do you perceive Team Training *credit and non-credit courses* provided by in-house training, outside consultants/trainers, outside seminars/conferences, and technical/vocational institutions?	Extremely Ineffective ☐	Ineffective ☐	Effective ☐	Extremely Effective ☐	No Opinion ☐
	WORKSHOPS AND SEMINARS					
	(19) How effective do you perceive Team Training *workshops and seminars* provided by in-house training, outside consultants/trainers, outside seminars/conferences, and technical/vocational institutions?	Extremely Ineffective ☐	Ineffective ☐	Effective ☐	Extremely Effective ☐	No Opinion ☐

PILOT TEST EVALUATION OF THE PREVIOUS SECTION (B).

Please refer back to the previous section (Section B).

(a) How clear are the *instructions* which read, **"Please check the response which describes your rating of the overall effectiveness of each of the following training programs:"?**

☐ definitely unclear ☐ unclear ☐ clear ☐ definitely clear

If you rated the *instructions* less than **"definitely clear,"** please suggest what can be done to make them "definitely clear":

(b) How clear is the **phrase: HIGHER EDUCATION: two-year colleges, four-year colleges, universities?**

☐ definitely unclear ☐ unclear ☐ clear ☐ definitely clear

If you rated the above less than **"definitely clear,"** please suggest what can be done to make it "definitely clear":

(c) How clear is the **phrase:** *credit and non-credit courses?*

☐ definitely unclear ☐ unclear ☐ clear ☐ definitely clear

If you rated the above less than **"definitely clear,"** please suggest what can be done to make it "definitely clear":

(d) How clear is the **phrase:** *workshops and seminars*

☐ definitely unclear ☐ unclear ☐ clear ☐ definitely clear

If you rated the above less than **"definitely clear,"** please suggest what can be done to make it "definitely clear":

(e) How clear is the **phrase: NONACADEMIC SOURCES: in-house training, outside consultants/trainers, outside seminars/conferences, and technical/vocational institutions?**

☐ definitely unclear ☐ unclear ☐ clear ☐ definitely clear

If you rated the above less than **"definitely clear,"** please suggest what can be done to make it "definitely clear":

C. YOUR PERCEPTIONS OF VARIOUS TRAINING TECHNIQUES

Some popular work team training techniques are listed in the table below. Circle the number that indicates your perception of the effectiveness of each of these techniques.

Definitions of "higher education" and "nonacademic sources" are the same as in Part B.

Techniques	Explanation	Provided by	Extremely Ineffective	Ineffective	Effective	Extremely Effective	No Opinion
Case Discussion	(20) Real or fictitious cases discussed in small groups	Higher Education	1	2	3	4	5
		Nonacademic sources	1	2	3	4	5
Equipment Operation	(21) Training in operation of equipment production methods directly related to performing team jobs	Higher Education	1	2	3	4	5
		Nonacademic sources	1	2	3	4	5
Gaining Team Agreement	(22) Applying skills for group decision making and consensus building	Higher Education	1	2	3	4	5
		Nonacademic sources	1	2	3	4	5
Leading Meetings	(23) Developing leadership skills required for teams that are moving to shared leadership	Higher Education	1	2	3	4	5
		Nonacademic sources	1	2	3	4	5
Maintenance Basics	(24) Learning basic machine preventive and total maintenance	Higher Education	1	2	3	4	5
		Nonacademic sources	1	2	3	4	5
Making Presentations	(25) Preparing and delivering formal presentations to customers or managers	Higher Education	1	2	3	4	5
		Nonacademic sources	1	2	3	4	5
Production Processes	(26) Developing Just-In-Time (JIT) systems and material requirements planning	Higher Education	1	2	3	4	5
		Nonacademic sources	1	2	3	4	5

Techniques	Explanation	Provided by	Extremely Ineffective	Ineffective	Effective	Extremely Effective	No Opinion
Programmed Instruction	(27) Self-paced lessons using text or computer	Higher Education	1	2	3	4	5
		Nonacademic sources	1	2	3	4	5
Role Playing	(28)Trainees act out roles, simulating on-the-job experiences	Higher Education	1	2	3	4	5
		Nonacademic sources	1	2	3	4	5
Selecting Team Members	(29) Using targeted behavior-based interviewing and assessment skills	Higher Education	1	2	3	4	5
		Nonacademic sources	1	2	3	4	5

PILOT TEST EVALUATION OF THE PREVIOUS SECTION (C).

(a) How clear are the section instructions that asked you to: ***Circle the number that indicates your perception of the effectiveness of each of these techniques:?***

☐ definitely unclear ☐ unclear ☐ clear ☐ definitely clear

If you rated the *instructions* less than **"definitely clear,"** please suggest what can be done to make them "definitely clear":

(b) Is this section **appropriate to its goal:** of helping us determine **your perception of the effectiveness of this technique?**

☐ definitely no ☐ no ☐ yes ☐ definitely yes

If you rated **appropriate to its goal** less than **"definitely yes,"** please suggest what can be done to make it "definitely yes":

TRAINING TECHNIQUES

"Case Discussion"

Is the term **"Case Discussion"** appropriate to the goal: of helping us determine **your perception of the effectiveness of this technique:?**

☐ definitely no ☐ no ☐ yes ☐ definitely yes

Does the term **"Case Discussion"** adequately describe a popular work team training technique?

☐ definitely no ☐ no ☐ yes ☐ definitely yes

If there is a better term than **"Case Discussion"** to describe such a technique, what would you suggest?

_____

"Equipment Operation"

Is the term **"Equipment Operation"** appropriate to the goal: of helping us determine **your perception of the effectiveness of this technique?**

☐ definitely no ☐ no ☐ yes ☐ definitely yes

Does the term **"Equipment Operation"** adequately describe a popular work team training technique?

☐ definitely no ☐ no ☐ yes ☐ definitely yes

If there is a better term than **"Equipment Operation"** to describe such a technique, what would you suggest?

_____

"Gaining Team Agreement"

Is the term **"Gaining Team Agreement"** appropriate to the goal: of helping us determine **your perception of the effectiveness of this technique?**

☐ definitely no ☐ no ☐ yes ☐ definitely yes

Does the term **"Gaining Team Agreement"** adequately describe a popular work team training technique?

☐ definitely no ☐ no ☐ yes ☐ definitely yes

If there is a better term than **"Gaining Team Agreement"** to describe such a technique, what would you suggest?

_____

"Leading Meetings"

Is the term **"Leading Meetings"** appropriate to the goal: of helping us determine **your perception of the effectiveness of this technique?**

☐ definitely no ☐ no ☐ yes ☐ definitely yes

Does the term **"Leading Meetings"** adequately describe a popular work team training technique?

☐ definitely no ☐ no ☐ yes ☐ definitely yes

If there is a better term than **"Leading Meetings"** to describe such a technique, what would you suggest?

_____

"Maintenance Basics"

Is this term **"Maintenance Basics"** appropriate to the goal: of helping us determine **your perception of the effectiveness of this technique?**

☐ definitely no ☐ no ☐ yes ☐ definitely yes

Does the term **"Maintenance Basics"** adequately describe a popular work team training technique?

☐ definitely no ☐ no ☐ yes ☐ definitely yes

If there is a better term than **"Maintenance Basics"** to describe such a technique, what would you suggest?

_____

"Making Presentations"

Is the term **"Making Presentations"** appropriate to the goal: of helping us determine **your perception of the effectiveness of this technique?**

☐ definitely no ☐ no ☐ yes ☐ definitely yes

Does the term **"Making Presentations"** adequately describe a popular work team training technique?

☐ definitely no ☐ no ☐ yes ☐ definitely yes

If there is a better term than **"Making Presentations"** to describe such a technique, what would you suggest?

_____

"Production Processes"

Is the term **"Production Processes"** appropriate to the goal: of helping us determine **your perception of the effectiveness of this technique?**

☐ definitely no ☐ no ☐ yes ☐ definitely yes

Does the term **"Production Processes"** adequately describe a popular work team training technique?

☐ definitely no ☐ no ☐ yes ☐ definitely yes

If there is a better term than **"Production Processes"** to describe such a technique, what would you suggest?

_____

"Programmed Instruction"

Is the term **"Programmed Instruction"** appropriate to the goal: of helping us determine **your perception of the effectiveness of this technique**?

☐ definitely no ☐ no ☐ yes ☐ definitely yes

Does the term**"Programmed Instruction"** adequately describe a popular work team training technique?

☐ definitely no ☐ no ☐ yes ☐ definitely yes

If there is a better term than **"Programmed Instruction"** to describe such a technique, what would you suggest?

_____

"Role Playing"

Is the term **"Role Playing"** appropriate to the goal: of helping us determine **your perception of the effectiveness of this technique**?

☐ definitely no ☐ no ☐ yes ☐ definitely yes

Does the term **"Role Playing"** adequately describe a popular work team training technique?

☐ definitely no ☐ no ☐ yes ☐ definitely yes

If there is a better term than **"Role Playing"** to describe such a technique, what would you suggest?

_____

"Selecting Team Members"

Is the term **"Selecting Team Members"** appropriate to the goal: of helping us determine **your perception of the effectiveness of this technique**?

☐ definitely no ☐ no ☐ yes ☐ definitely yes

Does the term **"Selecting Team Members"** adequately describe a popular work team training technique?

☐ definitely no ☐ no ☐ yes ☐ definitely yes

If there is a better term than **"Selecting Team Members"** to describe such a technique, what would you suggest?

_____

30. Please use the space below for any concluding comments or observations. Please record the questionnaire number of any item for which you want to add a comment.

Thank you for your time and help. When you have answered all questions, please return the form to me.

Howard Horton

APPENDIX E

Cover Letter to Accompany Mailed Survey

HOWARD HORTON
ASSOCIATE PROFESSOR OF MANAGEMENT
UNIVERSITY OF MARY HARDIN-BAYLOR
BELTON, TX 76513

OFFICE: (817) 939-4647 FAX: (817) 939-4535 HOME: (817) 527-3940

September 24, 1995

Dear Survey Monitor:

Thank you for taking your valuable time to assist in this important research project. Because of your position, we are asking you to select some of your employees to complete a questionnaire.

So far as we can determine, this is the first time a study has been conducted to measure the perceived effectiveness of programs and techniques used in team training. So in a real sense, you and those you select are helping us "make history"! I believe self-managed work teams, and specifically the training received by team leaders/facilitators and members, are so important that it is the subject of my doctoral dissertation!

So that the results can be analyzed properly with very reliable statistical methods, the way you select participants for us is very important! Please enlist the cooperation of as many participants as possible, trying to maintain a ratio of three times as many team *members* as team *leaders*. For example, if you had 100 participants, 75 team members and 25 team leaders would be ideal.

Each participant may complete the survey on their own and return it to you. But timing is crucial! All surveys must be completed and returned to me, via FedEx Next Day Delivery, in just three business days from the date of this letter. The enclosed mailing envelope is pre-addressed, and shipping charges are pre-paid.

Thank you very much for helping us with this very important project. Please call me if you or participants have any questions.

Sincerely,

Howard L. Horton
Ph.D. Candidate
East Texas State University

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VITA

Howard L. Horton was born in Corpus Christi, Texas, on September 22, 1942, the son of Mildred E. Horton and Howard Lee Horton. After graduating from Goliad High School in May of 1961, he attended Southwest Texas State University in San Marcos, Texas, where he received the Bachelor of Business Administration Degree in May of 1965. During college he lettered three years in baseball, and became a member of the "T" Association of athletes. He entered the United States Army in July of 1965, and was trained as a finance clerk. In February of 1968, he entered Officer Candidate School at Fort Benning, Georgia, and was commissioned a Second Lieutenant, Infantry Branch, in August of 1968. After serving one year in Vietnam as an infantry platoon leader with the 101st Airborne Division, he was discharged from active duty as a First Lieutenant in June of 1970. In January of 1974, he entered the Texas Army National Guard and served as an active member of the Guard and the United States Army Reserves until his retirement as a Lieutenant Colonel in December of 1992. In 1971, he enrolled in The Graduate School at Southwest Texas State University and was awarded the Master of Business Administration Degree in August of 1973. In 1973, he began working as a sales representative for ENTEX Corporation and continued there until 1975 when he left to work as an accounting clerk for the Texas Water Quality Board. In August of 1977, he accepted a position as Instructor of Business with Victoria College at Gonzales Warm Springs, Gonzales, Texas, teaching the physically disabled. In August of 1979 he began employment at the University of Mary Hardin-Baylor, Belton, Texas, as an Instructor in the department of economics and finance. In January of 1995, he transferred to

the Department of management and marketing and has continued there until the present. In September of 1989, he entered The Graduate School of East Texas State University and was awarded the Doctor of Philosophy Degree with a major in Adult and Continuing Education and a minor in Business Administration in May of 1996. In July of 1973, he married Nancy Symm of The Grove, Texas. Two daughters and one son were born: Heidi Rosie, in November of 1974; and twins Stacy Gail and Scott Lee on May 1, 1979. His permanent address and telephone numbers are:

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