December 1999

Characteristics of Viable and Sustainable Workers for the Year 2015

Brenda P. Dean
East Tennessee State University

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CHARACTERISTICS
OF Viable AND SUSTAINABLE WORKERS
FOR THE YEAR 2015

A Dissertation
Presented to
The Faculty of Educational Leadership and Policy Analysis
East Tennessee State University

In Partial Fulfillment
of the Requirements for the Degree
Doctor of Education

by
Brenda Pennington Dean

December 1999
APPROVAL

This is to certify that the Graduate Committee of

Brenda Pennington Dean

met on the

2nd day of August, 1999

The committee read and examined her dissertation,

supervised her defense of it in an oral examination, and
decided to recommend that her study be submitted to the

Graduate Council, in partial fulfillment of the requirements
for the degree of Doctor of Education in Educational

Leadership and Policy Analysis.

Chair, Graduate Committee

Signed on behalf of
The Graduate Council

Dean, School of Graduate Studies

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The purpose of the study was to forecast characteristics of valuable workers within Middle Eastern Tennessee for the year 2015. The following areas were studied as they related to the forecast: 1) the projected employment skill demands of business and industry; 2) the initiatives required and proposed by business and industry to meet their respective employment demands; and 3) the external support by education required for industry and business to meet their employment needs.

The Delphi panel was composed of 22 business and industry leaders who were nominated by the county executive of the ten counties of the study, officials at Walters State Community College, and members of the Regional Private Industry Council. The major areas of industry, manufacturing, and health care were represented.

In the first round of the study, panelists responded to a questionnaire consisting of 17 open-ended questions that related to the characteristics they perceive as needed by valuable workers for the year 2015. The narrative responses in round one revealed emerging consensus, which was narrowed by the second round iteration. In the second round of the Delphi, panelists responded to 55 items, each measured on a Likert scale and rank ordered the most critical characteristics or initiatives in each category.

The results indicate a clear need for workers who possess a strong work ethic, an ability to adapt to the changing workplace, and the willingness and ability to learn, as opposed to purely technical expertise. The findings of the study suggest implications for better articulation between public school curricula and industrial needs.
DEDICATION

This study is dedicated to John Dean, my husband and my dearest friend, without whose constant support, encouragement, and assistance this study would not have been possible. I appreciate him for the strength of his character, his devotion to his family and his God, and the love he continues to share with me.
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I want to express my heartfelt gratitude to Dr. Russ West, my committee chairperson. Throughout my program, he has provided guidance, concern, and patience that have been of critical importance to me in the completion of this degree and dissertation. He has provided me a powerful role model for professional leadership.

For their assistance in the completion of this study, I thank my committee. I am indebted to Dr. Louise MacKay for her constant encouragement and support throughout this process. My use of technology would be still be limited if it were not for the assistance provided by Dr. Russell Mays. He is a kind and generous man. Many thanks for the advice and insightful wisdom provided in this study by Dr. Cecil Blankenship.

I am eternally grateful to my friend and colleague, Martha Miller, who provided assistance on many levels and who was a source of abiding encouragement.

Special recognition goes to my daughter, Erin, for the joy she continues to provide in my life. The young lady that she has become is my greatest accomplishment.
Finally, I thank my parents, J.B. and Merium Pennington, who have taught me life's greatest lessons and provided me with a lifetime of unconditional love. How blessed am I to be their daughter.
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CHAPTER 1
INTRODUCTION

In order for the United States to compete in the global economy of the 21st century, the nation must successfully prepare workers and managers to meet the employment demands of the workplace. *A Nation at Risk* (National Council on Excellence in Education, 1983) gave scholarly and pragmatic attention to the relationships among a global economy, a quality education, and the welfare of the nation and the individual. The neo-classic study called for a competitive work force that is diversified, competent in mathematics and science, and equipped with the skills needed to meet the technological demands of the 21st Century.

Johnston and Packer (1987) forecast that six trends would impact work and workers in the next fifteen years. Johnston and Packer predict that policy and practice must meet the challenges of stimulating world economic growth; improving the level of productivity within the service-based industries; addressing the issues of a graying work force; aligning the discrepant needs of women, employers and families; empowering minorities (particularly...
African-Americans and Hispanics) as full participants in the workforce, and improving the skills and knowledge of workers to meet the needs of employers as potential entry-level employees.

Conventional wisdom embraces the belief that to maintain its position of world leadership and prosperity the nation must produce highly skilled workers who are adept problem solvers. If this is true, the responsibility for producing employees capable of critical thinking is shared by the educational system as well as by business and industry. However, studies of employment trends and salaries reveal that the number of people who are working for low wages is growing (Bracey, 1992).

D'Amico, Judy, and Gipel (1997) forecast that there will be an increasing need for workers who can adapt to the increasingly technological world and that the need for such workers will be exacerbated by the retirement of the baby boomers. Most valued will be the skilled employees who are able to work in more flexible settings and possess good educations (D'Amico, Judy, and Gipel, 1997). Are these the types of employees who will be required in all communities? If so, are schools preparing students to meet the forecast
employment demands of business and industry? Educators are particularly sensitive to the opinions and perceptions of employers about education and training because of a fundamental economic relationship; public education is dependent on the community for funding.

Examination of the basic facts concerning the nation's educational status reveals that U.S. students are second only to students in the Netherlands in the number of hours spent in the classroom and U.S. teachers are among the hardest working teachers in the world (Bracey, 1992). Further, although tremendous funds are poured into the nation's schools, the National Assessment of Educational Progress (NAEP) reveals virtually flat graphical results for student performance for the past twenty years (Walden, 1995). The results are frustrating to educators as well as to business and industry. Do these results indicate that current educational practices are inefficient and producing inferior workers incapable of meeting projected needs? Jerry Jasinowski, president of the National Association of Manufacturers (NAM), stated, "We increasingly feel the business of business is education" (Brosnan, 1998, p. B8). NAM reported that a survey of 4,500 member companies
revealed that one-third of job applicants were rejected on the basis of poor reading skills and that one-fourth were rejected for poor communication or math skills (Brosnan, 1998).

According to employment projections by the Tennessee Department of Employment Security for the period from 1994-2005, industries within the state will add almost 675,000 jobs (Tennessee Department of Employment Security, 1998). This represents a gain of 25.8% from 1994. Health, business, and educational services will accrue more than 258,000 of the new positions. Manufacturing is predicted to slip from 20.6% in 1994 to 17.6% in 2005, although the durable goods manufacturing sector is expected to rise by 16.8% by 2005. Within this sector, the manufacture of transportation equipment will add 13,950 jobs for an increase of 26.8%. Similar gains are expected in fabricated metal products and industrial machinery and equipment.

Earnie Deavenport, NAM chairman, stated, "The intellectual capital of the American workforce will be the difference between whether we remain an economic superpower or fall to second-tier status" (Brosnan, 1998, B8). Effective leaders will formulate strategies to meet their
organizational needs based on the existing and projected challenges and the resources at the organization's disposal. Included are the organization's resources and the needs of all stakeholders (Wortman, 1982). Such a paradigm shift is expected to divert the attention of leaders away from the concrete, short-term problems and abstract issues of daily operations, which have long-term consequences and allow organizations to respond proactively to future needs.

Statement of the Problem

For the nation and its constituent communities to succeed and enjoy economic prosperity in the 21st century, it must possess a ready supply of skilled workers. Identifying the characteristics of the viable and sustainable employee in the year 2015 would allow educational institutions and employers to collaboratively develop programs to meet their mutual needs.

Understanding the future job market in the ten county service area of Walters State Community College is of critical importance to the economic welfare of this region of middle eastern Tennessee. Knowledge of the types of workers and their required skills will enable local
institutions and organizations to meet the employment requirements and ameliorate skill gaps.

**Purpose of the Study**

The purpose of this study was to forecast the characteristics of the viable and sustainable employee in the year 2015 in the ten county service area of Walters State Community College. The following areas were studied as they related to the forecast:

1. The projected employment skill demands of the businesses and industries in the ten county service area in the year 2015.

2. The initiatives (e.g., training) required and proposed by business and industry to meet their respective employment needs in the year 2015.

3. The external support by education required for industry and business within the ten county service area to meet their employment needs.

**Research Questions**

The following research questions were formulated for this study:
1. What will be the competitive characteristics of a viable and sustainable worker in the year 2015?

2. What will successful companies do to ensure the availability of competent workers in the year 2015?

3. What changes in public education will be required to meet industry's needs in the year 2015?

**Significance of the Study**

The economic health of a community depends on the business and industry it can attract and maintain. Although cost of production is important, availability of skilled labor and government support in the form of education are equally important. In order for public education to serve one of its vital stakeholders, business and industry, it must know what business and industry require in terms of workers' skills and attributes. Once requirements are identified, strategies and priorities of business, industry, and education may be shifted to meet the expected needs.

This study will provide important information to business, industry, Chambers of Commerce, community leaders, workers, potential employees, and educators of the ten county service area of Walters State Community College in preparing for the challenges of the 21st century. The results may be utilized to forecast future events or conditions on the basis of rational study and the analysis of relevant data. It may lead to better articulation
between public school curricula and business needs and stimulate the development of a strengthened economic base.

**Definitions of Terms**

**Ten County Service Area of Walters State Community College**

The ten county service area of Walters State Community College, located in Middle Eastern Tennessee, is composed of the following counties: Claiborne, Cocke, Grainger, Greene, Hamblem, Hancock, Hawkins, Jefferson, Sevier, and Union.

**Viable and Sustainable Employee**

A worker who meets the minimum standards of an employer for initial employment and who is able to perform in the workplace at satisfactory levels to maintain employability.

**Limitations of the Study**

The following limitations were relevant to this study:

1. The members of the Delphi panel were chosen from the ten county service area of Walters State Community College in Middle Eastern Tennessee.

2. The results reflect the surveyed opinions and perceptions of the Delphi panel. No attempt was made to validate the stated opinions and perceptions.

3. The study is limited by the inherent nature of the research tool, the Delphi technique, as implemented in this study. The Delphi technique allows a group of participants to reach a consensus concerning future projections and
forecasts, but does not allow for the stimulation possible through face-to-face contact.

Assumptions

The following assumptions were considered relevant to this study:

1. It is assumed that all respondents answered all survey items with candor and to the best of their abilities.

2. It is assumed that the members of the Delphi panel represent a cross-section of the businesses and industries of the service area and possess the level of expertise needed to make forecasts and predictions concerning the characteristics of the viable and sustainable employees of the future.

Organization of the Study

The study was organized and sequenced as described here.

Chapter 1 has presented the introduction, statement of the problem, purpose of the study, research questions, significance of the study, definitions of terms, limitations of the study, assumptions, and organization of the study.

Chapter 2 contains the review of related literature and research related to the problem being studied.
Chapter 3 describes the methodology and procedures used to gather data for the study, including the Delphi technique.

Chapter 4 contains the procedures and results in Round 1 and reports the findings emerging from the Round 1 Delphi.

Chapter 5 contains the procedures and results in Round 2 and reports the findings emerging from the Round 2 Delphi.

Chapter 6 contains a summary of the study and findings, conclusions drawn from the findings, a discussion of the findings, and recommendations for further study.
This chapter provides an extensive review of the literature and research related to the study. The review of the literature focused on eight areas. The review of literature was organized in the following major categories: (1) employers' perceptions of available job applicants; (2) a world class worker; (3) employers' satisfaction with education; (4) assessment of education; (5) the changing workforce, including Tennessee; (6) training and development in the private sector; (7) education's role in worker preparation; and (8) the futurist view.

Employers' Perceptions of the Available Job Applicants

Schriner (1998) described a bleak scenario of current workforce conditions marked by such extremes as fist fights in the office, conducting fifty physical exams of job applicants before one is found who can pass, functionally illiterate workers unable to read job-related instructions, and employee turnover resulting in production reduction and the refusal of companies to take additional orders. A survey of 4,500 member companies of the National Association of Manufacturers (N.A.M.) revealed that one-third of all job applicants are rejected.
due to poor reading skills and one-fourth are rejected on the basis of deficiencies in mathematics and communication skills (Brosnan, 1998). Khojasteh (1994) found that 25% of new employees are deficient in arithmetic, basic reading, and writing. The N.A.M. survey of job skills also found that in excess of one-fourth of the companies reject more than 75% of their applicants as unqualified. Respondents indicated a belief that one-half of current employees are deficient in mathematics, writing, and comprehension. One-third of the N.A.M. members expressed the opinion that production technology had been negatively impacted by poor worker skills to the extent that 20% have delayed the addition of new lines of business due to lack of qualified employees (Brosnan, 1998). Among Fortune 500 companies, 58% report difficulty securing employees with basic skills and state that 20% of the American workforce is illiterate and mathematically challenged. Additionally, 30% of unskilled workers, 29% of semi-skilled workers, and 11% of all professionals are functionally illiterate (Khojasteh, 1994). Functionally illiterate is defined as "unable to read, write, calculate or solve problems at a level that enables them to cope with even the simplest tasks” (Bernardon, 1989, p.30).

These events point to a crisis among U.S. employers in locating quality workers. The worker employers seek is
physically able to perform the job, sufficiently skilled to perform the required tasks, and able to work cooperatively with others (Schriner, 1998).

The National Alliance of Business (1990) conducted a study of employers' satisfaction with blue-collar and clerical entry-level employees. Interviews with 200 executives who are responsible for recruitment of personnel from a national sample of Fortune 1000 companies and the top 200 privately held companies were conducted. Thirty-six percent expressed satisfaction with entry-level employees and 16% expressed satisfaction with the training level of entry-level applicants. Fifty-eight percent of respondents expressed the opinion that mathematics skills had declined over the past few years. Further, 25% rated the nation's workforce as unsatisfactory.

The critical shortage of quality workers is predicted to become more severe. While downsizing is still occurring in many industries, the U.S. Labor Department predicts that 17.6 million new non-agricultural jobs will exist by 2006 (Schriner, 1998). The shortage will be exacerbated by workers leaving the workforce and is projected to push the number of job openings to 50.6 million, of which 64% will be in the service area (Schriner, 1998).

The review of literature in the area of employers' perceptions with available job applicants reveals that many
employers are dissatisfied with current applicants. Deficiencies were reported in the areas of basic skills and comprehension. The aging of "baby boomers" exacerbates the problem and it is projected to worsen, creating concerns that the U.S. will not be able to provide world class workers to business and industry.

A World Class Worker

In 1991, The Secretary's Commission on Acquiring Skills (SCANS), under the auspices of U.S. Secretary of Labor Lynn Martin, produced a document to define the workplace competencies and foundation skills needed for effective job performance (New Hampshire School-to-Work, 1998). Workplace skills include resource management, interpersonal skills, the use of information, and the effective use of systems. The foundation skills of the workplace are basic skills, thinking skills, and personal qualities. Effective job performance requires the management of time, money, materials, facility resources, and human resources. The worker must be able to participate as a team member, teach others, serve clients, exercise leadership, work toward an agreement, and accept cultural diversity. Information must be acquired, evaluated, organized, maintained, interpreted, and communicated using computers. The desired employee is able to understand social, organizational, and technological systems and monitor, correct, improve, and design systems.
Further, workers must be able to select appropriate technology and apply technology to tasks while maintaining and trouble-shooting the technology (New Hampshire School-to-Work, 1998).

The foundation skills encompass reading, including accessing information and technical reading skills; writing; arithmetic, including computation, estimation, and graphs or diagram interpretation; mathematics, as a tool for problem-solving and the formulation of predictions; listening; and speaking (New Hampshire School-to-Work, 1998). Effective performance in the workplace employs thinking skills: creative thinking, decision making, problem-solving, mental visualization, knowing how to learn, and reasoning. Similarly, personal qualities of responsibility, self-esteem, sociability, self-management, integrity, and honesty are sought in the world class worker (New Hampshire School-to-Work, 1998).

Members of the American Vocational Association School-to-Work Partners coalition were interviewed to ascertain the skills and qualities desired in the workforce (What Do Employers Want? 1997). The panelists reported that the wealth of an organization is its people. Organizations seek employees for their personal qualities, work ethic, ability to read information, and ability to communicate. These skills are typically developed in vocational programs. The
focus of vocational training seems to be learning for doing as opposed to learning for learning. Employees who come to the organization able to communicate and willing and able to learn can be taught job-specific skills (What Do Employers Want?, 1997).

The changing nature of the workplace makes the ability to learn valuable. Students may change jobs 14 to 15 times in their lifetime and careers seven or eight times. Successful workers will have portable skills that may be taken from one job to another and from one career to another. The changing nature of the workplace and the emergence of new technologies make it impossible for schools to anticipate specific skills that will be required (What Do Employers Want?, 1997).

Personnel directors of the 116 largest companies in Illinois indicated the importance of basic skills for the success and competence of entry-level employees (Junge, 1983). The findings indicated the most important the areas to be writing, speaking and listening, reasoning, reading, mathematics, and science.

Lightner (1993) surveyed 564 audio professionals in an eight-state region and found a predominant result that
industry practitioners want schools to form appropriate student attitudes as well as developing technical skills. Participants ranked "people skills" above technical skills. Waddell (1998) asserts that an employee may have rich and varied technical skills, but be unacceptable as an employee due to deficits in character. Thinking skills are also highly valued in the employee (Lightner, 1993).

Good work habits and the ability to adapt to new conditions were determined to be the top general competencies desired in successful employees in the printing industry in Illinois (Carson, 1992). The participants of the study also deemed relationships with others, specific job skills, communication skills, reading and comprehension, self-esteem, problem-solving, mathematics skills, and broad background knowledge to be important. There is a close alignment between the perceptions of commercial printers and printing educators in the qualities desired in entry-level workers. Furthermore, the two groups agreed there is disparity between the competencies desired and the characteristics possessed by current entry-level employees (Carson, 1992).
In the workplace creativity is also important. Employees must be open to new ideas and willing to explore different ways of performing job duties and solving problems. Equally important to employers is an employee who can fit into the dynamic of the workplace and who knows how to manage conflict (What Do Employers Want?, 1997).

Greenan, Jarwan, and Munn (1992) conducted a local and national study of the status of secondary trade and industrial education curriculum; the needs of business, industry, and labor in the state of Indiana; and a clarification of the relationship between current secondary trades and industry curriculum; and the projected needs of business, industry, and labor. Three separate populations were sampled and measured by three separate instruments: 250 business, industry, and labor members of advisory groups in Indiana; 250 trades and industries teachers and coordinators in Indiana; and all state trades and industries supervisors, except the Indiana supervisor. The respondents identified as important correct usage of the following skills by their employees: whole numbers, fractions, decimals, percentages, measurement, calculations, mixed operations, estimation, words and meanings, reading, writing, speaking, listening,
planning, problem-solving, verbal reasoning, flexibility, adaptability, work behaviors, instructional and supervisory conversations, teamwork, and change (Greenan, Jarwan, & Munn, 1992). Assessment of current employees indicated scores approaching, but below average in these skills. These findings suggest that entry-level employees are below the expectations of the employers in these essential skills. Science and computer skills were rated as moderately important with the exception of earth science, biology, and chemistry, which were found to be of minimal importance (Greenan, Jarwan, & Munn, 1992). Fifty percent of the respondents stated interest in hiring generalists and 42% reported a desire to hire specialists. The remaining 7% indicated that it depended on the particular employer.

The review of literature in the area of world class workers suggests that the federal government has identified workforce competencies and foundation skills. A world class employee possesses basic literacy skills and can communicate effectively. Such workers have a strong work ethic, positive personal qualities, and are able to learn. One is left to wonder if employers perceive whether education is effectively developing workers with those traits.
Employers' Satisfaction with Education

In a global economy, where the availability of productive and skilled workers is directly linked to economic success, the reported statistics are cause for alarm. The skill requirements of new jobs are exceeding the skill levels of the workforce and little has been done to change the educational system to narrow the skill gap (National Alliance of Business, 1991). Past economic success was linked to machinery and natural resources and most jobs could be performed by the unskilled or semi-skilled individuals. Present economic success is linked to the quality of the worker in terms of intelligence in the use of the machinery, improvement of the machinery, and the ability to respond to diverse customer needs (National Alliance of Business, 1991). However, too many students leave high school without the occupational or academic skills needed to succeed in the workplace (Paris, 1994).

A report by the Commission on the Skills of the American Workforce (1990) asserts that Americans may have the worst school-to-work transition of any industrial nation and notes that the secondary curriculum of the typical
school is directed to articulation with the college or university. However, only 50% of high school graduates enroll in post-secondary education and only 50% of the enrollees earn a bachelor's degree (Paris, 1994). Yet, the U.S. Department of Education (1994) reports that the number of students enrolling in vocational education programs is declining. These facts, considered with a national drop-out rate of 11% and a 50% drop-out rate in some urban areas, indicate that many high school students approach adulthood and attempt to enter the workforce without needed skills (Paris, 1994). An employer survey conducted by the Business-Higher Education Forum found that by the year 2000, there will be universal computer literacy requirements for blue-collar workers, but found that the new workforce entrants may have trouble meeting those requirements (National Alliance of Business, 1991). The more professionalized blue-collar workers must be able to work in teams, to formulate decisions, to communicate with customers, and to participate as life-long learners. A U.S. Department of Education report (1993) indicated that 89% of the jobs created between 1992 and 2000 will require post-secondary levels of competency in the areas of literacy and
mathematics, but predicts that only one-half of the individuals entering the workforce will possess these skills. Paris (1994) posits that the skills of potential employees are in misalignment with the skills employers need.

The skill gap is reported to be the result of failures by the education system to match the skill level required in emerging jobs (Herman Miller, Inc., 1996). The educational system has failed to prepare graduates to be full participants in the workforce. Further, the growth occupations will demand a better-prepared worker than current positions require. Twenty-four percent of new jobs in 1985 required average to better skills as compared to the predicted 41% of jobs in 2000. A similar shift is seen in low skilled jobs. In 1985, 40% of jobs were identified as low skilled, while only 27% will be low skilled in 2000 (The Workplace Revolution, 1990). Poorly educated workers qualify for one in eleven of current jobs, but will only qualify for one in twenty-five jobs in the future (Hopkins, Nestelroth, and Bolick, 1991). A national Canadian study reports that the leading cause of rejection of an entry-level employee is no longer lack of experience. It has been
replaced by a deficit of communication skills in reading and writing (Perrin, 1991). Fifty-seven percent of respondents cited communication skills and 56% gave lack of experience as the major cause of applicant rejections.

Monson (1990) surveyed 100 businesses served by the Greeneville County School District in South Carolina and found that employers are more satisfied with high school graduates than non-high school graduates as entry-level employees. Monson asserts that the results contradict the current notion that South Carolina schools are not producing graduates who perform satisfactorily at the entry-level position. (Monson, 1990).

McNelly (1995) directed a survey of 798 employers in the state of Tennessee and reported their satisfaction with secondary vocational completers as entry-level employees. The three-year longitudinal study revealed that secondary vocational-technical completers were valued employees for entry-level jobs. Similarly, a study conducted by the Florida State Department of Education (1992) of 988 firms that had hired completers in job-related training found that most employers were dissatisfied with public education and occupational skills, but reported an increase in
satisfaction with basic skills. An earlier study by Petty (1989) revealed that employers were pleased with the performance of vocational completers, but not to the extent that they would support additional tax initiatives for vocational education funding. Participants recommended that vocational education teachers have subject-related work experience and possess a college education (Petty, 1989).

The Parker Project examined Wisconsin employer and employee perceptions of the effectiveness of job training and career education available in Wisconsin high schools (Oinonen, 1984). Survey participants indicated that employers are not satisfied with all training provided in the secondary schools. Improvement in education is necessary to prepare entry-level employees for future work needs. In addition to employers being more satisfied with vocational completers, vocational completers were more satisfied in their jobs than counterparts from college-prepatory programs. The differences in satisfaction may be due to vocational completers' employment-seeking skills and increased familiarity with the tools and equipment used in the workplace (Oinonen, 1984).
A survey was conducted by Kurtz (1986) to ascertain the satisfaction of employers with entry-level employees trained in the Riverside County Regional Occupational Program as compared with other entry-level employees. The employees trained in the occupational program were rated as having higher job motivation than other employees. While the employees trained in the occupational program had a higher skill level, the difference was not significant. It was concluded that employers in this study perceived occupational program trained entry-level employees as more acceptable than other employees in their overall job performance (Kurtz, 1986).

The review of literature in the area of employers' satisfaction with education indicates that a broad contingency of employers believe that too many students are leaving high school without the occupational or academic skills to compete in the workplace. Although employers are more satisfied with vocational completers, there is a decline in participation in the area of vocational education. However, to more completely understand the progress American schools are making, one needs to examine
the performance of students in regard to curriculum, national test scores, and international competition.

Assessment of Education

Secretary of Education William Bennett (1988) directed an assessment of American education to determine progress on the goals established by the study of the National Commission on Excellence in Education (1983) commonly known as "A Nation at Risk." The study compared transcripts of 15,000 students with a similar group of students in 1982 and revealed significant improvements. An increase from 13.4% to 30% of students completed the "new basics" in English, mathematics, science, and social studies. Five recommendations were formulated for American education: strengthen content curriculum; ensure intellectual opportunity for every student; establish an achievement ethic; recruit and reward excellent teachers and administrators; and institute accountability for student learning (Bennett, 1988).

The College Board announced that mathematics and verbal scores on the Scholastic Achievement Test had dropped by two points (Hodgkinson, 1992). However, closer examination reveals that 32 states showed improved performance. Alabama scores improved 46 points and Louisiana improved 39 points. Twelve of the states with low percentages of test takers showed improvement. Low percentages of test takers make the
results less valid, but they are included in the results (Hodgkinson, 1992). The mean SAT scores of Caucasian, African-American, Asian American, Native American, Mexican American, and Puerto Rican students increased from 1975 to 1990 (Berliner, 1993). Decreases in the mean overall score may be linked to educational opportunities and higher education being afforded to more students.

Bracey (1994) urges close scrutinization of statistical data in reference to the assessment of education. Americans are concerned with rank in international assessment, but Bracey posits that scores are a better indicator of the quality of performance. In the Second International Assessment of Educational Progress, U.S. 9-year-old and 13-year-old students ranked low, but their scores were near the international average. In science, scores three points above average placed U.S. 9-year-olds at a ranking of third. In mathematics, a similar difference of three points caused U.S. 13-year-olds to be ranked as 18th (Bracey, 1994). All industrialized nation’s scores are fairly close.

Concurring, Berliner (1993) refutes claims that the U.S. educational system is failing or that the performance of top U.S. students has declined. Berliner (1993) reports that on the Wechsler or Standford-Binet Intelligence Tests students’ scores have increased .3 points per year since 1932 for a total of 14 IQ points. The majority of the gains
have been in "thinking skills" in the area of problem-solving skills and in the ability to handle abstract information of a decontextualized nature. Participation in the Advanced Placement (AP) program has risen 255% from 1978 to 1990.

The National Assessment of Educational Progress (NAEP) tests administered to a national sample reveals only modest gains since 1970 in the areas of mathematics, science, reading, writing, geography, and computer skills (Berliner, 1993). However, investigation of the norming procedures reveals that it now requires a higher score to reach the fiftieth percentile. Likewise, the same trend is noted in the Iowa Tests of Basic Skills, the Stanford Achievement Test, the Metropolitan Achievement Tests, and the Comprehensive Tests of Basic Skills (Linn, Graue, & Sanders, 1990).

The United States ranks ninth among sixteen industrialized nations in per-pupil expenditures for K-12 education (Berliner, 1993). These figures represent expenditures 14% less than Germany, 30% less than Japan, and 51% less than Switzerland. In comparison with the same 16 nations, 13 have higher expenditures per-capita on K-12 education. To meet the mean per-capita income expenditure on K-12 education, the U.S. would require an additional $20 billion dollar expenditure (Berliner, 1993).
The National Alliance of Business (1991) examined what employers, educators, students, and parents think of American education. Responses of the 2,000 participants revealed that employers believed recent hires to be borderline in literacy and basic function skills. Employers and educators reported a general lack of preparation and discipline among students. All of the groups surveyed supported tougher standards and a higher level of investment in education (National Alliance of Business, 1991).

Weinstein, in an interview with the Greensboro News Record, identified the South as an underdeveloped region (cited in Campbell, 1997). The South is defined as being composed of 14 states: Alabama, Arkansas, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia. The region is experiencing growth without experiencing comparable prosperity. The new positions are low-wage positions. Although the South contains 32.7% of the nation's population and 32% of its jobs, Southerners earn 3% less than workers in other regions (Campbell, 1997). Weinstein attributes this to the poor education of the workforce.

The review of literature in the area of assessment of education reveals that the curricula of an increasing number of American high school students include the new basics.
Educators are being held to a higher degree of accountability for student learning than previous U.S. standards. In several areas, U.S. schools show progress. SAT scores for all ethnic groups have increased by an average of two points from 1975 to 1990. Similarly, IQ scores have steadily risen by .3 points each year since 1932. When U.S. students are compared to other industrialized nations, they score fairly close. The greatest discrepancy is seen in the area of per pupil expenditure for K-12 education. Thirteen of the sixteen industrialized nations have higher per pupil expenditures than the U.S. The South is particularly impacted by poor education, as indicated by the preponderance of low paying jobs. However, education is not the single factor that must be considered. Issues such as demographic changes in the workplace, the strength of the economy in face of globalism, and changes in social phenomena may further complicate the issue.

The Changing Workforce

In addition to the changes in skill requirements facing employers there may be a change in the economy and in the demographics of the workplace. A Hudson Institute study, Workforce 2000, forecasts the emerging trend toward increased diversity and a shortage of skilled workers
(Johnston & Packer, 1987). Johnston and Packer (1987) predict six trends and policy issues will emerge in the next fifteen years: stimulation of world growth; improvement of the synergy of an aging workforce; alignment of the needs of women, family responsibilities, and the requirements of the workplace; assimilating minorities, most notably Hispanics and African-Americans, into the workforce; and the advancement of workers' skills and level of education.

A similar study was conducted in Canada among 1500 senior managers in the private and public sector organizations (Perrin, 1991). Although only 29% of the organizations responded to the questionnaires, it is one of the few national studies of workforce trends in Canada, including the aging of the workforce. The 437 respondents predicted the lowest levels of labor force growth since the Great Depression with a 40% decrease in new job entrants. Further, a skill gap is predicted. The projected jobs will require in excess of 12 years of education, but a large percentage of the new job entrants will be high school drop-outs or functionally illiterate. The demographics of the Canadian workforce are projected to change in terms of age, gender, and race. The average age of the worker will be 37
by the year 2000, with 80% of the new job entrants being females and minorities. Sixty-three percent of females, including one-half of the women with children under the age of one, will return to work (Perrin, 1991). The Perrin study also addressed issues of work hours, work location, participation in job design, and decision-making. The results of the Perrin study are suspect due to lack of information concerning the methodology and the low response rate, but as it provides unique information on the Canadian workforce, it is worthy of attention.

Concurring with Johnston and Packer (1987), Khojasteh (1994) stated that the demographics of the American workforce will be altered by the following changes: a decrease in the growth of the population and the workforce; an increase in the age of the worker and the average age of the population; increase in the number of female and minority workers; an increase in the participation of immigrant workers in the workforce; and an increase in the number of provisionary workers.

Disagreeing with the work of Johnston and Packer (1987) and Khojasteh (1994), Thornburg (1991) posited that faced with a dearth of young skilled workers, industry will turn
to machinery. Likewise, pay rates will be adjusted to address issues of quality, service, and performance. The issue is not limited to the characteristics of the worker, but also includes the skill level of management (Thornburg, 1991).

The National Alliance of Business (1991) foresees that the American workforce will be reshaped by three demographic influences: reduction in population growth, increases in the number of female workers, and increases in the number of minority employees. The population and the workforce will experience a slower growth than for any other period since 1930. At the dawn of the 21st century, the supply of new workers will expand by 1% annually, as compared to a growth rate of 2.4% in the 1970s.

Females will represent 60% of the new entrants and comprise 47% of the workforce by 2000. The percentage of women in the workforce is predicted to increase and to comprise 47.8% of the workforce in 2005 (Fullerton, 1995). This trend has implications for the dynamics between family and the workplace. Eighty-four percent of women, many of whom will have young children, will have jobs by the year 2000. The fastest-growing population in the workforce is
women with children under the age of six (Jamieson & O'Mara, 1991). Kurian (1994) reported that 59.9% of married women in the workforce have children under the age of six and 55.8% of the women with children have children under the age of one. Seventy-five percent of the new jobs created in the United States between 1990 and 2010 will be filled by women and non-whites (Khojasteh, 1994).

Minority contributions to the workforce will expand. Asians, African-Americans, and Hispanics will be responsible for 57% of the predicted labor growth through 2000. However, white workers are predicted to continue to comprise the majority of the workforce in 2005 (Herman Miller, Inc., 1996). Businesses and industries that have relied on young males to fulfill employment needs are predicted to experience fewer applicants in the hiring queue. However, though few in number, the applicants will bring diversity to the applicant pool.

The review of literature in the area of the changing workforce predicts changes in the demographics of workers. The workforce is predicted to be an older group with more females and minorities represented. A reduction in population growth is predicted.
Basic skill deficiencies among workers render substantial cost for the employer. The costs include educational expenses, lower productivity, greater supervisory cost, and reduced product quality (National Alliance of Business, 1991). Larger organizations may have the funds for allocation to education and re-training, but these costs hinder competition with foreign competitors. Smaller organizations, which provide the bulk of jobs in the United States, do not have resources to re-educate the workforce (National Alliance of Business, 1991).

Training and Development in the Private Sector

The demographic changes and the increasing complexity of the workplace have made training and educating the American workforce a necessity. Current thinking is that traditional manufacturing jobs will be lost to developing nations due to lower labor costs. Many of the new work positions being created in the United States require higher skill levels than in years past (Flint, 1993; Ehrbar, 1993; Szabo, 1993). Lau (1993) posits that the basic education and work-related training are inadequate in comparison to other industrial nations. The U.S. Office of Technology
Assessment (1990) estimated that between 20% and 30% of U.S. employees are lacking in the basic skills required to effectively perform in their current positions, to efficiently participate in training programs, or to execute new technology initiatives successfully. Washburn and Franklin (1992) report that American business spends $20 billion a year in basic skills training to provide reading and mathematics skills sufficient to begin work-related training. Eisen (1993) states that the American Society for Training and Development reports that only seven percent of U.S. workers receive any formal training from an employer. Further, only 4% of companies engage in continuous training of employees to meet the demands of the increasingly complex workplace. A survey of 2500 firms that have more than 100 workers, conducted by the National Association of Manufacturers, indicates that 15% of the workers received formal training from their employer (Eisen, 1993). Most remarkable in this study was a shift from training only managers to training front-line employees, as well. According to the Congressional Manufacturing Task Force, industry leaders realize that bearing the cost of remedial education and training is an inherent cost of doing
business, as indicated by their $30 billion dollar national training expenditure (Eisen, 1993).

Complacency between workers and employers is a central concern. Lau (1993) found that fewer than 200 companies spend more than 2% of their payroll on formal training programs. Additionally, those workers most needing training are least likely to receive it. Front-line employees receive little training, although they are responsible for the operation, maintenance, and repair of the machines. Further, training is usually limited to job-specific situations and does not support motivation for life-long learning (Lau, 1993).

In years past, most production workers could obtain the needed work skills by simple observation of more experienced workers. Further education was not needed (Lau, 1993). Sophisticated technology demands the investment of a well-educated and trained workforce, as the technology has altered the production process. Work has changed as the machinery performs the routine and repetitive tasks and the worker is expected to plan, exercise sound judgment, think critically, solve problems, foresee problems, and become a more conceptual employee (Lau, 1993).
Stone (1991) found that U.S. companies spend only 1% to 2% of all hours worked in classroom training. Japanese and German companies heavily rely on formal training. New workers in Japanese companies receive an average of 300 hours of training in their first six months of employment, as compared to U.S. workers who receive less than 50 hours of training (Stone, 1991).

Because knowledge becomes obsolete at a rapid pace, Drucker (1992) noted that learning needs to be reinforced and needs to become a continuous activity throughout the career of the employee. Forward thinking companies have embraced this notion and offered appropriate training in a variety of formats. The Will-Burt Company, a manufacturer of machine parts for Volvo, Raytheon, and Mack, noted a 10% defect rate in its products (Eisen, 1993). The rate was high enough to cause business losses both domestically and internationally. Examination of the workforce revealed a tenth grade average education and a deficiency in blueprint reading and scale interpretation. The management offered voluntary blueprint reading and mathematics courses taught by high school and university personnel during the workday. A $200,000 training expenditure, augmented with state
funding, resulted in a 100% math literacy rate among workers, increased morale, reduced the cost of workman’s compensation from $500.00 to $3.00 per worker, increased worker attendance, stabilized health insurance claims, and lead to a production defect rate of only 3.7 defects per million (Eisen, 1993).

The 1994 Human Relations Award of Excellence was presented to Howard Hallman of the Stone Container Corporation of Savannah, Georgia (Smith, 1994). A $347 million dollar computerization of the mill necessitated an in-house adult literacy program. Studies of the workforce revealed that one-fourth of the workers were functionally illiterate. Faced with the options of training existing employees or replacing loyal employees, the company trained 158 of its employees. The program resulted in every worker attaining a minimum ninth-grade education and with 37 obtaining high school equivalency (GED). Additionally, plant-wide initiatives provided training and development in the areas of human relations skills, and basic economics (Profiles in Quality, 1991).

The National Center of the Educational Quality of the Workforce’s National Employer Survey provides information on
the employee recruitment, the organization of work, investment in physical capital, and the use of education and training in the workplace. The study examines time production records (Smith, 1994). Of the 2,441 eligible manufacturers, 1,621 returned the survey. Findings revealed that most employers provide some type of formal training programs.

General Motors management experienced similar situations. Automation at the General Motors plant in Linden, New Jersey, revealed that advanced technology could not substantially improve production or quality without total workforce training (Profiles in Quality, 1991). Each worker was given 80 hours of intense training in subjects not normally addressed with the front-line employees, such as quality control management, interpersonal communications, output, labor productivity, total factor productivity, and value-added measures; linking those items to the wages of the employee.

In a similar study, the U.S. Bureau of the Census administered a telephone survey to a nationally representative sample of private employers of more than 20 employees in both the manufacturing and non-manufacturing
sectors (Lynch and Black, 1996). Formal training in the survey was defined as structured planning offered at the work site or at another location and that occurred during the working hours or at another time. Examples of formal training included seminars, lectures, workshops, audiovisual presentations, apprenticeships, and structured on-the-job learning experiences. Results indicated that employers who have made larger investments in fiscal and human capital and have embraced the characteristics of a high performance work system or have hired workers with higher than average educational skills are more likely to have in-house training programs. This suggests that employer-provided training is a complement to investments in physical and human capital rather than a substitute for such investments.

Differences in training programs by the size and type of industry are noted. Manufacturers employing 20 to 49 employees are much less likely to offer formal training than organizations employing 1,000 employees or more (60% to 98%, respectively) (Lynch & Black, 1996). Additionally, chemical, petroleum products, and primary metals industries are more likely to provide formal training than employers in textiles and apparel industries as are noted by the 88% to
61% ratio of training programs. Ninety-nine percent of the surveyed employers reported that their organizations provided some type of informal training. However, there was little variation among the informal training programs based on the size or type of industry.

Lynch and Black (1996) found that 70% of the formal training occurs during work hours and 3% occurs outside normal working hours. That all formal and informal training occurs during working hours was reported by 52% of employees. In-house personnel provide approximately 56% of training programs. The most common providers of training outside the establishment are from equipment suppliers or buyers (78%). Other training providers include private consultants, vocational-technical institutions, two-year colleges, and industry associations. Government-funded training programs are utilized by 12% of the organizations and formal training programs of unions are used by 7% of the organizations (Lynch & Black, 1996).

In years past, public policy makers looked to emerging technologies and enhancement in formal education as the only means of achieving sustainable productivity growth (Bottoms, 1993). These two factors collectively account for 40% of
the productivity growth this century, but work-based learning is credited with 60% of the growth by the American Society of Training and Development (Bottoms, 1993). The report issued by the Secretary’s Commission on Achieving Necessary Skills (SCANS) attempted to bridge the skill gap between the classroom and the workplace (Bottoms, 1993). Enlarging on this work, the National Advisory Commission on Work-based Learning (NACWBL) urges voluntary industry-based skill standards to ensure quality workers to produce quality products and services (National Alliance of Business, 1990). The NACWBL asserts that the issue can be resolved through the development of standards, training to industry standards, competency-based assessment, and incentives. Furthermore, the U.S. Department of Labor and the U.S. Department of Education support the development of a framework to allow for the defining of high-level standards, but it is the job of industry and not the government to define these standards (Bottoms, 1993).

The role of the government in workplace training is cause for debate (Dentzer, 1992). Supporters of a government mandate for business and industry claim that training would reduce national unemployment, increase
productivity and output, create as many as two million new jobs, democratize the workplace by educating not just the top 10% of employees, and reduce the fear that highly trained workers will be pirated by competitors. The Institute for Workplace Learning identifies three means of government involvement in worker training: mandate that companies train; bribe companies through tax incentives; and offer government technical assistance by showing firms what to do (Dentzer, 1992).

Although workforce training programs in the private sector are also pursued to align an employee's skills with the skill set needed for success within the organization, it also attempts to build a world-class workforce linked to corporate strategies, corporate culture, and mission of the organization (Sternberg & Coleman, 1994). By designing educational curriculum, an organization may address core competencies, leadership skills, and the understanding of corporate values. Additionally, horizontal and vertical learning may occur (Sternberg & Coleman, 1994).

In response to writing deficiencies of entry-level employees, many companies have been forced to create business English or communication courses (Junge, 1983).
Writing standard English sentences was identified as the most deficient competency.

**Apprenticeship Programs**

U.S. industries and businesses need to develop a closer relationship with educational institutions, particularly high schools, to maintain the required supply of skilled workers. Dertouzos, Lester, and Solow (1989) found that in the United States formal education institutes are expected to supply the majority of skills needed in the workplace. In contrast, in Germany and Japan the employer provides job-related skills in context at the worksite. The German dual system of education alternates two to three years of highly structured work-based training with traditional classroom teaching for youngster beginning at age 16 (Finegold, 1993). These researchers conclude that the German and Japanese models are superior to that of the U.S. system in producing the flexibility and skills required to respond to changes in economic markets and emerging technologies (Dertouzos, Lester, & Solow, 1989).

The German system of dual education results in two-thirds of the total workforce being certified graduates of
an apprenticeship program (Lau, 1993). In 1992, 600,000 German students left school while still enrolled in apprenticeship programs, which were offered in 480 occupations (Prewo, 1993). The apprentices on average spend three years working in a firm under the auspices of a trained instructor, with one day of the week dedicated to training at a vocational school. The ventures are cooperatively financed and operated by the government and private industry (Lau, 1993). Government participation is limited to funding and to the development of the training parameters.

Although Japan does not have a national apprenticeship program, individual companies accept responsibility for education and training (Lau, 1993). Companies are well supported by educational institutions. Japanese companies train approximately 90% of all entry employees within the company or at government sponsored schools. On average, the training period is four months long compared to a much shorter time span in the United States. Rosenbaum and Kariya (1989) found that large Japanese firms allot to each of their contract schools a specific number of jobs to recruit their best graduates before graduation. Such a
contract system creates competition among schools and students, producing an incentive for excellence among individual students (Rosenbaum & Kariya, 1989).

The United States is the only industrial nation that lacks a system for linking the workplace and the school or for the certification of skills of secondary school graduates (Hoerr, 1990). Enthusiasm for youth apprenticeships, although not a well-defined term in the American context, has led President Clinton to announce a goal of creating an apprenticeship program to be developed in all 50 states (Finegold, 1993). However, only five million dollars was budgeted for the initiative. The program is directed by three tenets: it must have the status to attract and motivate young people; it must provide incentives and institutional support for employers to offer high caliber training; and it must support and link training to the administration's strategy of competing in a high tech global economy (Finegold, 1993).

The review of literature in the area of training and development in the private sector reveals that for all the talk from industry about the lack of quality workers, little has been done by industry to ameliorate the problem.
However, companies that do engage in aggressive training reap great financial rewards and an increase in worker satisfaction and morale. Company size appears to be closely related to expenditure on training; smaller companies are less able to provide training programs. Companies that do have training programs are afforded the opportunity to impart corporate strategy, corporate culture, and organizational mission. Although apprenticeship programs are emerging in the U.S., compared to Germany and Japan, U.S. companies have paid only cursory attention to training a qualified workforce in the private sector.

**Education's Role in Worker Preparation**

To meet the needs of society and to provide workers for the new high-performance workforce, schools are required to prepare students for productive careers in the technological-information society (Dutton, 1995b). The Tech Prep Education Act (Title IIE of the Carl D. Perkins Vocational and Applied Technology Act Amendments of 1990 and the School-to-Work Opportunities Act of 1994) illustrates the Congress' directive for education.
Tech Prep

The Tech Prep Education Act responds to the needs of a workforce steeped in the academic basics of mathematics, science, and communication that are required for the new technologies of the workplace and the new working conditions. The legislation particularly addresses the middle two quartiles of the student population. The legislation provides funding to all states for the establishment of consortia between secondary schools and two-year colleges that offer associate degrees. The articulation between the institutions develops an educational program that leads to an associate's degree; builds student competencies in the academic basics; provides technical preparation in at least one field of engineering, applied science, mechanical, industrial, trade, agriculture, health, or business; and leads to employment (Dutton, 1995b). Tech Prep legislation allows the local consortia to identify needs and to develop activities to promote systemic change. However, the legislation does not fund a specific training program or the purchase of equipment.
School-to-Work

Building on the Tech Prep legislation, the School-to-Work Opportunities Act attempts to create a comprehensive education and training system for all students (Dutton, 1995b). It is the intent of this legislation that all students are prepared for careers in high-wage, high-skill jobs or further education in college. School-to-Work legislation extends the population served to include students in elementary, middle, and secondary schools, as well as two-year and four-year institutions. Out-of-school students may also be served.

The three constituents of the program are school-based learning, work-based learning, and connecting activities (Dutton, 1995b). J.D. Hoye, Director of the National School-to-Work Office, states that the three components recognize that learning occurs in a variety of places and that all learning is important (Dutton, 1995a). School-based learning, which occurs in the classroom, may be made more relevant by relating it to the experiences of the learner. Such contextual learning is more motivational. Work-based learning recognizes that valuable learning occurs beyond the classroom walls and that work-based learning can
support and extend school-based learning. Work-based learning may be organized into three categories: visits to workplaces, work-like experience, and employment (Hamilton & Hamilton, 1997). Workplace visits may be one-time observations, field trips, or longer termed job shadowing experiences. Work-like experiences include service learning, unpaid internships, or youth-run enterprises. Employment includes the spectrum of the traditional youth job, subsidized employment training, cooperative education, paid internships, and youth apprenticeships (Hamilton & Hamilton, 1997). Connecting activities recognize the individuals, organizations, and groups that bridge the school and work (Dutton, 1995a). Examples include matching students with an employer, training job-site mentor, or teacher.

Further, school-based learning must be articulated with training and work experiences and a program of study designed to meet the same academic rigors established for all students under the Goals 2000: Educate America Act of 1994. The instruction and curriculum must integrate academic and vocational learning. School-to-Work requires career education, exploration, and counseling leading to the
selection of a career path by the eleventh grade. Participants receive workplace mentoring and training in workplace competencies. Finally, the participant receives assistance in finding a job and in the continuance of his or her training and education (Dutton, 1995b).

The requirements of Tech Prep and School-to-Work has lead to the formation of Career Paths for All Students in some schools. Tech Prep organizes curricula around career clusters and requires the participant to choose a career cluster and concentrate within that cluster. Career guidance and counseling is provided in conjunction with career development opportunities. Educators realize that such an approach is appropriate and desirable for tech prep or college prep students (Cuetara, 1995). Oregon and Missouri have passed legislation supporting the career path concept and Wisconsin has developed a career path for all students (Dutton, 1995b).

Service Learning

Another education initiative to connect learning and living is service learning. Service learning is a vehicle to help students develop skills critical to the workplace:
problem-solving, effective communication, decision making, and information synthesis (Brandell & Hinck, 1997).

Brandell and Hinck (1997) reported that service-learning participants scored significantly higher on acceptance of cultural diversity, service leadership, and measures of personal and social responsibility. Participants were also found to have higher grades in mathematics, science, and social studies and to have higher academic aspirations and engagement. Service learning participants rated their school experience more positively and were more likely to go to a four-year college than a comparison group of students. Positive impact was most notable in middle school participants, with a 16% difference in core grade point average. The core included English, mathematics, social studies, and science. There was a 25% difference in mathematics scores and a 30% difference in social studies grades (Brandell & Hinck, 1997).

Although service learning is popular among educators, parents, and the general public, Alt (1997) states there is little firm evidence to confirm that students engaging in such work learn more than students who do not participate. Socio-economic status and standardized test performance
appeared to be associated with a greater likelihood of participating in service learning. Additionally, students with higher grades and students in private or urban schools are more likely to volunteer (Alt, 1997).

Although education is often maligned for failure to produce quality workers, the review of literature in the area of education's role in worker preparation reveals several current initiatives. The Tech Prep program targets the middle two quartiles of high school students and attempts to develop stronger articulations among high schools, community colleges, and vocational schools. Building on this program, School-to-Work addresses all levels of education and provides school-based and work-based learning. The program has a strong career exploration and career-planning component. Another initiative, service learning, is a vehicle to develop skills critical to the workplace: problem solving, communication, decision-making, and the synthesis of information. However, participation in service learning appears linked to socio-economic status and standardized test performance.

School-to-Work initiatives such as tech prep or service learning show great promise in developing workplace
skills and in exploring career opportunities. As community, industrial, and educational leaders look with vision to the future, will these efforts be sufficient to meet the projected workplace needs of the twenty-first century?

**The Futurist View**

The American workforce faces changes in structure and composition that will direct employers' methods of recruiting, hiring, managing, and retaining employees. The changes are demographic and economic. The American workforce has garnered a reputation as a potent and hard-working labor force (Coates, Jarratt, & Mahaffie, 1991). Other nations envy American education, potential for mobility, creativity, and ability to generate new jobs. Maintaining such a reputation and status will require planners and managers to examine future trends.

Although most think of innovation in terms of technology or science, it is people who are the most critical component of service and production (Coates et al., 1991). Coates et al. (1991) recognizes the examination of future trends as a positive development of business
organizations. Such examinations allow action based on informed forecasts.

Futurists examining employment projections for the state of Tennessee likewise find that occupational outlook is intrinsically linked to the demand for goods and services. As the state population increases, the demand for workers to provide services will similarly increase. Technology, organization, and the supply-demand conditions occurring in other occupations will effect Tennessee occupational employment. Tennessee Employment Security Research and Statistical Division reports that two factors determine annual job openings. First, the growth or expansion resulting from new jobs. Second, there will be the need to replace workers due to retirement, disability, death, or other causes. The research reveals a high replacement figure which may be linked to workers leaving each year because of low pay, low status, or limited opportunities for training. At present, the need to replace workers is less than the growth rate and is attributable to the healthy state economy. Employment is projected to increase by 26% from 1994 to 2005 (Tennessee Department of Employment Security, 1998).
D’Amico, Judy, and Gipel (1997) have identified four forces that will dramatically influence and direct changes in the workforce in America in the year 2020: technological change, globalization, the aging workforce, and increased ethnic diversity. The first form, technological changes, is impossible to predict with specificity, but the proliferation of computers and telecommunication initiatives allows one to speculate. Automation will lead to the loss of low-skilled or unskilled work in manufacturing and the office. Machines will replace some forms of human labor. Organizations with advanced technology will also replace some workers with technology or with lower-paid workers in other nations. Although some jobs will be lost due to technology, new jobs will be created by the new technology. The new jobs will be characterized by greater security for the employee, higher personal satisfaction with the work, and increased wages. Americans will fill these positions if they possess the skills demanded. Otherwise, the positions will be filled in other nations. The new positions will require brains in lieu of brawn. Likewise, employees will determine working environments and work schedules. This will open job markets to more women and older Americans.
The second force is the impact that the rest of the world will have on American workers. The future of the U.S. labor force and the economy are intrinsically linked to the globalization. Coates et al. (1991) predict as global economies emerge, there is an increased likelihood that international shifts in corporate ownership and new organizational structures will emerge. Technical and science skills will sharpen competition. Further, birthrates will drop almost everywhere in the industrialized world. Between 2020 and 2025 birthrates in Asia, Europe and North America are projected to decline to about 12 to 14 births per 1,000 population (Coates et al., 1991).

Manufacturing will be the dominant U.S. export (D'Amico, Judy, & Gipel, 1997). Twenty percent of American jobs are linked to exports and that reliance will grow as foreign economies rapidly expand and generate greater demand for American goods. The current trend of skilled workers whose jobs are linked to exports being better paid than other manufacturing workers will continue in the year 2020 (D'Amico, Judy, & Gipel, 1997). However, low-skilled or
unskilled workers will not only compete locally and nationally, but also compete with similar workers worldwide. Jobs in this sector are predicted to disappear or be available at depressed wages. The current trend of second or third jobs or full-time employment for both spouses will become even more necessary by the year 2020 (D'Amico, Judy, & Gipel, 1997). The percentage of jobs found in the manufacturing sector will decrease as a result of globalization and automation, but highly productive manufacturing jobs will remain. The result is that these positions will be even better paid positions. Employment growth is expected in the service sector. D'Amico, Judy, and Gipel (1997) predict volatility in the U.S. economy due to globalization and technology. Small and medium-sized firms will be most able to respond to the volatility and will proliferate. Workers will change jobs more frequently and if these workers maintain and improve their skills, the results will be higher wages (D'Amico, Judy, & Gipel, 1997; Coates et al., 1991).

Third, America is aging and there are implications for the workforce. American "baby-boomers", children born between 1945 and 1965, will begin to reach the age of 65 in
2010 (D'Amico, Judy, & Gipel 1997). Twenty percent of the population will be at least 65 years old by 2020 and seven million Americans will be 85 (D'Amico, Judy, & Gipel 1997; Coates, et al., 1991; Besl & Kale, 1994; Silvestri, 1997). The aging workforce will precipitate issues of worker productivity and flexible employment options. Additionally, the aging workforce will impact consumer habits, resulting in demands for leisure-time activities, health care, and home services. These service jobs may replace the low-skilled or unskilled manufacturing jobs that the nation is in danger of losing abroad, but at lower salaries (D'Amico, Judy & Gipel 1997).

Besl and Kale (1994) report that the state of Wisconsin closely mirrors the national age distribution. Their study indicated that the number of older adults without a high school diploma will decline from 1990 to 2020, but all other categories will increase. While the number of high school dropouts will decrease by one-third by 2020, the number of college graduates will surpass the number of high school dropouts. The study assumed that all members of each cohort will have finished formal education by the age of 25.
However, the study does not account for differences in the labor force by race or ethnicity.

The final force impacting the workforce will be the continued ethnic diversification. D'Amico, Judy, and Gipel (1997) predict that white non-Hispanics will simply replace existing white workers. One-third of new entrants in the labor pool will be minority candidates. Presently, whites are 76% of the workforce, but will shrink to 68% by 2020. Hispanics will be the largest, fastest-growing minority in the U.S. Coates, et al. (1991), citing Bureau of Census estimates, report that the Hispanic population has grown from 14.6 million in 1980 to 21.9 million in 1990. At this growth rate, there will be 39.5 million Hispanics by 2010.

Asian Americans are out-performing Caucasians in the workplace and in the classroom. Additionally, Asian Americans are forecast to experience a 6% increase in the labor force in the next 20 years. Of the seven largest Asian groups in the United States, males between the ages of 25 and 39 have a high school graduation rate of 89% to 96%. This is in comparison to white counterparts with a graduation rate of 87%. The South and the West regions will see the largest growth of Hispanics and Asians in workforce
representation. African-Americans' participation in the workforce is expected to remain constant at 11% to 12%
(D'Amico, Judy, & Gipel, 1997; Coates et al., 1991).

The review of futurist literature includes forecasts for many changes for the American workforce. Despite criticisms, American workers have established a reputation as potent and hard working. Other nations marvel at America's propensity for creativity, ability to generate new jobs, and potential for personal mobility. To protect and maintain economic strength, future trends must be examined. Four trends are forecast to greatly impact the American workforce: technology, aging, globalization, and ethnic diversity. Human capital is predicted to remain the most critical component of service and production and of paramount importance to the nation, the region, the state, and leaders of education, industry, business, and the communities of Middle Eastern Tennessee.

Summary of the Literature Review

The eight portions of the literature review (employers' perceptions of the available job applicants, a world class worker, employer's satisfaction with education, assessment
of education, the changing workforce, training and development in the private sector, education's role in worker preparation, and the futurist view) reveal America's economic position is in a state of flux. Change is constant and occurring more rapidly than in any other era in history. Emergence of globalism and new technology is redefining the nature of work, products, production, workers and the workplace. Jobs no longer depend on the strength of one economy or economic base, but a nation's ability to provide industry and business with workers who possess the skills and characteristics required for efficient productivity. Likewise, the demographics of the labor pool will change in terms of age, gender, race, and ethnicity.

Although U.S. students have shown academic gains, the advancements are not sufficient to meet the needs of business and industry, as indicated by the number of job applicants who are rejected due to skill and employability deficiencies. There is a misalignment of current skills and worker skill requirements for entry-level employees. The nation's competitiveness depends on a labor force with the skills and knowledge to execute high-performance, high technology, high-wage jobs. The literature establishes that
life-long learning is a necessity of the successful worker.

As Peter Drucker (1994) describes the situation:

Work on the eve of the twenty-first century requires constant learning, adaptation, and acquisition of new skills to keep pace with emerging new technologies, new methods of operation, and new forms of workplace organization that place more responsibility on individuals at all levels of an organization (p.108).
CHAPTER 3
METHODS AND PROCEDURES

This chapter includes a description of the research design, Delphi group selection, panel size, instrumentation, and pilot study.

Research Design

The Delphi technique was used to forecast the characteristics of the viable and sustainable employee in the year 2015 in the ten county service area of Walters State Community College. Additionally, the study attempted to predict the initiatives that successful companies would undertake to ensure the availability of competent workers. Further, the study attempted to forecast the changes that would be required of public education to meet the needs of industry in the year 2015.

The Rand Corporation developed the Delphi method in the early 1950s. The Rand Corporation used this method to answer the Air Force's questions concerning nuclear armament and the United States gross national product. The method operates on the tenet that *n* heads are better than one. Collective wisdom is more likely to lead to the truth than
is possible with a single decision-maker (Linstone & Turoff, 1975). Heath, Neimeyer and Pedersen (1988) described the Delphi method as the best available forecasting tool, which gathers and combines the opinions of experts to obtain consensus about future development in a particular field. Although it has been widely used by military agencies, it has similarly been used in other fields. Those fields include: education, business, health care, geo-politics, communications, agriculture, technology, and the environment (Linstone & Turoff, 1975).

The Delphi technique is used to forecast and gather information. However, instead of physically bringing an expert group together, the Delphi technique uses other means of communication channels to promote anonymous discussions. It is a method for achieving a structured interaction among a carefully selected panel through the avenues of questionnaires and controlled feedback. The structure of the process increases the likelihood that the results are accurate to guide good decision-making (Twiss, 1992).

Delphi methodology is grounded solely in knowledgeable opinion. It is appropriately used when a consensus is desired from knowledgeable individuals on a singular topic.
or when a decision-maker is interested in having an informed group present a myriad of options and supporting evidence for consideration in the development of a policy (Linstone & Turoff, 1975).

The basis of the procedure is repeated administration of questionnaires to each member of an expert panel, without face-to-face contact. At the conclusion of each round of the questionnaire, some type of group feedback is provided to the expert panel. Panelists are provided the opportunity to reflect upon their responses in light of the feedback. This process continues for as many rounds as needed until consensus is reached (Heath, Neimeyer, & Pedersen, 1988).

The Delphi method is designed to gain the advantage of group decision making and to avoid the disadvantages frequently experienced by the round table or committee. The final decision of the round table or committee is often a compromise that has been prompted by undue psychological factors. Such psychological factors include: eloquent persuasion, perceived power and influence of the speaker, reticence to express one's opinion publicly, loud and verbose speakers, and the bandwagon effect of the majority opinion (Cyphert & Gant, 1971). The Delphi method is
grounded on the notion that several minds are better than one in making subjective decisions, estimates, or predictions about future events. Further, the controlled communications, that are free from personal or psychological factors, will lead to judgments based on rational thought and collective information. This allows the group to reach sound conclusions (Heath, Neimeyer, & Pedersen, 1988).

Linstone and Turoff (1975) have identified seven applications for the Delphi method. If one or more of the following characteristics is present, it leads to the need for utilizing the Delphi (Linstone & Turoff, 1975, p.4):

1. The problem does lend itself to discrete analytical methods but can benefit from subjective judgments on a collective basis.

2. The individuals needed to contribute to the examination of the problem have no history of adequate communications and may possess varied backgrounds in terms of experience and expertise.

3. More individuals are required than can effectively meet in a face-to-face exchange.

4. Constraints of time and expense make group meetings infeasible.
5. A supplemental group communication process can augment the efficiency of face-to-face meetings.

6. Disagreements among the individuals are so severe or politically unpleasant that the communication process must be refereed or anonymity must be assured.

7. The heterogeneity of the participants must be preserved to assure the validity of the results and to avoid domination by the quantity or by the strength of personality causing a bandwagon effect.

The subject of this study, characteristics of viable and sustainable employees in the year 2015, met most of these characteristics. Item #5 and item #6, regarding severe disagreement and the augmentation of face-to-face meetings, did not fit the reasoning for usage in this study.

Delbeq, Van de Ven, and Gustafson (1975) identified three elements necessary to conduct a successful Delphi: adequate time, participants skilled in written communication, and high participation motivation. The Delphi is not appropriate when less that 45 days are available or when the participants have limited reading skills or difficulty in expressing themselves in written form. Additionally, as with other group processes, the
quality of responses is inherently linked to participants’ commitment and interest. High participant motivation is of paramount importance in the Delphi as other people are not present to stimulate and maintain motivation.

Research on the effectiveness of the Delphi method has shown it to be more effective in producing accurate decisions than with the traditional face-to-face method and superior to the face-to-face method at obtaining a consensus a strength of judgment (Heath, Neimeyer, & Pedersen, 1988). Delbeq et al. (1975) found the Delphi to be more effective than interactive meetings and the findings of the pooled group more accurate than the estimates resulting from the interactive meeting.

The fact that the study meets five of the criteria established by Linstone and Turoff and the three critical conditions identified by Delbeq et al. makes its use appropriate. The Delphi method was selected as the process by which to forecast the characteristics of viable and sustainable employees in the year 2015 in the ten county service area of Walters State Community College.

As previously established, the Delphi method utilizes a panel of experts to examine a particular problem or issue by
written communication. The participants do not meet in a traditional face-to-face meeting and there is no individual identity. "The Delphi is essentially a series of questionnaires. The first questionnaire asks the individual to respond to a broad question. Each subsequent questionnaire is built upon responses to the preceding questionnaire. The process stops when consensus has been approached among participants" (Delbecq, et al., 1975, p. 83).

A series of questions, also called iterations, was used in this study. The iterations of this study were constructed in an objective manner to reach consensus on the research questions posed in Chapter I. Martino (1972) found that at least two rounds of polling is required for the Delphi group to reach a consensus and there is no advantage in going beyond two rounds.

The Delphi method has faced criticism because of its reliance on subjectivity and personal opinion and not on discrete and quantifiable data. However, because the expert panel is small, Delphi studies do not attempt to produce statistically significant results (Gordon, 1992). Research techniques that employ random sampling of the population are
not appropriate because the general population does not possess the level of information needed to forecast industries future employee characteristics. For this reason, experts in industry lend more validity to the results of futuristic studies.

Another class of criticisms of the Delphi technique was described by Linstone and Turoff (1975, p. 6). They identified five common reasons for failure of the Delphi:

1. The imposition of the monitor's views and preconceptions of a problem upon the panel by over specifying the structure of the Delphi and not allowing for the contributions of other perspectives;

2. Operating under the assumption that the Delphi can be a surrogate for all other forms of communication in a given condition.

3. Poor techniques of summarizing and presenting the group response;

4. Ignoring and not fully exploring disagreements; and

5. Underestimating the demanding nature of a Delphi.

The Delphi technique has virtual problems that do not affect the usefulness of the method. First, how does one choose a "good" respondent group? The same question arises
regardless of the group activity. Secondly, the technique may be made too explicit or too restrictive. Third, the honesty and integrity of the monitor is a concern. This caveat is true of all studies or analysis groups. Finally, misunderstandings may arise from differences in language and logic as the result of diversity in cultural background (Linstone & Turoff, 1975).

Delphi Group Selection

Prudent selection of the Delphi group is essential for conducting a Delphi study. Martino (1972) stated that the selection of the panel is the most important decision that the Delphi director will make and that solicitous care must be taken to appraise the degree of expertness. Heath et al. (1988) posited that the strength of a Delphi is its panel. Although the selection of panelists is somewhat an arbitrary decision, insights into the future is more likely to come from individuals who are active scholars and practitioners. Such individuals are currently involved in research that will help direct the future of the discipline or will determine the future. Delbecq et al. (1975, p. 87) listed
four attributes that are required of effective participants in a Delphi:

1. Feel personally involved in the problem of concern to the decision-makers;

2. Have pertinent information to share;

3. Are motivated to schedule the time needed for the Delphi in their completing tasks; and

4. Feel that the aggregate judgment of the respondent panel will include information that they will value and to which they would not otherwise have access.

The first and second attributes describe the general characteristics of desirable panel members. Once the qualifications are established, a nomination procedure should be used to select the individual respondents. Nominations should be solicited of well-known and respected individuals from individuals within a target group of experts or from an appropriate random sample of respondents, if representativeness is a criterion. Regardless, one should ask for nominations from a large and diverse set of target group members to minimize distortion in the data (Delbecq, et al., 1975). The nominations are then ranked and culled. Highly ranked nominees become evident and form
the foundation of the panel selection. The selection process, nomination by one's peers, may flatter panel members and motivate individuals to serve on the panel. However, expertise is the desired goal for panel selection and it is the feature which sets the Delphi method apart from other forms of survey research (Clayton, 1997).

The third and fourth characteristics addressed by Delbecq et al. may be determined during the initial contact with potential panel members. Participants must be convinced of the importance of the study and the importance of their participation. The initial contact should be by telephone or a face-to-face meeting by someone whom the respondent respects. The contact person should fully explain the study in terms of objectives, the nature of the panel, obligations of participants, the amount of time involved, and the information that will be shared among participants. It is suggested that a self-addressed, stamped envelope be provided to facilitate the acceptance by the individuals who have been contacted (Delbecq, et al., 1975).

In this study, the researcher utilized the guidelines of Linstone and Turoff (1975) and Delbecq et al. (1975) in
assembling the Delphi panel. The first criterion for selecting members for the Delphi group is the requirement that members be true experts. The researcher contacted by personal phone call the county executives of Claiborne, Cocke, Grainger, Greene, Hamblen, Hancock, Hawkins, Jefferson, Sevier, and Union counties to obtain the name of the chairperson of the county's industrial board or equivalent organization. The chairperson of each of the industrial boards, the chairman of the Private Industry Council, and the Dean of Industrial and Technical Education at Walters State Community College composed the nomination committee for the Delphi panel. The researcher contacted the nomination committee by personal phone calls and informed them about the purpose of the study and asked for their assistance in nominating experts within the ten county area to serve as potential panel members. Each of those contacted agreed to submit in writing nominations for the Delphi panel. A cover letter, a nomination form, and a self-addressed envelope was sent to the industrial board chairpersons, the Private Industry Council chairperson, and to the Dean of Industrial and Technical Education at Walters State Community College. These items are included in
Appendix A. The cover letter requested nominees in the areas of general manufacturing, metalworking, furniture production, health care, printing industry, automotive manufacturing, textile production, chemical industry, and a category described as other. Further, the letter reiterated the qualities sought in panel member and described such members as knowledgeable about their respective industry and its future, and the particular qualities and skills that will be needed by viable and sustainable workers in that industry in the year 2015.

The individuals receiving multiple nominations formed the core of the panel. The researcher initially contacted these individuals by phone, explaining the study and asking them to participate and to nominate others who were similarly knowledgeable concerning industry and the workforce. Through daisy chaining, the process of one nomination leading to another nomination, other nominees became evident. From the initial nominees by the nominating committee and by the nominations of panel members the researcher chose the Delphi panel. The panel included representatives of all the categories of industry selected for study and all individuals receiving multiple
nominations. Although no attempt was made to recruit panel members to increase the demographic diversity of the panel, nominations included males and females and Caucasian and Afro-American nominations.

Panel Size

The size of the panel may vary depending on the problem and the complexity of the issue being explored. It is most germane that the panel of experts represents a true cross-section of experts. Also to be considered is the willingness of the researcher to analyze the data. Delbecq et al. (1975) provided no definitive formula. Clayton (1997) stated that the panel may be of varying size and local, state, national, or international in composition. A general guideline for panel size indicates that 15 to 30 people are appropriate for a homogeneous population of experts from the same discipline and 5 to 10 people for a heterogeneous population. Such a heterogeneous panel is composed of individuals with expertise on a particular problem, but they are representatives from diverse social or professional strata (Delbecq, et al., 1975). Martino (1972) established that a panel of 15 panelists from a cross-
section of experts in a given field is sufficient to provide reliable results.

For this study, a panel of 25 experts was utilized to conduct the first iteration. A panel of 25 meets the criteria established by Linstone and Turoff (1975), Clayton (1997), Martino (1972), and Delbecq, et al. (1975). The 25 panelists were selected by nominations from the target group and as the result of daisy chaining by nominees. The members of the Delphi panel represent a cross-section of the businesses and industries in the ten county service area of Walters State Community College and possess the level of expertise needed to make forecasts and predictions concerning the characteristics of the viable and sustainable employee of the future. The Delphi panelists' names and organizational affiliations are listed in Appendix E by permission of the individuals.

Instrumentation

The initial iteration allowed panel participants the opportunity to respond to broad issues in narrative form. The panelists were apprised of the length of time required
to answer this iteration at the time of initial contact and before they formally agreed to engage in the study.

Responses to the first iteration were the basis of the second iteration. The researcher analyzed the answers to ascertain where the group had produced similar ideas, visions, and views of the future.

The purpose of the second iteration was to establish a stronger consensus on the concepts that emerged most frequently from the first iteration. The instrument for the second round asked participants to acknowledge and accept, to whatever extent each was agreeable, the most commonly held views from the first questionnaire. A Likert scale, a quantitative selection scale, was used.

The major areas from which the general questions for the first iteration was drawn are listed here. The question topics are listed with their supporting reference.

1. Employer satisfaction with job applicants: basic skills, thinking skills, personal qualities, use of resources, interpersonal skills, information usage, systems understanding, and technological skills (Brosnan, 1998).

3. Impact of demographic changes on the workforce and its impact on manufacturing: aging baby boomers, diversity, and women (D’Amico, Judy, & Gipel, 1997).


5. Private sector training (Eisen, 1993; Lau, 1993).

6. Technology skills: technology selection, application to task, and maintenance and troubleshooting equipment (The Secretary’s Commission on Achieving Necessary Skills [SCANS], 1992).


8. Critical skill shortages (Khojasteh, 1994).

9. Basic skills in the workplace (Khojasteh, 1994).

10. Experience and training (Lau, 1993).

11. Interpersonal skills: team membership, teaching, serves clients, leadership, negotiation, and working with diversity (SCANS, 1992).


17. Systems: social, organizational, and technological systems; monitoring and self-correction, and system design and improvement (SCANS, 1992).


22. Thinking skills: creativity, decision making, problem solving, conceptualizing, knowing how to learn, and reasoning (SCANS, 1992).

23. Educational support of industry (Hamilton & Hamilton, 1997).
In addition to the content questions, biographical information was requested from the participants in the first iteration. The purpose of this information was to illustrate each panelist's expertise through the positions the various individuals hold and each person's years of experience in his or her respective business or industry. Although names of participants were requested on the survey, all participants were guaranteed complete anonymity and confidentiality. Their names are published with their consent.

A copy of the questionnaire used in the first iteration is provided as Appendix B.

Pilot Study

A pilot study was conducted to field test the questionnaire of the first iteration of the Delphi instrument. Six middle and upper level management people, representative of the same organizational mix that was utilized to conduct the main portion of the study completed the document. The members of the pilot study were precluded from participation in the Delphi panel. Further, the pilot
sample was taken from business and industry leaders in Hamblen County.

The purpose of the pilot study was to test the structure, format, content, scope, and interpretation of questions to eliminate ambiguity or vagueness that might have impacted the quality of response by the Delphi panel during the first iteration. Second only to the selection of the Delphi panel is the construction of the questionnaire (Delbecq, et al., 1975).

The researcher hand delivered the questionnaire and the proposed cover letter to accompany the first iteration to each member of the pilot. Further, the researcher personally stressed the critical importance of constructive criticism. The members of the pilot study were very cooperative and diligent in meeting the deadlines established for the pilot.

The researcher interviewed each member of the pilot group after the participant had completed the questionnaire to solicit notes for needed corrections, suggestions for revisions, and other comments or concern about the questionnaire. Two members of the pilot discovered an omitted word from one question and another member of the
pilot group suggested minor changes in the cover letter. The responses of the pilot group were excellent and closely aligned with the responses of the Delphi panel. Four of the six members of the pilot reported having difficulty identifying current initiatives being undertaken by industry to ensure that an ample supply of skilled workers will be available in 2015. All four reported that they understood the question but realized that their industry was doing little in this area. Although one stated that he had considered fabricating a response, all related that their responses had been true and candid.

The questionnaire and cover letter were revised and presented to the pilot group to ensure that the Delphi panel would be able to use the instrument without problems. The recommendations and corrections of the pilot group were incorporated into the final questionnaire of the first round. All members of the pilot group expressed that the instrument would be effective in a future study of the particular qualities and skills that will be needed by viable and sustainable workers to support industry.
Summary

Chapter 3 describes the methodology and procedures used to gather data for the study, including the Delphi technique. The description of the research design, the selection of the Delphi group, and the construction of the questionnaire produced the foundation from which to continue with the research. The Pilot Study provided valuable help in correcting ambiguities or vagueness in the instrument and accompanying materials utilized in the first iteration. Further, the Pilot Study provided a foretaste of the results of the responses in the first iteration. Chapter 4 of the study includes the findings and analysis of the first iteration.
CHAPTER 4

ROUND 1 FINDINGS AND ANALYSIS

Introduction

This chapter contains a summary of the procedures and results in Round 1 and reports the findings emerging from the Round 1 Delphi. The study attempts to forecast future industrial needs. In reporting the opinions and perceptions of the panelists, the researcher often states that certain events "will" occur. The use of this term or other related predictive terms in this chapter is not a guarantee of certainty that the event will come to fruition, but rather it is the opinion or perception of the panelist or panelists that the event will occur. The findings and analysis of Round 1 are organized in five major categories: the distribution of the survey, the response rate, the demographics of the Delphi panel, methodology of content analysis and findings, and a brief chapter summary.

Survey Distribution

The selection of the Delphi panel members was finalized in April 1999. Members of the panel were nominated by either the chairman of one of the ten county industrial
boards, the Dean of Technical and Industrial Education of Walters State Community College, the chairman of the Private Industry Council, or another panel member. Phone conversations with the nominees secured their participation and their preferred mailing addresses. A packet containing a cover letter, a schedule for the Delphi panel, instructions for the iteration, the instrument for Round 1, and a return self-addressed stamped envelope was sent to each panelist. The packets were mailed to 25 panelists on April 19, 1999 and scheduled for return by May 15, 1999. These materials are included in Appendix B.

Response Rate

Ten of the twenty-five questionnaires were returned by May 7, 1999. A postcard was sent to the remaining 15 panel members on May 10, 1999 to remind them of the proposed schedule for the return of the first iteration. The postcard reminders proved very helpful and elicited several e-mails and phone calls from panel members to notify the researcher that their questionnaire had been mailed. The panel demonstrated commitment to fulfill the projected schedule and conveyed enthusiastic comments to the
researcher. By May 15, 1999, a total of 22 questionnaires were returned for a response rate of 88%. This response rate was deemed sufficient to provide the depth and scope of expert knowledge necessary to conduct the study.

Demographics of Panel

The 22 panelists possessed 517 years of industrial experience. Although, gender or ethnicity was not an issue for consideration in selecting panel members, 16 panelists were male and 6 panelists were female. The average male panelist had 23.18 years of industrial experience and the average female panelist had 24.33 years of industrial experience. Only one of the 22 Delphi members was Afro-American and the remainder were Caucasian.

Methodology of Content Analysis: Round 1 Questionnaire

Completion of the Round 1 iteration required the respondents to provide narrative answers to the 17 questions. The dedication of the panel members was demonstrated by the time and effort required in completing the questionnaire. Comments from several panel members indicated that the questionnaire required between one and two hours to complete. The answers were self-generated.
without any information from which the panel members might react.

The researcher initially read all questionnaires without any content analysis. During the process of content analysis, only one question at a time was considered. The researcher then read all responses to Question #1 to discover the common themes in the participants' responses. The researcher then read and analyzed all responses to Question #1 before considering any other question. The same process was repeated with the remaining 16 questions.

The researcher clustered statements made by the panelists into common categories. However, some responses were not repeated by other panel members and were treated as outliers. As other panelists repeated the same idea or concept, tallies were made. The categories with high tally marks indicated areas of growing consensus and provided the basis of the questions formulated for the Round 2 questionnaire.

Analysis of the content revealed six acronyms or terms that were unfamiliar to the researcher. The researcher interviewed three industry leaders similar to the composition of the panelists to assure that the researcher...
completely understood all terms used and the context in which they were used.

The vast majority of answers were complete and reflective of great thought on the part of the panelists. However, some respondents were more specific in providing responses while other contributors answered in broader, less specific terms. The totality of the contributions of the panelists provided the researcher a firm basis from which to build the desired consensus.

**Round 1 Findings and Analysis**

Much valuable information was contributed by the panelists. The information has been analyzed by question and organized in a concise manner to assist clarity. Statements appearing in quotation marks are the actual verbatim responses of the panelists. The contributors of the individual statements are not identified although the name and organization of affiliation of the panel members are listed in Appendix E. The respondents were promised anonymity and assured that their individual responses would be used solely for data analysis.
Question # 1: In your judgement, what are the three most important general worker characteristics employers will seek in employees in 2015?

Two characteristics emerged as most important to employers. Those were a general work ethic and thinking skills. The majority of panelists desired workers endowed with a classic American work ethic. They described this quality as "a work ethic that makes one want to accomplish and achieve". This attribute was associated with dependability, responsibility, attendance marked by absenteeism of less than one-percent, effort, hardworking, and a "commitment and dedication to the organization". "Global competition will produce lean work forces that must be available at all times".

The second most common characteristic sought in the worker of 2015 was the ability to think. Panelists described the desirable employees as "creative, free thinkers" who are logical and have analytical ability. These employees will be able to solve problems by "reducing them to manageable increments" and "drawing conclusions based on one or more graphics".
Receiving less compelling Delphi panel support, the panelists regarded as important to future employers workers who possessed mastery of basic skills, proficiency with communication, technical skills, interpersonal skills supporting "the ability to work in a team environment", and flexibility. According to panelists, mastery of the basic skills will be needed to communicate with the team and allow the worker to "read with understanding basic instructions and procedures". Specific job related skills and computer literacy were forecast to be desired. Similarly, several panelists reported that flexibility would be required. The primary reason given was that workers will face multiple assignments and responsibilities that will require workers to be "capable of dealing with constant change". Demands of the market "decree that companies must rapidly improve and replace products and the workforce must reflect this ability to rapidly change".

Question # 2: In your opinion, what will be the three most important characteristics or skills that successful workers in 2015 will possess in the following areas:

Question # 2-A: Interpersonal skills
The vast majority of the panel identified interpersonal skills that enhance a workers ability to effectively participate as a team member as a core essential to future workers. Such workers must be able to contribute to the team and solve problems cooperatively with others. General consensus from the panel indicated that the "effective relationship skills" of this desired employee would make them adept with negotiation skills and proficient in avoiding and resolving conflicts. These workers will "confront problems and concentrate on the issue rather than the personalities involved". Successful workers will be "proactive in relationships" and realize how their actions impact the success of the team and fellow team workers. Further, they will not engage in actions, which diminish the self-respect of fellow employees, but will have the "ability to love and care for one another".

The panelists assigned relatively equal importance to communication as an interpersonal skill imperative for preferred future employees. The Delphi group mentioned all classic forms of communication, including written expression, listening, and public speaking. However, many of the panelists linked the communication skills to teaming
activities. "The workplace of 2015 will require workers who are able to make articulate presentations within a group and express ideas in written form".

Several participants mentioned the ability to change as a paramount interpersonal skill. Viable personnel will "accept change and diversity in and of co-workers". They will accept others and their ideas to the extent that they will "accept and implement the consensus of a work team". According to one panelist, "Resistors to change will be swept aside when change becomes the only constant".

Question # 2-B: Technology skills

The Delphi group expressed beliefs that proficiency with technology was critical to success in the future workplace because "everything will be available through technology if the person knows how and where to find it". The dominant technological skills were predicted to be computer literacy "or its successors", knowledge of technical skills specific to industry, and the interpretation of data.

According to a panelist from the industrial sector, "Everyone from the janitor to the CEO will have their work dependent on the use of computers". The industrial leaders
asserted that beyond general technology skills, the workplace would require workers to be adept with various computer platforms and software programs. The desired workers must be capable of using computer software that is linked to the production mainframe. By interfacing with the mainframe, workers will be able to effect production, increase quality, reduce costs, develop schedules, and perform statistical process control. One of the panelists reported, "Skilled jobs will be in information systems; entry level jobs will perform what skilled positions performed in the 70's, 80's, and 90's".

Although workers will still require general mechanical aptitude to operate hand tools and uncomplicated systems, panelists affirmed the belief that the workplace would also require diverse sophisticated technical skills. It was forecast that a requisite of business and industry in 2015 will be for workers to operate clinical, automated, and computerized equipment. In describing the technical skills required by the future workplace, one industrial leader stated, "Industry will seek workers who are willing to explore new and innovative manufacturing strategies by exploring automation options, laser technology, computer
controlled equipment, and photo-optics". The narrative indicated that personnel will be required to perform maintenance on this electronically sensitive equipment. This will require workers to possess advanced knowledge of electricity/electronics and the digitizing of data.

Highly valuable workers will be able to interpret data, particularly alphanumerical data, to draw salient conclusions. Further, the workers will be able to read and form inferences from the examination of graphs and flow charts that are associated with the production process.

**Question # 2-C: Thinking skills**

The future workers are forecast to be decision-makers and problem solvers. According to one panelist, "They will be those who are free thinkers who work outside the box, who see the unseen option, who possess creativity, and are willing to express it in a positive manner".

The desired decision-maker will be able to make independent decisions in an expeditious manner and a proactive mode. The viable worker is forecast to be able to think and act quicker than current day employees are performing to reach decisions. This "visionary" will be willing to brainstorm with the work team and to initiate
changes that foster continuous improvement. Decisions will be made in view of the "Big Picture" as opposed to specific job requirements and directed by the effect that the actions of the work team will have on the overall success of the company.

One panelist eloquently related the reasons for the changes in the thinking skills required for the workplace of 2015:

"Fast-paced, lean environments will require employees that can think fast and accurately to correct problems without waiting on a supervisor to make a decision. Less strict supervision will require employees who can think through problems to ultimate solutions. Thinking innovations can reap big rewards for unique solutions".

In describing the skill of problem analysis, panelists predicted that successful workers will be able to distinguish fact from opinion and analyze situations to formulate assessments correctly. In solving problems, workers will gather and organize data to determine root causes in a logical fashion. One panelists expressed, "Successful workers will demonstrate critical thinking skills that empower them with the ability to assess a problem and determine a course of action by logical
thinking, deductive reasoning, and analytical troubleshooting”.

**Question # 2-D: Mathematical skills**

In enumerating the mathematical skills essential for personnel, the Delphi group was very specific in the types of competencies needed. The responses of the panel addressed specific mathematical skills and concepts and the practical application of mathematical skills to the workplace.

First and foremost, the panel forecast that the basic math skills of computation, adding, subtracting, multiplying, and dividing, using decimals and fractions are imperative. Workers will have computers, calculators, or the equivalent to perform mathematical operations. However, the worker must have “the ability to reduce real life problems to a solvable equation, i.e. the hated word problem”. Several addressed the need for higher mathematics skills and included elementary algebra, geometry, and trigonometry, including the application of sine, cosine, and tangent and the capability of determining the length of a side a triangle when given the length of the other two sides. Nonetheless, the ability to perform basic
computation operations of addition, subtraction, multiplication, and division was a clear consensus.

It appears that the group expects the theoretical to be translated into the practical to solve problems and to direct decision-making. It is anticipated that valuable employees will have the ability to create and understand graphs and charts and interprets it to reduce real life problems to solvable equations.

Other participants emphasized the role of business mathematics. The worker is not expected to come to the work force with all the mathematical skills he or she will need, but will have the ability and the intrinsic desire to learn the needed skills. Several mentioned Statistical Production Control (SPC). Workers at all levels of operation will be expected to use statistical analysis "as it relates to specific job related processes". Statistics will be required to calculate cost payback, manage inventory control systems, improve quality control, monitor process improvement, and to interpret financial reports.

One participant presented the antithesis of these ideas. "Math skills will become a lost art". 
Question # 2-E: Communication skills

"Effective clear communication will become the number one requisite for a successful employee". The most cited communication skill was oral communication skills. Many of the responses were similar to the responses in Question #2-A. The oral communication skills are required to facilitate successful team membership. Workers are sought who have the ability to communicate "one-on-one" in a respectful manner. The skills will be used to present "fact-based" presentations and to express one's self on a day-to-day basis. The workplace will demand associates who are "very articulate and clear in conversation, able to communicate effectively with a wide range of persons, and keep others informed of important information." Information will be exchanged amongst the team in an expeditious and efficient manner to solve problems and to convey easily understood instructions. As the importance of communication skills were described by a member of the Delphi group:

"At the lower levels of an organization, the ability to understand oral and written instructions and to effectively communicate a problem or situation to superiors is needed. The necessity for giving instructions that are easily understood increases with the individuals rise in the business structure".
The panel forecast that writing will be vital to successful employees. The written communications of the future worker are expected to be "focused, concise, easily understood" and constructed in accordance with good grammar, appropriate sentence structure, and spelling. One panelist stated that not only must the rules of Standard English be applied, but that the rules of etiquette will be important. The employee will be expected to practice proper etiquette, including concise and prompt response. Another of the Delphi members stated, "Clear written communication will become even more important as e-mail, etc. allows CEOs to see messages written by the janitor".

The workplace will require workers who practice good listening skills. These skills will allow them to comprehend, formulate correct responses, respect the thoughts and ideas of others, and to understand oral instructions.

One panel member felt that reading and understanding written instructions will be highly characteristic of the viable employee. Another panel member, extending on this idea, asserted that workers must have the ability to
interpret written technical information and then to disseminate it to the masses in an understandable format.

**Question # 2-F: Organizational skills**

Viable and sustainable employees will demonstrate "the ability to function in a complex organization" and the "ability to thoroughly arrange data and job details into logical structures according to business demands". Many other general organizational skills were mentioned. Employers expressed that profitable workers will be capable of setting goals, organizing data and ideas, constructing operational outlines, delegating, and documenting conditions and occurrences.

Many panelists identified task-related organizational skills as important. The preferred employee will be able to develop a plan of attack to accomplish the multiple tasks of the workday by dividing the task into logical steps. The tasks will be prioritized and completed simultaneously, giving complete time-on-task and completing the task with minimal or no supervision.

Adeptness at time management was identified by many panelists as important. One panelist posited that use of personal organizers would increase to assist time
management. Another panelist asserted that "computers will compensate for lack of organizational skills if the employee can follow timelines for data submission".

The worker will be expected to organize and maintain the personal work area, including issues or simplification and safety. Extending on this idea, one Delphi member stated that workers will be expected to "analyze work stations to improve efficiency".

Several people stated that the work force of 2015 is forecast to possess "follow-up" skills. These skills will empower workers to conduct audits to assess the effectiveness of the system's organization. Such workers will display "techniques necessary to achieve constant improvement in terms of quality and productivity".

**Question # 2-G: Physical skills**

The strongest prediction extracted from the narrative answers to this question was that physical requirements will diminish. According to one panelists from the industrial sector, "Work will become less physical, but healthy workers will be more valuable due to lean workforces and high health costs." A healthy worker was described as one with a "personal goal of good health" and one who "participates in
a healthy life style program". Several panelists included a life style free from the abuse of alcohol and drugs.

Physical stamina will be required to endure long shifts. Many forecast that twelve-hour shifts will be common, although manufacturing jobs will become more automated and less physically demanding.

There will be "less physical labor, but more mental stress". Effective stress management skills will become more important.

One panelist stated that "with technological changes taking place physical skills will become much less critical". Nonetheless, several enumerated as needful eye-hand coordination, agility, standing, flexibility, walking, manual dexterity, ability to perform repetitive motions, lifting reasonable loads of less than 50 pounds, and working safely to not injure yourself or other.

Question # 3: What do you believe are the three most important initiatives currently being undertaken by industry to ensure that an ample supply of skilled workers will be available in 2015?

There was a high degree of consensus by the panel in response to this question. The sentiment of the group was
succinctly stated by one panelist; "Realization that if a competent and well-trained work force is expected, then there must be a commitment to the development of workers internally by investing in a structured training faculty and associated programs, equipment, etc". The most frequently cited initiative was expanded in-house training program to develop employees, specifically "service workers", non-production workers, such as tool and die operators or general maintenance specialists. Additionally, increasing the computer literacy of the current workforce was identified as a high priority of training initiatives.

The narrative indicated that not all endeavors in training will be conducted by in-house employees or on-site. Seminars away from the plant are predicted to be utilized for specific training for low level employees, as well as vocational schools to train for "specialized crafts". The Delphi members frequently cited tuition reimbursement for training or education that would directly impact job performance as a viable initiative to ensure that an ample supply of skilled workers will be available in 2015.

Many of the responses clustered around the theme of partnerships between business or industry and schools or
school-oriented organizations. Current efforts mentioned included the "formation of partnerships between industry and education that allows for school-to-work opportunities, teacher stints in industry, collaboration on curricula, etc". Forward thinking organizations are reportedly participating in Education Edge, educational advisory boards, and school-industry work and planning teams. These ventures were said to be undertaken to increase awareness of the skills needed by industry. The respondents posited that partnerships with schools increasingly result in the design and implementation of apprenticeship programs, career fairs, and "educational programs to support world class companies". Further, the results of these partnerships to enhance technical skills is the updating of outmoded equipment with "up-to-date state-of-the-art equipment on which to train future workers".

Not all panelists corroborated these opinions on current initiatives by industry. One stated that some jobs had been relocated to China to ameliorate the problem. Another participant maintained:

"I don't see a lot. In a global economy where prices for many products are declining, downsizing of employees, budget cuts in all departments, including
training; reorganization and restructuring are the norm. There does not seem to be a lot of long-term thinking*.

Another Delphi member indicated much of the present training budget is spent to augment current employees skills to meet immediate industrial needs that little is being done to prepare potential workers for the labor force.

**Question # 4: What three initiatives by business and industry do you believe will be most successful in attracting and maintaining quality, skilled employees in the year 2015?**

One of the most frequently mentioned avenues for attracting and maintaining skilled employees was through "an ever increasingly attractive benefits package". The most frequently cited benefit was competitive wages. However, some mentioned that the pay would be intrinsically linked to performance and results. Other indicated benefits included on-site day care and elder care, excellent insurance packages, tuition assistance to promote lifelong learning, matching 401-K funds, recreational opportunities, vacation and sick leave, and longevity pay.

The culture of the workplace was also mentioned as useful in maintaining quality workers. One member of the
Delphi panel in describing the importance of the culture of the workplace stated, "Develop a company culture where the employee feels valued and respected." Improved working conditions were predicted to lead to an atmosphere of employee empowerment, a friendly, positive work environment, and ultimately, becoming the employer of choice.

The panel again broached the issue of training. Several agreed that skill enhancement and opportunity for professional growth will be helpful in 2015 in retaining superior employees. Organizations were forecast to provide in-house training to enable workers to achieve national or industry-wide certification. Beyond this, one panelist strongly stated that it was incumbent upon industry to not only provide the training, but to encourage it. An atmosphere of lifelong learning was anticipated to be an expectation or requirement rather than the exception.

Another member of the panel asserted, "For those who desire it, there will be more opportunity to explore more challenging career opportunities within the organization." Additionally, opportunities for growth and upward mobility at an earlier age were predicted to encourage staff improvement and contributions.
Question # 5: As you consider the work experience and educational training required for employment in the year 2015, what three major changes do you foresee in such programs as apprenticeships, on-the-job training, on-site training, or work experience requirements?

There was great consensus among the panelists addressing work experience. The requirement for work experience "will almost disappear for most jobs as industry recognizes that experience is not available. However, if there are highly trained, experienced workers, they will receive preferential treatment in hiring practices. Another panelist added that "employees will be expected to contribute at an earlier time interval and at a quicker pace".

On-site and on-the-job training was forecast to expand through industry, but some changes from current practices were expected. One industrial panel member believed that the "with decreasing labor supply, industry will greatly expand on-site training". Contractors will provide on-the-job training in some cases. Such training will be addressed in the company sponsored classroom such domains as basic skills, "soft skills", and healthy life style concepts.
Several changes in current traditional approaches to education were foreseen. First, technical training will increase and include computer experience and knowledge, software training, and certification. With the advent of new technology, this training was forecast to become “more specific, individual, and interactive”. One contributor stated that education would see an end to “antiquated mechanical drawing and woodworking”.

Secondly, more integration of the theory to its application was desired in education on many levels to allow students to see the relevance of the classroom activity to the workplace. Opinions that theoretical knowledge and practical skills should be taught simultaneously to support the workplace were noted. A member of the Delphi group posited that teachers will need to follow students to the workplace and continue to be accountable for teaching outside the classroom as well.

Several panelists asserted that apprenticeship programs are expected to expand. Apprenticeships were seen as beneficial in attracting high skilled workers in maintenance and electronics. Eventually it was predicted that apprenticeship programs might replace the company sponsored
classroom-training program. The apprenticeship was forecast as an intermediate step from initial hiring to internship, a precursor of full employment. However, one member of the Delphi who was supportive of workplace experience expressed concern of liability issues; “Insurance and liability concerns make it difficult to provide young people experience in the workplace. Efforts should be made to overcome this obstacle to provide 16 year olds practical experience in a variety of work environments.” Another panelists expressed, “In the last year or two of high school, students should begin a career path program, which is heavy on practical experience. Technical skills, interpersonal skills, and problem solving should be stressed”.

Several of the contributors reported that training programs must be recognized as essential to the survival of business and further stated that education costs will be viewed as an investment rather than an expense for the corporation. However, these respondents also noted that not all the cost for education can be absorbed by industry.

Question # 6: In 2015, what do you think will be the three most important forms of educational support existing
to provide industry with a ready supply of competent employees?

The narrative responses to Question # 6 in Round 1 were rather consistent with the responses to the earlier questions.

The panelist continued to affirm that there must be increased communication on what the current "real" industry needs versus what the school thinks industry needs, or what they knew five years ago. A need for the school experience to provide greater educational opportunities for all learners in the areas of writing, reading, mathematics, logic, and computer literacy was frequently reported.

In particular regard to the secondary schools, the panelist stated that curricular materials used at the high school level should be more applicable to the workplace and reflect actual workplace problems. According to one panelist:

"There must be more expansion of the industry-education partnership to have more teacher exposure to industry. There should be joint collaboration between industry and education on curricula development to the extent that industry contributes time, money, equipment, and even people to assist educational growth and enhancement."
The importance of effective team membership to the future employee continued to be expressed by many of the panelists. These contributors stated that the high school experience should develop teaming skills by requiring more group projects and provide more opportunities for co-op programs, job-shadowing, and apprenticeship programs.

The narrative responses continued to reflect that there will be more emphasis on "soft skills". As described by one panelists, "There will be greater emphasis on values education, dependability, reliability, flexibility, and communication than is now available in the school curriculum."

The one subject that emerged that had not been addressed in earlier narrative response was transportation. Educational resources were cited as a potential means of providing workers with vital transportation to the work site.

Question # 7: In your judgement, what are the three most critical changes that K-12 education should make to develop workers with the characteristics that will make them successful and valuable employees for industry in the year 2015?
The three most identified changes required of K-12 education to produce the cadre of skilled workers for 2015 are development of soft skills, curricular changes, and philosophical changes. Members of the panel stated the need for educational experiences to develop self-discipline, endurance, self-motivation, reliability, pride in work, honesty, integrity, effort, ambition, commitment, positive attendance patterns, and a strong work ethic. One panelist noted that something must be done to develop a stronger work ethic among students, but questioned whether the educational system was capable of accomplishing this. According to this panelist, "Scraping by with average or even below average performance will progress a person K-12, but it will not necessarily be tolerated in a work environment and certainly will not lead to work promotion".

Through responses to Question #7 panelists addressed curricular changes in basic skills, computer literacy, teaching methods, and course offerings. One panelist cautioned that schools should not, "get so involved in advanced programs that the basics are forgotten". Another stated that basic skills should be certified. Moreover, the panelists expressed the opinion that the awarding of a high
school diploma represents that an individual has the skills to work. Expansion of curricular offerings to include more economics education and business-related courses and to utilize process thinking or problem-solving across the curriculum were identified as critical changes for education to undertake.

Several members of the Delphi panel expressed that the current K-12 education primarily prepares a student for college. It was their opinion that if a student does not go to college, he or she has very few skills that workplaces need. In order to ameliorate this situation, many panelists suggested, that vocational education should be upgraded and all courses should be taught in such a manner that the learner will easily see the connection between what is being taught and its application to the workplace. Teaching methods should shift from the traditional lecture format to a participatory, practical, and interactive format.

Moreover, philosophical changes should also be reflected in guidance services and involve teachers and parents in career path selection at an earlier age.

**Question # 8: In your opinion, what will be the three most important forms of support that industry will receive**
The answers generated in response to Question # 8 indicated that funding for education and grants for training will be the most important forms of government support available to meet projected employment needs.

The support of education at all levels, secondary education, vocational-technical schools, and community colleges, was cited as strategic in worker preparation. Additionally, apprenticeship programs, co-op programs and school-to-work opportunities were recognized as likewise helpful. However, one panelist added a caveat to these ideas. There must be "some sort of evaluation system for local schools" and "freedom for students (and parents) to select local schools based on quality and specific curriculum offered".

Participants expressed the belief that some form of subsidizing of the "immense cost of training to be borne by industry" would be most helpful. Several constituents of the group expressed the view that grants should be available to subsidize in-house training specific to the business or
industrial needs of the organization rather than general training through a government agency.

Consideration was given to workmen's compensation and employee-employer litigation. "Worker's compensation is an issue that is very costly for industry at present. Companies need help now and in the future to curtail these rising costs, especially for fraudulent claims resulting in litigation".

Several responses were noted in the narrative that received only single or limited mention. Those items include re-evaluation of EPA standards; repealing laws directing hiring practices; funding for infrastructure expenses; tax compensations for training, expansion, and to increase competitiveness; assistance for welfare recipients; and assistance in start-up costs of the application process, screening, testing, and hiring.

The answers from two panelists represented the opposite end of the continuum. According to the first, "Government programs are on the way out; we will be on our own". The second panelists added, "Companies and individuals will receive less from federal and local government. Support will come on how for us to be more self-sufficient."
Question # 9: In your perception, what will be the three most significant differences in the characteristics of successful and viable workers of the year 2015 and the successful and viable employee of your present organization?

The responses elicited to Question #9 were repetitive of comments made by the group in other questions, particularly Question #1 and Question #2. However, technical skills, teamwork, and communications were most frequently mentioned.

The following citations are representative of the recurrent themes:

1. "Workers functioning as equal members of a cohesive unit".

2. "Will be better able to make decisions relating to the workplace".

3. "Technical and computer skills will be more important in 2015 to meet advanced technology needs."

4. "Employees who readily adapt and embrace change."

5. "More articulate to deliver presentations before work teams".

6. "More able to interact with software driving computer mainframe to add and retrieve data".
7. "Ability and willingness to continue education or training to react to technology changes".

8. "Employees who better understand global competition and what this means in terms of running our business".

9. "Employees who are flexible and who have various skill sets".

10. "Work ethic".

Although not a new subject for consideration, two Delphi panel members maintained that there would be no significant differences in the characteristics of associates in 2015 and the successful present day employees. One of the panelists stated, "Dependability, initiative, and a creative "can do" attitude will always be the characteristics of a successful and viable employee."

**Question # 10: Describe the idealized employee you seek for your organization in the year 2015.**

The one major response to the question was that future idealized employees sought by industry will have "soft skills" and a well-defined work ethic. There was strong consensus in the narratives to this question. The idealized worker was described by terms such as positive attitude, inquisitive, caring, honest, dependable, capable,
responsible, self-disciplined, drug free, motivated, and self-respectful. In describing the work ethic of the idealized worker of 2015, the panelists indicated that he or she would be characterized by the following attributes: requires minimal supervision, a willingness to go the extra mile, dependability as indicated by an absenteeism rate of less than one percent, demonstrates pride in the work and the product, demonstrates a commitment to excellence, and is a hard worker.

The second major finding in the analysis of Question #10 was that the future idealized employee that industry will seek will be an effective member of a team with strong interpersonal skills. More than two-thirds of the panelists asserted this opinion. Team players were described as having good people skills, a cooperative attitude with coworkers, and the ability to share and give back to fellow associates.

The third theme of responses clustered around the topic of education or training. More formal education will be required in the prospective employee, including a minimum of a high school education and some technical or college instruction. The educational experiences will develop
technical skills, particularly computer literacy and software usage to interface with the mainframe. Further, the workplace will demand that the desired employee possess mastery of the basic skills of reading, mathematics, and communication. "They will have the foundation of sound basics that will allow them to learn the specific skills we want them to have".

The Delphi panel, to a lesser degree, addressed the desire for the idealized employee to be an integral part of the organization. This level of relationship includes "viewing the company as family", "a willingness to contribute to the progress of an organization", and striving to achieve the organization's mission and vision.

**Question # 11: Please feel free to comment on any other aspect of projected skills and characteristics that will be needed for successful employment that you believe was overlooked by the above questions.**

The majority of panelists did not respond to this question. The participants who did respond did not present additional substantive materials to be considered. Their comments were a reaffirmation of opinions and perceptions expressed in other parts of the narrative. The narrative
answers to Question # 11 stated that change is a certainty and to effectively prepare to meet these challenges education must be able to change quickly without encumbrance from bureaucracy. Further, educators must realize that all children are not going to college and must prepare the learners to enter the workforce with marketable skills from technical training. Positive personal qualities and a robust work ethic were identified as of paramount importance for successful employment.

This question offered no substantive contribution to the study, but it did allow the Delphi panel the opportunity to contribute their personal discourse.

**Summary**

The narrative responses to the questions forming the Round 1 iteration were perceptive in nature and provided a foundation from which to formulate the Round 2 iteration. The Delphi panelists provided rich commentary to all areas of study. The analysis of the data revealed points of emerging strong consensus concerning the desirable characteristics of viable and sustainable workers in 2015. These elements formed the basis of the Round 2 iteration to
further narrow the opinions and perceptions of the panelists.
CHAPTER 5

ROUND 2 FINDINGS AND ANALYSIS

Introduction

This chapter includes a description of the procedure by which the Round 2 questionnaire was constructed, distributed, and analyzed. An explanation of the procedure used to organize and to summarize the 55 item second round iteration is described, including an explanation of the scale.

Construction of the Round 2 Instrument

The content analysis of the narrative responses generated by the open-ended questions of the Round 1 iteration formed the basis of the construction of the second round questionnaire. The purpose of the second round iteration was to further narrow responses and to increase the level of consensus among the panelists in regard to the research questions found in Chapter 1. In order to accomplish this, the researcher identified the perceptions and opinions with the greatest degree of agreement among the Delphi members from the Round 1 questionnaire and developed the 55 item Round 2 questionnaire. The second
round questionnaire and the cover letter utilized in the second round are found in Appendix C. The statistical results from the Round 2 iteration are reported in tables.

The answers to the first round instrument were analyzed inductively to determine the emerging areas of agreement among the panelists. The analysis of the data included taking the exact statements of the respondents and placing the statement into topical categories. Tallies were made of the number of times that a member of the Delphi expressed a particular idea. From these tallies, the researcher determined what items should be included in the second round iteration.

In the majority of cases, inclusion of an item in the second round was very obvious due to the large degree of support among the panelists. However, an arbitrary cut-off was necessary to determine if a belief expressed by a panel member warranted further consideration in the Delphi process. The point of demarcation was established at a count of four. Any opinion or perception that received four or more concurring statements was included in the Round 2 questionnaire. Opinions or perceptions without four
concurring statements were omitted from further consideration.

The second round iteration employed a Likert scale and a ranking scale to increase the degree of consensus. The Likert scale was used to measure the level of agreement among the panelists concerning the qualities desired in the workers of 2015 and the initiatives required by industry and public education to ensure the availability of the needed workers. The respondents were asked to choose a number along a continuum from 1 to 5. A response of "1" indicated that the participant strongly agreed with the statement and believed it to be critical or urgent in nature. A response of "2" indicated that the respondent believed the statement to be relevant or of considerable significance, but a second order priority. Marking a "3" on the continuum indicated agreement with the statement and assent that the statement had some importance. A response of "4" or "5" indicated disagreement with the statement. Choosing "4" indicated that the statement was insignificantly relevant, and had little importance. However, a "5" indicated that the panelist strongly disagreed with the statement and assigned no relevance, no priority, or no measurable effect to the
remark. A table of the Likert scale results of the 55 items is included in the study.

Further, a second analytical procedure asked the panelists to identify and rank the ten most important characteristics or initiatives in each of the three sections of the second iteration. The items are listed in rank order with the sum of the ranking points each item received in the tables. The ranking was most helpful in allowing additional refinement of the consensus among the Delphi members.

**Distribution and Return Rate of the Round 2 Instrument**

In accordance with the original schedule distributed with the Round 1 iteration, the Round 2 instrument was mailed on May 30, 1999. Packets were sent to the 22 panelists who responded to the Round 1 iteration. In addition to the Round 2 iteration, the packet mailed to panelists also included a cover letter, directions for the iteration, and a self-addressed stamped envelope for the convenience of the panel members. The Delphi schedule requested that the instruments be returned by June 15, 1999. A copy of this material is provided in Appendix C.
The level of response to the Round 2 iteration demonstrated the high commitment of the Delphi members. The first iteration was returned to the researcher by June 3, 1999. On June 12, 1999, the researcher sent a postcard reminder of the scheduled return date of June 15, 1999 to all panelists who had not responded. By June 15, 1999, 18 of the panelists had responded and all of the 22 panelists had responded by June 16, 1999.

Methodology for Data Summary

The researcher developed frequency tables to organize the data. A statistical program was used to determine the standard deviation and mean for each of the 55 items.

The Likert scale which was utilized for the iteration employed a continuum from "1" to "5". A "1" indicated that the panelist strongly agreed with the statement and a "5" indicated that a panelist strongly disagreed with the statement. An item with a lower mean indicated higher consensus among the Delphi panel.

In consideration of the ranking of the items, a different method was utilized. The respondents ranked the ten most important items in regard to each question. An
item which received a first place ranking received ten points and an item which received a second place ranking received nine points. The same scheme was continued until the item with a tenth place ranking received one point. From the sum of the ranking points, the researcher was able to rank order the items.

The results are organized in a table and displays the items in rank order. Additionally, the table includes the Likert scale mean, the mode, and standard deviation of the item, and a frequency table of the Likert item choices.

Round 2 Findings and Analysis

This segment of the study includes a summary of the items as they related to the three research questions.

Research Question #1:

What will be the competitive characteristics of a viable and sustainable worker in the year 2015?

The statistical data to Research Question #1 is organized in Table 1.

Item # 1-A: Ability to make oral presentations to a work group.
TABLE 1
FORECAST DESIRED WORKER CHARACTERISTICS OF 2015 IN RANK ORDER
Means, Standard Deviation, and Distribution of Likert Scales in Rank Order

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Ranking N</th>
<th>Mean</th>
<th>SD</th>
<th>Mode</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>A strong work ethic</td>
<td>124</td>
<td>1.5</td>
<td>0.7</td>
<td>1</td>
<td>13</td>
<td>7</td>
<td>2</td>
<td>0</td>
<td>0</td>
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<tr>
<td>A positive attitude</td>
<td>123</td>
<td>1.4</td>
<td>0.6</td>
<td>1</td>
<td>14</td>
<td>7</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>The ability and willingness to learn</td>
<td>106</td>
<td>1.5</td>
<td>0.5</td>
<td>1</td>
<td>12</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Dependable as indicated by low absenteeism</td>
<td>99</td>
<td>1.5</td>
<td>0.6</td>
<td>1</td>
<td>12</td>
<td>9</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Adaptability to the workplace</td>
<td>98</td>
<td>1.4</td>
<td>0.5</td>
<td>1</td>
<td>13</td>
<td>9</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Personal integrity</td>
<td>85</td>
<td>1.5</td>
<td>0.8</td>
<td>1</td>
<td>13</td>
<td>7</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Drug and alcohol free</td>
<td>67</td>
<td>1.3</td>
<td>0.5</td>
<td>1</td>
<td>17</td>
<td>4</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>The ability to effectively participate in a work team</td>
<td>66</td>
<td>1.6</td>
<td>0.6</td>
<td>2</td>
<td>10</td>
<td>11</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>A high school graduate</td>
<td>65</td>
<td>1.5</td>
<td>0.6</td>
<td>1</td>
<td>13</td>
<td>8</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Computer literacy, including the usage of software</td>
<td>61</td>
<td>1.6</td>
<td>0.7</td>
<td>1</td>
<td>11</td>
<td>9</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Critical thinking skills</td>
<td>52</td>
<td>1.9</td>
<td>0.5</td>
<td>2</td>
<td>5</td>
<td>15</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>The ability to understand written communication</td>
<td>42</td>
<td>1.8</td>
<td>0.6</td>
<td>2</td>
<td>7</td>
<td>12</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Creativity (Thinks outside the box)</td>
<td>41</td>
<td>2.1</td>
<td>0.8</td>
<td>2</td>
<td>6</td>
<td>9</td>
<td>6</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Listening skills</td>
<td>33</td>
<td>1.8</td>
<td>0.6</td>
<td>2</td>
<td>7</td>
<td>12</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Advanced vocational-technical skills</td>
<td>33</td>
<td>1.8</td>
<td>0.6</td>
<td>2</td>
<td>7</td>
<td>12</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ability to handle multiple tasks simultaneously</td>
<td>30</td>
<td>2.1</td>
<td>0.8</td>
<td>2</td>
<td>5</td>
<td>11</td>
<td>5</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Logical method of solving problems.</td>
<td>29</td>
<td>2.1</td>
<td>0.7</td>
<td>2</td>
<td>3</td>
<td>15</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>The ability to interpret data, including graphs and charts</td>
<td>16</td>
<td>2.2</td>
<td>0.7</td>
<td>2</td>
<td>2</td>
<td>14</td>
<td>5</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Decision-making skills</td>
<td>15</td>
<td>2.0</td>
<td>0.8</td>
<td>2</td>
<td>5</td>
<td>12</td>
<td>4</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Mathematical computation skills</td>
<td>13</td>
<td>2.2</td>
<td>0.6</td>
<td>2</td>
<td>2</td>
<td>15</td>
<td>4</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Time management skills</td>
<td>3</td>
<td>2.3</td>
<td>0.7</td>
<td>3</td>
<td>2</td>
<td>7</td>
<td>12</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Ability to make oral presentations to a work group</td>
<td>1</td>
<td>2.4</td>
<td>0.1</td>
<td>2</td>
<td>2</td>
<td>10</td>
<td>9</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Capable of learning Statistical Process Control</td>
<td>0</td>
<td>2.6</td>
<td>1.1</td>
<td>2</td>
<td>3</td>
<td>8</td>
<td>6</td>
<td>4</td>
<td>1</td>
</tr>
</tbody>
</table>
The mean value for this item was 2.4 (SD = 0.7) and it ranked 22nd of the 23 items associated with the research question. However, only one panelist disagreed that viable and sustainable workers would possess this characteristic.

**Item # 1-B: Advanced vocational-technical skills.**

Panelists ranked this item fifteenth of the 23 items. Nonetheless, 100% of the participants chose a selection on the Likert scale between strongly agree and agree in support of this item. Analysis on the item revealed a mean score of 1.8 (SD = 0.6).

**Item # 1-C: Computer literacy, including the usage of software.**

The Delphi group indicated that computer literacy, including software usage will be critical to the success of future workers, as indicated by its tenth place ranking. In response to the item, 100% of the panel selected an item on the Likert scale between strongly agree and agree. The mean value was 1.6 (SD = 0.7).

**Item # 1-D: Critical thinking skills.**

The panel members expressed the need for critical thinking skills by the future workforce. Although all participants chose a Likert response between agree and
strongly agree ($M = 1.9$, $SD = 0.5$), "2" was chosen by 68% of the panelists. This indicated that it is very likely that successful workers would possess this characteristic.

**Item # 1-E: A positive attitude.**

Responses to this item by the Delphi panel illustrated strong consensus that a positive attitude would be an attribute of the desired worker of 2015. Sixty-four percent of the panelists strongly agreed about this characteristic, earning it a second place ranking among the characteristics. The mean on the Likert scale was 1.4 ($SD = 0.6$). The mean Likert value for this item was the highest of any item associated with this research question.

**Item # 1-F: A strong work ethic.**

The panelists asserted that the sustainable and viable worker of the future would bring to the workplace a strong work ethic as indicated by the first place ranking of the item. Responses indicated that 100% of the panelists selected a point on the Likert scale between agree and strongly agree. However, 64% of the membership strongly agreed. As a result, the mean value of the item was 1.5 ($SD = 0.7$).

**Item # 1-G: The ability and willingness to learn.**
The members posited that the ability and willingness to learn would be a quality of the forecast worker. The Delphi panel ranked this feature as third among the 23 items. Strong consensus for this item was indicated by 55% of the panelists reporting that they strongly agreed that this would be an attribute of the desired future worker. The remainder of the panelists selected "2" on the Likert scale ($M = 1.5$, $SD = 0.5$).

**Item # 1-H: Adaptability to the changing workplace.**

The experts of the Delphi asserted that the rapidly changing workplace of the future would require workers who can quickly and adroitly adapt. The mean value generated by this item was 1.4 ($SD = 0.5$), which tied with Item #1-E as the highest mean value of any item. Respondents to the iteration ranked this item as fifth.

**Item # 1-I: Mathematical computation skills.**

In consideration of the necessity of mathematical computation skills by preferred workers of 2015, the panelists ranked this characteristic as twentieth of the 23 characteristics. Nine percent of the panelists strongly agreed with this statement. Further, 5% selected a "4" on the Likert scale, indicating disagreement with the
statement. The mean value generated by the statement was 2.2 (SD = 0.6).

**Item # 1-J: The ability to effectively participate in a work team.**

There was general consensus among the panelists in regard to the requirement of forecast workers to effectively participate in a work team. The item produced a mean value of 1.6 (SD = 0.6). As evidence of the agreement among the panelists, the item garnered a ranking of eighth.

**Item # 1-K: The ability to interpret data, including graphs & charts.**

The responses to this item asserted that the ability to interpret data, including graphs and charts would be a quality of successful future workers. The mean on the Likert scale was 2.2 (SD = 0.7). In ranking the characteristics most important of forecast successful workers, the Delphi panel ranked this item eighteenth in the field of 23.

**Item # 1-L: Decision-making skills.**

The responses indicated that decision-making skills would be an attribute of desired workers in 2015. The Likert mean was 2.0 (SD = 0.8). The responses in the second
iteration ranked decision-making skills as nineteenth among the 23 qualities.

Item # 1-M: The ability to understand written communication.

Successful workers will possess the ability to understand written communication according to the Delphi panel. The mean value on the Likert scale was 1.8, (SD = 0.6). The importance of this characteristic is indicated by its twelfth place ranking among the aggregation of 23 attributes.

Item # 1-N: Listening skills.

The responses to this item predicted that listening skills would be required for successful participation in the future world of work. Analysis of the responses to this item revealed a mean on the Likert scale of 1.8 with a standard deviation of 0.6. Panelists ranked the item as fourteenth of the set of 23 characteristics.

Item # 1-O: Time management skills.

The Delphi group expressed in their responses that time management skills will be required by desired workers in 2015. Analysis of the data revealed that 96% of the panelists selected an item on the Likert scale between agree
and strongly agree (M = 2.3, SD = 0.7). The Delphi panel ranked this trait as 21st among the 23 items.

**Item # 1-P: Ability to handle multiple tasks simultaneously.**

The experts of the Delphi group predicted that the complexity of the future workplace will necessitate that employees have the competence to handle multiple tasks simultaneously. Respondents ranked this attribute as sixteenth among the field of 23. The Likert scale mean was 2.1 with a standard deviation of 0.8.

**Item # 1-O: Drug and alcohol free.**

Consensus respecting the belief that viable and sustainable workers of 2015 will be drug and alcohol free was very strong among the participants. Seventy-seven percent of the panelists strongly agreed with the statement, more than any other item, the greatest consensus of any item in the study. The mean value of the Likert scale was 1.3 (SD = 0.5). The respondents ranked this item as seventh.

**Item # 1-R: A high school graduate.**

The predicted successful worker will be a high school graduate according to the panelists. As evidence of the strength of consensus, 59% of the panelists strongly agreed
with the statement. The mean value of the item on the Likert scale was 1.5 with a standard deviation of 0.6. The item was ranked as ninth in the set of 23.

**Item # 1-S: Personal integrity.**

The positive responses to this item were among the strongest in the study. Panelists rated personal integrity as the sixth most important characteristics that will be required of the desired workers. The item had a mean value of 1.5 on the Likert scale (SD = 0.8).

**Item # 1-T: Creativity (Thinks outside the box).**

The Likert mean for this item was 2.1 (SD = 0.8) and was ranked as thirteenth of the considered characteristics. Ninety-six percent of the panelists agreed that the valued worker of 2015 would possess this attribute.

**Item # 1-U: Logical method of solving problems.**

The panelists supported the belief that the workers of future will utilize logical approaches to the solution of problems. The agreement for this item was 2.1 on the Likert scale with a standard deviation of 0.7. The respondents assigned this characteristic to a rank of seventeenth.
Item # 1-V: Dependable as indicated by low absenteeism.

The experts of the Delphi panel posited strong support for the opinion that dependability as indicated by the worker's low absenteeism will be a critical characteristic of viable workers of 2015. Strong agreement with the item was expressed by 55% of the respondents. The mean value on the Likert scale was 1.5 (SD = 0.6). Only two other items have a higher mean value. The item was placed at a ranking of fourth among the considered characteristics.

Item # 1-W: Capable of learning Statistical Process Control.

The capacity to learn Statistical Process Control was moderately supported by the panel. The mean value of the item was 2.6 with a standard deviation of 1.1. This was the lowest mean value of any considered characteristic. Twenty-two percent of the panelists chose an item on the Likert scale between disagree and strongly disagree. Further, it was the only item to not be chosen as one of the ten most important characteristics in the category by any panelists. It was placed as 23rd among the field of 23 characteristics.
Research Question # 2:

What will successful companies do to ensure the availability of competent workers in the year 2015?

The statistical data to Research Question #2 is organized in Table 2.

Item # 2-A: Participate in an apprenticeship program.

The opinion that successful companies will participate in apprenticeship programs to ensure the availability of quality workers received moderate support from the panel. The mean value on the Likert scale was 2.5 ($SD = 1.0$) with 82% choosing an item on the scale between agree and strongly agree. The panel ranked the item as ninth among the 16 initiatives considered by the group.

Item # 2-B: Expand in-house training programs.

The belief that expansion of in-house training programs as a feasible initiative to guarantee that quality employees will be available to meet industrial needs was strongly supported by the Delphi group. The mean value on the Likert scale was 1.6 with a standard deviation of 1.6. Further, 55% of the participants strongly agreed with this opinion. In consideration of the initiatives that business and
<table>
<thead>
<tr>
<th>Initiative</th>
<th>Ranking Points</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Mode</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Establish a culture that values and respects the worker</td>
<td>154</td>
<td>22</td>
<td>1.3</td>
<td>1.3</td>
<td>1</td>
<td>17</td>
<td>4</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Increase on-the-job-training for employees</td>
<td>139</td>
<td>22</td>
<td>1.5</td>
<td>0.6</td>
<td>1</td>
<td>12</td>
<td>9</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Expand in-house training programs</td>
<td>118</td>
<td>22</td>
<td>1.6</td>
<td>0.7</td>
<td>1</td>
<td>12</td>
<td>7</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Institute a participatory management style</td>
<td>114</td>
<td>22</td>
<td>1.8</td>
<td>0.8</td>
<td>2</td>
<td>8</td>
<td>13</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Develop pay scales linked to performance or results</td>
<td>93</td>
<td>22</td>
<td>1.9</td>
<td>0.8</td>
<td>2</td>
<td>8</td>
<td>9</td>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Provide tuition reimbursement for job related training</td>
<td>89</td>
<td>22</td>
<td>1.5</td>
<td>0.7</td>
<td>1</td>
<td>12</td>
<td>8</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Assist in the development of K-12 curriculum</td>
<td>85</td>
<td>22</td>
<td>2.3</td>
<td>0.8</td>
<td>3</td>
<td>4</td>
<td>8</td>
<td>9</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Participate in local school-oriented organizations</td>
<td>65</td>
<td>22</td>
<td>2.2</td>
<td>0.7</td>
<td>2</td>
<td>2</td>
<td>14</td>
<td>5</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Participate in an apprenticeship program</td>
<td>54</td>
<td>22</td>
<td>2.5</td>
<td>1.0</td>
<td>2</td>
<td>3</td>
<td>9</td>
<td>6</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Provide all employees opportunities for upward mobility</td>
<td>54</td>
<td>22</td>
<td>2.2</td>
<td>1.1</td>
<td>1.3</td>
<td>7</td>
<td>6</td>
<td>7</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Offer flexible work schedules</td>
<td>50</td>
<td>22</td>
<td>2.4</td>
<td>1.2</td>
<td>3</td>
<td>6</td>
<td>6</td>
<td>7</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Provide in-house training for industry-wide certification</td>
<td>38</td>
<td>22</td>
<td>2.4</td>
<td>0.9</td>
<td>3</td>
<td>4</td>
<td>7</td>
<td>9</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Provide extensive benefit package</td>
<td>31</td>
<td>22</td>
<td>2.4</td>
<td>1.0</td>
<td>3</td>
<td>6</td>
<td>5</td>
<td>8</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Increase the number of internships</td>
<td>27</td>
<td>22</td>
<td>2.5</td>
<td>0.7</td>
<td>2</td>
<td>0</td>
<td>14</td>
<td>5</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Offer on-site job-shadowing to teachers</td>
<td>25</td>
<td>22</td>
<td>2.2</td>
<td>0.9</td>
<td>2</td>
<td>5</td>
<td>11</td>
<td>3</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Replace outmoded equipment used in K-12 education</td>
<td>23</td>
<td>22</td>
<td>2.7</td>
<td>0.9</td>
<td>3</td>
<td>2</td>
<td>6</td>
<td>10</td>
<td>4</td>
<td>0</td>
</tr>
</tbody>
</table>
industry will undertake to meet employee needs, expansion of in-house training ranked third.

Item # 2-C: Increase on-the-job training for employees.

There was ardent support for the expansion of on-the-job training to develop required future workers. The members of the panel recognized this as the second most likely method to meet forecast needs. The item garnered a mean value of 1.5 on the Likert scale ($SD = 0.6$). Analysis of the item revealed that 55% of respondents strongly agreed with the statement of the item.

Item # 2-D: Participate in local school-oriented organizations.

According to the consensus of the Delphi panel, participation within the local community with school-oriented organizations will be helpful in producing a quality workforce. The mean value for this item on the Likert scale was 2.2 ($SD = 0.7$) and its ranking among the initiatives was at the midpoint of eighth.

Item # 2-E: Assist in the development of K-12 curriculum.
The response to Item # 2-E was closely aligned with the responses to Item # 2-D. The mean value on the Likert scale was 2.3 (SD = 0.8). The assessment that companies will participate in the development of K-12 curriculum was ranked as seventh of 16.

Item # 2-F: Provide tuition reimbursement for job related training.

Vigorous support was noted for providing tuition reimbursement for job related training by industry. More than one-half of the participants strongly agreed with this effort as indicated by the Likert scale mean value of 1.5 (SD = 0.7). Moreover, the item was ranked as sixth among the forecast industrial initiatives.

Item # 2-G: Increase the number of internships.

Less hearty support was given to increasing the number of internships by the expert panel. No panelist strongly agreed with the item. The item obtained a mean value of 2.5 on the Likert scale (SD = 0.7) and a ranking of fourteenth among the list of 16 undertakings.

Item # 2-H: Institute a participatory management style.
Instituting a participatory management style amassed strong support among the panel as reflected by the Likert mean of 1.8 ($SD = 0.8$). The likelihood that industry will adopt this as a strategy to ensure the availability of competent workers is high as suggested by its fourth place ranking.

**Item # 2-I: Offer flexible work schedules.**

In consideration of offering flexible work schedules, the group offered support. Affirming its probability of occurrence, 86% of the panelists selected an item between agree and strongly agree on the Likert continuum for a mean value of 2.4 ($SD = 1.2$). The item was ranked as eleventh of the 16 initiatives.

**Item # 2-J: Establish a culture that values and respects the worker.**

The strongest consensus within the items related to Research Question # 2 was the belief that establishing a culture that values and respects the worker will ensure the availability of the workers required to meet industries needs in 2015. The strength of the support is reflected in the mean value of 1.3 ($SD = 0.5$). Additionally, 77% of the panelists strongly agreed with the item, which is far
greater than any other item in this category. The item was ranked as first of the 16 initiatives.

**Item # 2-K: Provide extensive benefit packages.**

The mean value on the Likert scale was 2.4 ($SD = 1.0$). The panelists gave moderate positive support to providing extensive benefit packages as a strategy to guarantee the caliber of worker desired and ranked it as thirteenth of the 16 items.

**Item # 2-L: Develop pay scales linked to performance or results.**

The concept of developing pay scales linked to job performance or job results received high support from the Delphi members. The analysis of the item revealed a mean value of 1.9 on the Likert scale ($SD = 0.8$). There is high probability that employers will utilize this strategy as indicated by its fifth place ranking.

**Item # 2-M: Provide all employees opportunities for upward mobility.**

The mean value for the item was 2.2 ($SD = 1.1$). Ninety one percent of the respondents chose an item on the Likert between agree and strongly agree. The strategy of providing opportunities for upward mobility for all employees as a
rationale mode for attracting and maintaining employees was ranked as tenth.

**Item # 2-N: Provide in-house training for industry-wide certification.**

Raters concurred that successful industries will provide in-house training for industry wide certification. The mean value was 2.4 (SD = 0.9). Panelists rated the item as twelfth of 16.

**Item # 2-O: Replace outmoded equipment used in K-12 education.**

The Delphi group posited positive, but moderate support for this item. Eighty-two percent chose an item on the Likert scale between agree and strongly agree. The mean value of the item was 2.7 (SD = 0.9). The panelists rated this item as sixteenth of the 16 items in this category.

**Item # 2-P: Offer on-site job-shadowing to teachers.**

The mean value for the item was 2.2 (SD = 0.9). Although 95% of the panelists selected an item between agree and strongly agree, the panelists ranked its importance as fifteenth of the field of 16.
Research Question #3:

What changes in public education will be required to meet industry's needs in the year 2015?

The statistical results to Research Question #3 are organized in Table 3.

Item # 3-A: Expand vocational-technical education.

Forty-five percent of the respondents indicated that they strongly agreed that public education should expand vocational technical education to provide the caliber of workers required for the workplace in 2015. The mean value on the Likert scale for the item was 1.8 ($SD = 0.8$). Panelists ranked this item as fifth among the 16 initiatives considered for action by public schools.

Item # 3-B: Employ teachers with practical industrial experience.

The panel expressed belief that public schools should employ teachers with practical industrial experience. The mean value for the item was 2.2 ($SD = 1.0$). A seventh place ranking was assigned to the item by the panelists.

Item # 3-C: Expand apprenticeship programs.

The Delphi group agreed that the expansion of apprenticeship programs was an action that public schools
## TABLE 3

Forecast Initiatives of Public Education in Rank Order
Means, Standard Deviation, and Distribution of Likert Scales in Rank Order

<table>
<thead>
<tr>
<th>Initiatives</th>
<th>Ranking N</th>
<th>Mean</th>
<th>SD</th>
<th>Mode</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase student reading proficiency</td>
<td>137</td>
<td>1.5</td>
<td>0.7</td>
<td>1</td>
<td>13</td>
<td>6</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cooperatively develop curriculum/materials with industry</td>
<td>132</td>
<td>1.9</td>
<td>0.9</td>
<td>1</td>
<td>9</td>
<td>8</td>
<td>4</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Increase student mathematical proficiency</td>
<td>131</td>
<td>1.5</td>
<td>0.7</td>
<td>1</td>
<td>13</td>
<td>7</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Increase student writing proficiency</td>
<td>116</td>
<td>1.8</td>
<td>0.8</td>
<td>2</td>
<td>8</td>
<td>11</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Expand vocational-technical education</td>
<td>111</td>
<td>1.8</td>
<td>0.8</td>
<td>1</td>
<td>10</td>
<td>8</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Emphasize technology at all levels</td>
<td>86</td>
<td>1.9</td>
<td>0.9</td>
<td>1</td>
<td>9</td>
<td>7</td>
<td>5</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Employ teachers with practical industrial experience</td>
<td>84</td>
<td>2.2</td>
<td>1.0</td>
<td>3</td>
<td>8</td>
<td>3</td>
<td>9</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Integrate theoretical teaching and practical application</td>
<td>79</td>
<td>2.0</td>
<td>0.7</td>
<td>1</td>
<td>13</td>
<td>6</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Develop student attitudes of tolerance for diversity</td>
<td>70</td>
<td>2.3</td>
<td>0.9</td>
<td>2</td>
<td>4</td>
<td>10</td>
<td>5</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Realize that not all students will go to college</td>
<td>70</td>
<td>1.9</td>
<td>1.0</td>
<td>1</td>
<td>12</td>
<td>6</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Provide appropriate career guidance for all students</td>
<td>67</td>
<td>2.0</td>
<td>0.7</td>
<td>1</td>
<td>10</td>
<td>7</td>
<td>3</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Incorporate conflict resolution in K-12 curriculum</td>
<td>47</td>
<td>2.3</td>
<td>0.8</td>
<td>2</td>
<td>2</td>
<td>14</td>
<td>3</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Expand apprenticeship programs</td>
<td>35</td>
<td>2.4</td>
<td>0.8</td>
<td>2</td>
<td>3</td>
<td>10</td>
<td>7</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Offer specialized classes in electronics</td>
<td>20</td>
<td>2.6</td>
<td>0.9</td>
<td>3</td>
<td>3</td>
<td>6</td>
<td>10</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Offer specialized classes in maintenance</td>
<td>19</td>
<td>2.8</td>
<td>0.8</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>11</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Provide more opportunities to develop public speaking ability</td>
<td>9</td>
<td>2.8</td>
<td>0.9</td>
<td>3</td>
<td>2</td>
<td>6</td>
<td>9</td>
<td>5</td>
<td>0</td>
</tr>
</tbody>
</table>
should undertake to provide industry with the desired future workers. The mean value for the item was 2.4 (SD = 0.8). This item received a thirteenth place ranking.

**Item # 3-D: Cooperatively develop curriculum and associated materials with industry.**

Strong support was expressed in regard to public education cooperatively developing curriculum and associated materials with industry. A mean value of 1.9 (SD = 0.9) was associated with item. Panelists ranked this item as the second most important initiative of public education.

**Item # 3-E: Emphasize technology at all levels.**

Likewise, strong support was obtained for emphasizing technology at all levels. The Likert scale mean value for this item was 1.9 (SD = 0.9). The panel of experts ranked this item in a position of sixth.

**Item # 3-F: Offer specialized classes to teach general maintenance.**

The mean value for this item was 2.8 (SD = 0.8), indicating moderate positive support. It is noted that 18% of the respondents disagreed with the statement. The item was ranked as fifteenth in the group of 16 actions.

**Item # 3-G: Offer specialized classes in electronics.**
The responses to item # 3-F and item # 3-G were very similar. The mean value of the item was 2.6 (SD = 0.9). Although the support for the item. The public education initiative of offering specialized classes in electronics received a ranking of fourteenth.

Item # 3-H: Provide more opportunities in the school curriculum for students to develop public speaking ability.

This item received the weakest support of any item associated with the actions of public education. The item had a mean value of 2.8 (SD = 0.9). Twenty-three percent of the panelists disagreed that this is action that should be pursued. Further, the item was ranked as sixteenth of the 16 actions in the category.

Item # 3-I: Develop student attitudes of tolerance for diversity.

The mean value for the item was 2.3 (SD = 0.9). Eighty-six percent of the panelists chose an item on the Likert scale between agree and strongly agree. The Delphi group ranked the item as ninth.

Item # 3-J: Increase student writing proficiency.

The panelists expressed belief that it is important for public schools to increase the writing proficiency of
students. Thirty-six percent of the respondents strongly agreed with the statement. The item had a mean value of 1.8 ($SD = 0.8$). The panelists ranked this item as fourth in importance for action by public education.

**Item # 3-K: Incorporate conflict resolution in K-12 curriculum.**

Moderate support was expressed by the panelists for the incorporation of conflict resolution into the K-12 curriculum by public schools. A mean value of 2.3 ($SD = 0.8$) was noted for this item. It was ranked as twelfth of the sixteen initiatives.

**Item # 3-L: Increase student mathematical proficiency.**

Increasing student mathematical proficiency received ardent support among the expert panel, as indicated by its third place ranking. Fifty-nine percent of the panelists strongly agreed that this is an action that public education must undertake to ensure that industrial needs may be met in 2015. The mean value for the item was 1.5 ($SD = 0.7$).

**Item # 3-M: Increase student reading proficiency.**

All participants chose to select an item on the Likert between agree and strongly agree. As with Item # 3-L, 59% of the panelists strongly agreed that this is an action for
public education to adopt. In the ranking of the initiatives for public education, the panelists ranked this as the first priority for action.

**Item # 3-N: Integrate theoretical teaching and practical application to support the workplace.**

The mean value for this item was 2.0 ($SD = 0.7$) with 96% of the membership selecting an item along the Likert between agree and strongly agree. It was ranked as eighth by the panelists.

**Item # 3-O: Provide appropriate career guidance for all students.**

The panelists expressed hearty support for this initiative as indicated by the mean value of 1.9 ($SD = 1.0$). Forty-six percent of the panelists strongly agreed that this action should be taken. It received an eleventh place ranking among the 16 items.

**Item # 3-P: Realize that not all students will go to college.**

The Likert mean of 1.7 ($SD = 0.9$) illustrated the strong support of the Delphi panel for this item. Fifty-five percent of the respondents strongly agreed that public schools must realize that not all students are going to
college. The item ranked tenth among the 16 items in this category.

**Summary**

This chapter contained the analysis of the Round 2 iteration which was used to narrow the consensus concerning the characteristics of viable and sustainable employees in the year 2015 and the actions required of industry and public schools to ensure the availability of these desired workers. The 55 items of the questionnaire were organized around the three research questions. The opinions and perceptions of the Delphi panel were measured in two ways. The panelists responded to each of the 55 items on a Likert scale. Further, the top ten items in each category were ranked by the panelists. It is obvious from the analysis that both industry and public schools must undertake significant changes in order to meet the forecast worker demands of the future.

Chapter 6 provides recommendations and conclusions for industry and public schools and a summary of the study.
CHAPTER 6

CONCLUSIONS

Introduction

A complete description of the Delphi method used in the study was contained in Chapter 3, including the method by which the expert members of the Delphi panel were selected. It is noted that the Delphi method does not attempt to produce statistically significant results (Gordon, 1992), but is nonetheless described as the best forecasting tool (Heath, Neimeyer, & Pederson, 1988). Chapter 4 contained the analysis of the narrative data generated by the Round 1 iteration concerning forecast worker characteristics and the efforts required of companies and public education to provide the caliber of employee desired. The consensus of the panel was further refined by the Round 2 iteration. The analysis and findings of that instrument was contained in Chapter 5. The panelists expressed agreement with all the items of the Round 2 iteration, but to varying degrees. From these results, a forecast concerning desirable future workers may be made.
The substantive content of Chapter 6 is organized around the three research questions. The chapter purposes to synthesize the opinions and perceptions of the Delphi members into a body of conclusions, recommendations, and summary.

**Research Question # 1 Conclusions**

*What will be the competitive characteristics of a viable and sustainable worker in the year 2015?*

The Delphi group expressed the belief that personal qualities rather than highly developed technical skills will be the most important characteristics of the desirable worker of 2015. The panelists posited that imperative to successful employment will be a strong work ethic. Supporting this tenet, the panel forecast that the successful worker will have a positive attitude and demonstrate dependability as indicated by low absenteeism. Several panelists in the narrative of the first iteration described a future workplace that will have a lean workforce due to the impact of globalism. Such an environment will require workers upon whom the organization may rely for daily, concerted efforts to meet the organizational goals.
The expert panel asserted that the preferred employee will bring to the workplace an ability and willingness to learn. Further, this individual will possess the capacity of adaptability. The opinion of the panel was not that the worker must come to the workplace with all skills in tact, but rather know how to learn and be willing to learn.

A man or woman of high personal integrity will be valued by organizations. The Delphi group valued this trait higher than any basic skill. Again, the panel expressed the idea of the value of personal character. Further, the desired employee will be drug and alcohol free. No other belief or opinion received stronger agreement.

In regard to education, the Delphi panel felt that an individual with a formal high school education is more important for viability in the workplace than an individual with advanced technical skills. The workplace will demand computer literacy, including the usage of appropriate software or the equivalent of computer literacy in 2015. Although the Round 1 iteration was replete with statements of the importance of basic educational skills, in the Round 2 iteration basic educational skills fell to the second tier of employee attributes. In order of importance as
determined by the panel were computer literacy, written communication, listening skills, advanced vocational-technical skills, mathematical computational skills, and oral communication. However, it is noted that the Delphi panel was forecasting the idealized worker in the factory who serves as an operator or the worker delivering direct services and not the supervisor or the professional employee.

The ability to effectively participate in a work team will be a valued asset of desired future workers. Many narrative comments stressed the importance of workers being able to move from an attitude of "individual good" to an attitude of "team good". The panelists emphasized the importance of the ability to foster positive relations with other team members and being able to solve problems collectively by attacking the problem rather than the personalities involved.

Although vital to successful workers, the traits that may be clustered as thinking skills were valued as second tiered in importance. These qualities include critical thinking skills or the ability to "think outside the box", the level of organizational thought that allows one to
handle multiple tasks simultaneously, logical methods of solving problems, data interpretation, and decision-making skills.

The placement of these skills in the second tier does not indicate that the panelists do not believe these skills as critical to successful employees based on the volume of comments in the Round 1 iteration. Rather, these attributes are considered less critical than individual character and work ethos.

The purpose of the study was to forecast desired worker characteristics. Throughout the study the Delphi panel expressed that the market will demand that workers come to the workplace as men and women of high moral character who are willing to work and dedicated to the organization. Such workers will bring with them a basic level of knowledge that will empower them to learn the specifics that the ever-changing workplace will demand, requiring sustainable employees to be lifelong learners.

**Research Question # 2 Conclusions**

What will successful companies do to ensure the availability of competent workers in the year 2015?
The strong and clear consensus of the Delphi panel was that establishing a culture that values and respects the worker is the most salient initiative to ensure the availability of workers in 2015. Similarly, there was strong consensus among the panelists regarding participatory management as an avenue to guarantee quality workers are available. Culture is perhaps the most powerful tool available to business and industrial leaders who are forward looking. There are many implications from the fostering of such a work culture. The benefits extend to the organization and equally to the members of the organization. Empowering organizational cultures are marked by vertical and horizontal communication that leads to equal access to information to foster innovation. Effective team membership is a by-product of the climate, as indicated by the relationships among associates and a motivation directed by values and interest rather than strict supervision and criticism. Additionally, the effective culture nurtures lifelong learning at all organizational levels. The adage that a happy worker is a good worker is fulfilled in this culture.
The Delphi panel affirmed strong conviction that expanded on-the-job-training, additional in-house training programs, and providing a program of tuition reimbursement for job related training are important methods for employee development. However, the panel expressed that specific training was more important than general training to meet the criteria of industry-wide standards.

The Delphi group expressed stronger confidence in the ability of successful companies to develop the skills of future workers through in-house training programs rather than looking to interactions with public schools to provide the needed training to produce desired, quality workers. Only the cooperative development of K-12 curriculum and associated materials was considered in the first tier of initiatives by the panelists. Apprenticeships, participation in local school-oriented organizations, internships, job-shadowing for teachers, and replacing outmoded equipment used in K-12 education were rated as less important than the training designed and delivered by industry to meet specific needs. In the narrative of the Round 1 iteration, the issue of liability was mentioned by panelists. Although not specifically mentioned, one is left
to wonder if there is an issue of lack of confidence in the public school to provide the needed training or if the specificity of the training is the issue.

Ardent support was affirmed for developing pay scales that are directly linked to performance or results. However, the panelists did not express the same level of commitment to the opinion that offering flexible work schedules and providing extensive benefit packages will be instrumental in securing quality workers. Although a decent wage is helpful in retaining quality employees, the panelists returned to the belief that the desired associate of 2015 will be more intrinsically motivated and derive satisfaction from the work itself.

Research Question #3 Conclusions

What changes in public education will be required to meet Industry's needs in the year 2015?

The panel's message to public education is very clear. If it is the intent of public education to develop a generation of learners ready to enter the world of work, then schools should hone the basic skills and be open to industry's needs. The panelists identified increasing
student reading proficiency, mathematical proficiency, writing proficiency, technical literacy, and expanding vocational-technical education at all levels as imperative. However, these items were not identified by the panelists from the business and industrial sectors among the top tier of forecast characteristics of viable and sustainable workers of the year 2015.

This is not to say that public education should only continue its traditional role of imparting knowledge or assuming the philosophy of vocationalism. True education is more than an imparting knowledge or the accumulation of a body of facts and skills. Educators must play a pivotal role in the development of the key characteristics that employers seek in workers, such as the classic American work ethic, a positive attitude, high personal integrity, and the ability and willingness to learn. This is due in part to the failure of other social institutions to provide for all learners character, moral, and civil instruction and development. Public education must provide all students with a firm knowledge base and enculturate the learner into the human family.
Furthermore, the panelists stated the importance of public education being open to the needs of business and industry. The second ranked item was to cooperatively develop curriculum and associated materials with industry. The panelists believed that the current curriculum is too abstract and theoretical for the learner to easily translate the learning to its practical application on the job. Additionally, the Delphi group confirmed that hiring teachers with practical industrial experience would be helpful in securing valued employees of 2015. However, it is noteworthy that in regard to Research Question #2, the panelists ranked job-shadowing by teachers as next to last among the field of initiatives available to business and industry. Job-shadowing is the only avenue of practical industrial experience available to many teachers, particularly those in the academic realm.

The experts expressed strong support for changes in guidance services within public school to provide all learners with appropriate career guidance and at an earlier age. That level of career guidance would include the career possibilities and benefits one may obtain in the workplace. Further, the panelists communicated that all educators must
realize that not all children will leave high school for college. A large portion will shortly come to the workplace. Acting on this paradigm change will result in significant change in the curriculum and result in more practical application across the curriculum to develop marketable job skills.

The panelists expressed the opinion that expanding vocational-technical education at all levels was of paramount importance. Although urging expansion of vocational-technical education, the panel communicated only mild support for the expansion of apprenticeship programs or specialized vocational-technical classes as electronics or general maintenance. The mild support of the expansion of the apprenticeship program may be the result of the panelists' limited experience with such programs in the workplace or issues of liability and resource allotment. The mild support for the electronics or general maintenance classes may be linked to the perceived quality of such classes and the limited and outdated equipment available for use in the K-12 setting. Further, the reason may be that these programs are important, but simply to a lesser degree than other initiatives considered by the panel.
The public school educational experience should include more opportunities for learners to develop teaming skill and learn to cooperatively solve problems with others. This is of particular importance for greater inclusion at the secondary level. Likewise, the secondary schools must give greater attention to increasing the reading proficiency of all students and promote reading across the curriculum.

Recommendations for Further Research

As a result of this study, the subsequent recommendations are offered for consideration.

The broad study examined many major areas concerning forecast desirable workers and the initiatives that will be required of business, industry, and public schools to develop this cadre of high caliber workers. The recurrent themes that emerged in the study are worthy of additional study. These themes include interpersonal skills of the successful worker, basic skills required for workplace success, effective industry directed training programs, and initiatives by business and industry to build positive work cultures.
The second recommendation is that the study be expanded beyond Middle Eastern Tennessee to include the state of Tennessee or the South Eastern Region of the United States to ascertain if the findings of this study vary widely from the perceptions and opinions of a broader selection of business and industry leaders.

The third recommendation would be for the development of a quantitative study of the subjects discussed. An inherent weakness of the Delphi method is its lack of significant statistical data and its heavy reliance on feelings. Significant statistical data would give the impacted stakeholders greater direction to guide strategic planning.

The fourth recommendation offered is that additional studies be conducted to ascertain the characteristics of the employee who is a professional or who serves in a supervisory capacity. The Delphi panel of this study was forecasting the idealized worker in the factory who serves as an operator or the worker delivering direct services and did not attempt to forecast the characteristics of all employees of business and industry.
Summary

The value of this study is its general forecast of the qualities that will enable workers to successfully enter the work force and continue viable employment. Additionally, the study forecasts the initiatives that industry and public education must pursue to have skilled employees available to industry to allow the nation and its constituent communities to compete in the global economy. Organizations that are interested in developing high caliber workers will begin to implement strategies based on the findings, conclusions, and recommendations of this study.

On the dawn of the 21st century, the economic welfare of all communities and the nation are intrinsically linked to the availability of a competent work force to compete in the global market. Investments by industry and public schools in the development of quality workers are not an optional activity, but rather an imperative one. A caveat for all organizations is to look beyond shortsighted goals and to be proactive in the solution of this problem. This study should stimulate forward-looking business and industry leaders as well as school leaders to consider the long-term ramifications of immediate decisions. The findings,
conclusions, and recommendations of this study concerning desirable worker characteristics should be compared to similar forecast studies. The mutual conclusions of this study and similar forecast studies will provide impetus to direct changes required to meet future employment needs.
REFERENCES


employment compared to competencies of entry level employees, Carbondale, IL: Southern Illinois University.


Martino, J. (1983). *Technological forecasting for*


APPENDIX A

NOMINATION OF PANEL MEMBERS
Brenda Pennington Dean  
615 Shockley Avenue  
Morristown, Tennessee 37814  
March 26, 1999

Mr. Larry Lay  
P.O. Box 278  
Maynardville, Tennessee 37807

Dear Mr. Lay:

Your county executive has identified you as the chair of your county's industrial relations board or similar organization. As we discussed during our phone conversation, I am seeking to establish a panel of experts to reach consensus concerning viable and sustainable workers in 2015 within the ten county service area of Walters State Community College through a series of questionnaires. The results will assist in the research for a doctoral dissertation. I believe that the results will be helpful to leaders in industry, business, government, and education in developing future quality workers for the area.

I am requesting that you nominate experts from your county or other counties within the ten county service area of Walters State Community College (Claiborne, Cocke, Grainger, Greene, Hamblen, Hancock, Hawkins, Jefferson, Sevier, or
Union) to serve on this panel. The nominees must be knowledgeable about their respective industry and its future, and the particular qualities and skills that will be needed by viable and sustainable workers in that industry in the year 2015. Please nominate individuals in each of the categories on the nomination form. If you believe that you meet these criteria, please feel free to nominate yourself.

I have enclosed a nomination form and a self-addressed stamp envelope for you to reply. Please return the nomination form in the provided envelope by April 10, 1999. If you have any further questions, you may contact me at during the day at (423) 586-2543 or in the evening at (423) 581-4373.

Again, I appreciate your time and attention.

Sincerely,

Brenda Pennington Dean
Nomination Form

Union County

Please nominate individuals in each of the following categories, indicating the company with which they are affiliated and the city of the company's location.

General manufacturing

Name ________________________________

Company ____________________________ City __________

Phone Number (If known) ________________________________

Name ________________________________

Company ____________________________ City __________

Phone Number (If known) ________________________________

Name ________________________________

Company ____________________________ City __________

Phone Number (If known) ________________________________
Metalworking

Name ________________________________

Company _____________________________ City ________

Phone Number (If known) ________________________________

Name ________________________________

Company _____________________________ City ________

Phone Number (If known) ________________________________

Name ________________________________

Company _____________________________ City ________

Phone Number (If known) ________________________________

Furniture Production

Name ________________________________

Company _____________________________ City ________

Phone Number (If known) ________________________________

Name ________________________________

Company _____________________________ City ________

Phone Number (If known) ________________________________
Name ______________________________
Company ___________________ City _________
Phone Number (If known) ____________________________

Health Care
Name ______________________________
Company ___________________ City _________
Phone Number (If known) ____________________________
Name ______________________________
Company ___________________ City _________
Phone Number (If known) ____________________________
Name ______________________________
Company ___________________ City _________
Phone Number (If known) ____________________________

Printing Industry
Name ______________________________
Company ___________________ City _________
Phone Number (If known) ____________________________

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Name _______________________________ Company _______________________________
City ___________ Phone Number (If known) _______________________________

Name _______________________________ Company _______________________________
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City ___________ Phone Number (If known) _______________________________

Name _______________________________ Company _______________________________
City ___________ Phone Number (If known) _______________________________

Name _______________________________ Company _______________________________
City ___________ Phone Number (If known) _______________________________

Name _______________________________ Company _______________________________
City ___________ Phone Number (If known) _______________________________

Automotive Manufacturing

Name _______________________________ Company _______________________________
City ___________ Phone Number (If known) _______________________________

Name _______________________________ Company _______________________________
City ___________ Phone Number (If known) _______________________________

Name _______________________________ Company _______________________________
City ___________ Phone Number (If known) _______________________________

Name _______________________________ Company _______________________________
City ___________ Phone Number (If known) _______________________________

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Textile Production

Name ______________________________

Company ______________________________ City __________

Phone Number (If known) ______________________________

Name ______________________________

Company ______________________________ City __________

Phone Number (If known) ______________________________

Name ______________________________

Company ______________________________ City __________

Phone Number (If known) ______________________________

Chemical Industry

Name ______________________________

Company ______________________________ City __________

Phone Number (If known) ______________________________

Name ______________________________

Company ______________________________ City __________

Phone Number (If known) ______________________________
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<th>Name</th>
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APPENDIX B

ROUND 1 QUESTIONNAIRE AND CORRESPONDENCE
Brenda P. Dean  
615 Shockley Avenue  
Morristown, Tennessee 37814  
April 26, 1999

Vanessa Massey  
1530 West Andrew Johnson Highway  
Morristown, Tennessee 37814

Dear Mrs. Massey:

Thank you for agreeing to participate on a panel of experts who are being invited to engage in a series of questionnaires in a study that seeks to establish consensus about a group of questions related to viable and sustainable workers in the year 2015. The panel will be involved in two questionnaires in reaching consensus. The collective answers to the first questionnaire will be analyzed, grouped for consensus, and used to formulate the questions of the second questionnaire. The second questionnaire will be much shorter and take less time to complete. The entire process is projected to be completed by June 15, 1999.

As I told you during our phone conversation, the results of these questionnaires will assist in the research for a doctoral dissertation. The results of these efforts will be helpful to leaders in industry, business, and education in developing future quality workers for Middle Eastern Tennessee.

I am sure that you appreciate the fact that you were nominated to serve on this panel by an industrial board,
Walters State Community College, or the Private Industry Council. The panel membership is composed of a few highly selective experts in your field. Your participation throughout the process is critical to its success.

Your individual responses to this voluntary survey will be kept anonymous and be used solely for data analysis. I will consider your return of the questionnaire informed consent to participate in the study. Additionally, the names of the participants will be published in the dissertation. At the conclusion of the study, participants will be sent a courtesy copy of the final findings.

I have enclosed the following items: 1) a copy of the questionnaire for which consensus is desired; 2) a schedule for questionnaires; and 3) a self-addressed stamped envelope for reply. Please return the questionnaire in the self-addressed stamped envelope to me by May 15, 1999. If you have any further questions you may contact me during the day at (423) 586-2543 or in the evening at (423) 581-4373.

If you have another address, other than the one that I am currently using, that you would prefer to use for this study, please provide that information on your questionnaire.

Again, I appreciate your willingness to serve on this Delphi panel.

Sincerely,

Brenda Dean

(423) 586-2543 (work)
(423) 581-4373 (home)
Brenda_Dean@hcboe.net (e-mail)
Round 1 Instructions

Attached are the questions for the first round of the Delphi study. The questions are designed around the topic of characteristics of viable and sustainable workers in the year 2015 and the efforts of industry and education to develop such workers. Thus, there may be some overlaps in discussing the matter.

Please answer the questions in the space provided. Should you need additional space, please use the reverse side of the questionnaire. Please return this questionnaire by May 15, 1999 in the self-addressed stamped envelope. This will allow the Delphi to meet the proposed schedule.

Thank you for your participation.

Brenda Dean
615 Shockley Avenue
Morristown, Tennessee 37814
Schedule

A Delphi Study of the Desirable Characteristics of Viable and Sustainable Workers in 2015

Brenda Pennington Dean

May 1, 1999  Invitation to participate and first questionnaire sent to experts of Delphi Panel.

May 15, 1999  First questionnaire responses due.

June 1, 1999  Second questionnaire sent to panel participants.

June 15, 1999  Second questionnaire responses due.
Please complete these brief biographical questions.

Name ___________________________________________________

Current Position ___________________________________________

Organization ______________________________________________

Years in Business or Industry_______________________________

1. In your judgement, what are the three most important general worker characteristics employers will seek in employees in 2015?

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________
2. In your opinion, what will be the three most important characteristics or skills that successful workers in 2015 will possess in the following areas:

Interpersonal skills

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Technology skills

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

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Thinking skills

Mathematical skills
Communication skills

Organizational skills
Physical skills
3. What do you believe are the three most important initiatives currently being undertaken by industry to ensure that an ample supply of skilled workers will be available in 2015?

________________________________________________________________________

________________________________________________________________________

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________________________________________________________________________
4. What three initiatives by business and industry do you believe will be most successful in attracting and maintaining quality, skilled employees in the year 2015?
5. As you consider the work experience and educational training required for employment in the year 2015, what three major changes do you foresee in such programs as apprenticeships, on-the-job training, on-site training, or work-experience requirements?
6. In 2015, what do you think will be the three most important forms of educational support existing to provide industry with a ready supply of competent employees?
7. In your judgement, what are the three most critical changes that K-12 education should make to develop workers with the characteristics that will make them successful and valuable employees for industry in the year 2015?

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________
8. In your opinion, what will be the three most important forms of support that industry will receive from federal, state, and/or local government to assist industry in meeting their employment needs in the year 2015?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

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________________________________________________________________________
9. In your perception, what will be the three most significant differences in the characteristics of successful and viable workers of the year 2015 and the successful and viable employee of your present organization?
10. Describe the idealized employee you seek for your organization in the year 2015.
11. Please feel free to comment on any other aspect of projected skills and characteristics that will be needed for successful employment that you believe was overlooked by the above questions.
APPENDIX C

ROUND 2 QUESTIONNAIRE AND CORRESPONDENCE
To: Delphi Panel Participants
From: Brenda Pennington Dean
Subject: Round 2 Questionnaire
Date: May 29, 1999

Thank you for your excellent response to the first round questionnaire and your cooperation in meeting the schedule. The quality of your responses provided an excellent narrative and met all my expectations. From the panel's answers, the characteristics of the successful worker in 2015 began to emerge, as did the initiatives that industry and schools must take to prepare quality workers for 2015.

As I explained in my earlier letter, this second and final questionnaire is much shorter and less time consuming to complete. The objective of this round is to further narrow the answers you as a panel generated in the first round. The statements in the attached questionnaire are the result of the content analysis of the answers of all twenty-two panelists in the first round. Ideas that received a high degree of consensus in the first round have been included in the second round for your review. You will find the specific directions for the Round 2 questionnaire on the top of the questionnaire.

I have enclosed a self-addressed stamped envelope for your use and am requesting that you have your responses in the mail by June 15, 1999. This will allow me to stay on schedule for the completion of this dissertation and my doctoral degree from East Tennessee State University.

Again, I thank you for your cooperation and willingness to serve on this panel. It is my firm belief that the final results will be helpful to industry, business, and educational leaders throughout Middle Eastern Tennessee.

Brenda Pennington Dean
615 Shockley Avenue
Morristown, Tennessee 37814
Brenda_Dean@hcboe.net
(423) 586-2543 (work) or (423) 581-4373 (home)
A Delphi Study of Desirable Characteristics of Viable and Sustainable Workers in 2015

Brenda Pennington Dean
615 Shockley Avenue
Morristown, Tennessee 37814

Name _____________________________________________________________

Directions:
A. Please circle the number on the scale below each statement that best reflects the extent to which you agree or disagree with the statement.
1 = Strongly agree, critical or urgent
2 = Relevant or of considerable significance, a second order priority
3 = Agree, the item has some importance
4 = Insignificantly relevant, has little importance
5 = Strongly disagree, no relevance, no priority, no measurable effect

B. For each of the three statements below, in the blanks provided, indicate the ten most important characteristics or actions in each category. Place a #1 in the blank of the most important, a #2 in the blank of the second most important, and likewise continue until you identify the top ten characteristics or actions.

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1. In 2015, the viable and sustainable worker will possess the following characteristics:

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<tr>
<th>Characteristic</th>
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<th>2</th>
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<tbody>
<tr>
<td>Ability to make oral presentations to a work group.</td>
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<tr>
<td>Strongly Agree</td>
<td>Agree</td>
<td>Strongly Disagree</td>
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<tr>
<td>Advanced vocational-technical skills</td>
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<tr>
<td>Strongly Agree</td>
<td>Agree</td>
<td>Strongly Disagree</td>
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<td>Computer literacy, including the usage of software</td>
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<td>Strongly Agree</td>
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<td>Critical thinking skills</td>
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<td>Strongly Agree</td>
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<td>Strongly Disagree</td>
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<tr>
<td>A positive attitude</td>
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<td>Strongly Agree</td>
<td>Agree</td>
<td>Strongly Disagree</td>
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<tr>
<td>A strong work ethic</td>
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<td>Strongly Agree</td>
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<tr>
<td>The ability and willingness to learn</td>
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<td>Strongly Agree</td>
<td>Agree</td>
<td>Strongly Disagree</td>
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<td>Adaptability to the changing workplace</td>
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<td>Strongly Agree</td>
<td>Agree</td>
<td>Strongly Disagree</td>
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<tr>
<td>Mathematical computation skills</td>
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<td>Strongly Agree</td>
<td>Agree</td>
<td>Strongly Disagree</td>
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<tr>
<td>The ability to effectively participate in a work team</td>
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<td>Strongly Agree</td>
<td>Agree</td>
<td>Strongly Disagree</td>
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</tbody>
</table>
The ability to interpret data, including graphs and charts  
1  2  3  4  5  
Strongly Agree  Agree  Strongly Disagree

Decision-making skills  
1  2  3  4  5  
Strongly Agree  Agree  Strongly Disagree

The ability to formulate a plan of action  
1  2  3  4  5  
Strongly Agree  Agree  Strongly Disagree

The ability to understand written communication  
1  2  3  4  5  
Strongly Agree  Agree  Strongly Disagree

Listening skills  
1  2  3  4  5  
Strongly Agree  Agree  Strongly Disagree

Time management skills  
1  2  3  4  5  
Strongly Agree  Agree  Strongly Disagree

Ability to handle multiple tasks simultaneously  
1  2  3  4  5  
Strongly Agree  Agree  Strongly Disagree

Drug and alcohol free  
1  2  3  4  5  
Strongly Agree  Agree  Strongly Disagree

A high school graduate  
1  2  3  4  5  
Strongly Agree  Agree  Strongly Disagree

Personal integrity  
1  2  3  4  5  
Strongly Agree  Agree  Strongly Disagree
____ Creativity (Thinks outside the box)
   1  2  3  4  5
Strongly Agree       Agree       Strongly Disagree

____ Logical method of solving problems
   1  2  3  4  5
Strongly Agree       Agree       Strongly Disagree

____ Dependable as indicated by low absenteeism
   1  2  3  4  5
Strongly Agree       Agree       Strongly Disagree

____ Capable of learning Statistical Process Control
   1  2  3  4  5
Strongly Agree       Agree       Strongly Disagree
2. In order to ensure the availability of competent workers in 2015, successful companies will pursue the following initiatives:

____ Participate in an apprenticeship program

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<td>Strongly Agree</td>
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____ Expand in-house training programs

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<td>Strongly Agree</td>
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____ Increase on-the-job-training for employees

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<td>Strongly Agree</td>
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____ Participate in local school-oriented organizations

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<td>Strongly Agree</td>
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____ Assist in the development of K-12 curriculum

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<td>Strongly Agree</td>
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____ Provide tuition reimbursement for job related training

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<td>Strongly Agree</td>
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____ Increase the number of internships

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<td>Strongly Agree</td>
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____ Institute a participatory management style

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<td>Strongly Agree</td>
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____ Offer flexible work schedules

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Establish a culture that values and respects the worker

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Provide extensive benefit packages

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<td>Strongly Agree</td>
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Develop pay scales linked to performance or results

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<td>Strongly Agree</td>
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Provide all employees opportunities for upward mobility

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Provide in-house training for industry-wide certification

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<td>Strongly Agree</td>
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Replace outmoded equipment used in K-12 education

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Offer on-site job-shadowing to teachers

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<td>Strongly Agree</td>
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<td>Strongly Disagree</td>
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3. In order to meet industry’s needs for a competent workforce in 2015, public education will undertake the following actions:

_____ Expand vocational-technical education

1 2 3 4 5
Strongly Agree Agree Strongly Disagree

_____ Employ teachers with practical industrial experience

1 2 3 4 5
Strongly agree Agree Strongly Disagree

_____ Expand apprenticeship programs

1 2 3 4 5
Strongly Agree Agree Strongly Disagree

_____ Cooperatively develop curriculum and associated materials with industry

1 2 3 4 5
Strongly Agree Agree Strongly Disagree

_____ Emphasize technology at all levels

1 2 3 4 5
Strongly Agree Agree Strongly Disagree

_____ Offer specialized classes to teach general maintenance

1 2 3 4 5
Strongly Agree Agree Strongly Disagree

_____ Offer specialized classes in electronics

1 2 3 4 5
Strongly Agree Agree Strongly Disagree

_____ Provide more opportunities in the school curriculum for students to develop public speaking ability

1 2 3 4 5
Strongly Agree Agree Strongly Disagree
_____ Develop student attitudes of tolerance for diversity

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<td>Strongly Agree</td>
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_____ Increase student writing proficiency

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<td>Strongly Agree</td>
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_____ Incorporate conflict resolution in K-12 curriculum

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<td>Strongly Agree</td>
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_____ Increase student mathematical proficiency

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<td>Strongly Agree</td>
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_____ Increase student reading proficiency

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<td>Strongly Agree</td>
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_____ Integrate theoretical teaching and practical application to support the workplace

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<tbody>
<tr>
<td>Strongly Agree</td>
<td>Agree</td>
<td>Strongly Disagree</td>
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</tbody>
</table>

_____ Provide appropriate career guidance for all students

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<tbody>
<tr>
<td>Strongly Agree</td>
<td>Agree</td>
<td>Strongly Disagree</td>
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_____ Realize that not all students will go to college

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<td>Strongly Agree</td>
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</tbody>
</table>
APPENDIX D

THE DELPHI PANEL
Automotive Manufacturing

Max K. Biery
President
Toyoda TRW Automotive
5932 Commerce Boulevard
Morristown, Tennessee 37814

Lyons A. Hamblen
Vice-President
Tuff Torq Corporation
5943 Commerce Boulevard
Morristown, Tennessee 37814

Steven Hendrickson
Plant Manager
John Deere Power Products
1630 Hal Henard
Greeneville, Tennessee 37743

Daronda Patterson
Human Resources Manager
TRW
2101 West Main Street
Rogersville, Tennessee 37857

Rick L. Trent
Training Coordinator
Mahle, Inc.
One Mahle Drive
P.O. Box 748
Morristown, Tennessee 37815

Chemical

Joseph M. Seaton
Safety and Training Supervisor
Minco
510 Midway Circle
Midway, Tennessee 37809
John D. Foy
Human Resources Manager
Great Lakes Chemical
380 Chemwood Drive
Newport, Tennessee 377821

Furniture

Dominick Jackson
Human Resources Director
MECO Corporation
1500 Industrial Drive
Greeneville, Tennessee 37745

Kenneth Parson, Jr.
Director of Engineering
Berkline Corporation
One Berkline Drive
Morristown, Tennessee 37813

General Manufacturing

Shirley Flynn
Director of Human Resources
Telex/EVI
1201 Dolly Parton Parkway
Sevierville, Tennessee 37862

Phillip Rasnick
Human Resources Manager
Kingston-Warren Corporation
Harvard Industries
309 Press Road
Church Hill, Tennessee 37642

Health Care

Becky Bible
Director of Volunteer Services
Staff Instructor for Continuous Quality Improvement
Greene Valley Developmental Center
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Greeneville, Tennessee 37744
Richard L. Clark  
Administrator and CEO  
Morristown-Hamblen Healthcare System  
408 West Fourth North Street  
Morristown, Tennessee 37814

Vanessa Massey, R.N.  
Education Coordinator  
Covenant Home Care  
1530 West Andrew Johnson Highway  
Morristown, Tennessee 37814

Ellen F. Wilhoit  
President and Chief Administrative officer  
Fort Sanders Sevier Medical Center  
P.O. Box 8005  
Severville, Tennessee 37864

Metal Working

Jimmy Hammond  
Director of Human Resources  
Rockwell-Meritor  
One Rockwell Drive  
Morristown, Tennessee 37813

Douglas Moses  
Vice-President of Manufacturing  
Jeffrey Chain  
2307 Maden Drive  
Morristown, Tennessee 37813

Dave Uram  
General Manager  
Howmet  
5650 Commerce Boulevard  
Morristown, Tennessee 37814
Textile

Johnny Smith
Director of Human Resources
730 Middle Creek
Sevierville, Tennessee 37862

Other

A. Dean Williams
Coordinator of Economic Development
Cocke County Partnership for Economic Development
433 Prospect Avenue
Newport, Tennessee 37821
VITA

BRENDA PENNINGTON DEAN

Personal Data: Date of Birth: May 25, 1951
Place of Birth: Memphis, Tennessee
Marital Status: Married

Education: Public Schools, Shelby County, Tennessee
Tennessee Technological University, Cookeville, Tennessee;
University of Tennessee, Knoxville, Tennessee
Curriculum and Instruction, M.S., 1985.
East Tennessee State University, Johnson City, Tennessee

Professional Experience: Chemistry and Biology Teacher, Morristown-
Adjunct Faculty, University of Tennessee, Knoxville, 1992-1993

Honors and Awards: Who's Who Among Students in American Universities and Colleges
Outstanding Graduate Student in Curriculum and Instruction, University of Tennessee, Knoxville
Martin Marietta Fellow