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**EVALUATING WORK KEYS PROFILING AS A PRE-EMPLOYMENT
ASSESSMENT TOOL TO INCREASE EMPLOYEE RETENTION**

by

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B.A. May 1978, Colgate University
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A Dissertation Submitted to the Faculty of Old Dominion
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the Degree of

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ABSTRACT

EVALUATING WORK KEYS PROFILING AS A PRE-EMPLOYMENT ASSESSMENT TOOL TO INCREASE EMPLOYEE RETENTION

Ruth Zimmer Hendrick
Old Dominion University, 2006
Director: Dr. John M. Ritz

Twenty-first century changes in the nature of work, the workforce and employment practices, along with increased employer need to select employees who will have the best "fit" with particular jobs in order to increase return on investment, are leading employers toward greater use of pre-employment assessments. The purpose of this study was to investigate the effects of one of those tools, the Work Keys skill assessment battery, on employment retention. Research questions centered around the effects of Work Keys testing on employment.

Job applicant assessment scores and retention information were obtained from and interviews were held with 12 employers who were utilizing Work Keys. Chi-square analysis comparing employees hired with and without Work Keys scores as a factor provided statistically significant results, indicating that use of Work Keys for job applicants did increase employment retention.

Additional ANOVA and chi-square analyses of Work Keys applicants' test scores showed that only the Applied Mathematics assessment and CRC trio shared significant relationships with retention, and within those tests, individuals who scored in the low range of the scoring spread were least likely to retain employment. Analysis also determined that the use of additional assessments beyond the three used for the Career Readiness Certificate transportable credential significantly improved employment retention.

Qualitative analysis of interview responses from employers showed that they primarily elect to use pre-employment tests in order to increase objectivity and legality in their hiring practices. Their greatest concern about the use of testing is the increased possibility of screening out individuals who might otherwise have become excellent employees.

This research provides valuable information to employers in their selection and use of a testing instrument; however, further research is recommended to investigate other aspects of Work Keys, additional employment retention factors and other influences affecting corporate return on investment.

DEDICATION

This dissertation is dedicated to my mother, Edna Paton Zimmer, who always believed in me, and to my best friend, Buddy, who was with me every keystroke of the way. My one sadness in completing this work is that neither of them is still with me to witness the completion of this journey.

Ruth Zimmer Hendrick

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CHAPTER I

INTRODUCTION

Organizations and the nature of work have changed dramatically in the United States in the past twenty years. Technological advancements, globalization and new economic demands have altered the landscape of U.S. business and the characteristics and values of its workforce (Nadler & Heilpern, 1998; Osterman, 2000).

In order to remain economically competitive in a fast-paced, constantly changing global environment, employers now seek to hire individuals who come already equipped with the skills and values required to do a particular job and to do that job well. Employers are also increasingly concerned with return on investment (ROI) and closely scrutinize human resource department functions to determine the effects that employee selection and retention have on the corporate bottom line. Companies currently seek individuals who can hit the ground running with the good skill sets. They place increased importance on hiring individuals whose skills and abilities have a close "fit" with the needs of the job (Cairncross, 2002) and who exhibit the best potential for higher employment retention rates. At the same time that employers are seeking

employees who possess a greater depth of skills at the point of hire, the breadth of employee knowledge is also more critical. Employees are needed who not only have technical skill in a subject area but also have reasoning and problem solving skills, teamwork abilities and knowledge of computer technologies (Secretary's Commission on Achieving Necessary Skills [SCANS], 1991).

Demographic, educational and legal restrictions, however, have confounded employers in their goal of quickly hiring the ideal candidates for an open position. The available population of workers is shrinking and becoming more diverse. Employees are demanding greater flexibility, individuality and control (Jameison & O'Mara, 1991). Employer reports and extensive research voice concerns over the training and education students are receiving in school, noting that the content and level of educational preparation does not match the needs of employers on the job site (National Commission on Excellence in Education, 1983). Legal restrictions also affect the hiring process and the employer's ability to effectively match jobs and employees.

Selection and retention research suggests that close matching of individuals' knowledge, skills, abilities and characteristics to the group with which they will be

associated will increase the possibilities of a successful, long-term relationship (Jamieson, 1991). This research is borne out in many fields. In the realm of education, students are tested for placement in the most appropriate reading group in order to maximize their success. High school seniors are tested for college placement that may provide them with the greatest possibility of program completion. Professional sports teams assess the physical stamina, strength or specific skills of players in order to put together a "dream team" and maximize success. Business research further suggests that by improving pre-employment selection techniques and tools, employees will have an improved "fit" with corporate needs, leading to greater employee retention (Cairncross, 2002; McKeown, 2002; Furnham, 2001).

Employers historically have utilized "the classic trio" of employee selection tools, consisting of the application, interview and reference checks, in their attempt to select the most appropriate individual for a position (Cook, 1998). Numerous factors are affecting employers' abilities to effectively utilize these tools at the same time that the need for a better employer-employee match is intensifying (Holzer, 1999).

Thus, changes in the nature of work, the workforce and employment practices, along with increased employer need to select employees who will have the best "fit" with particular jobs, are leading employers toward greater use of alternative hiring tools and practices. Use of pre-employment testing instruments that can help employers choose the individuals who will have the best match to the skill sets mandated by particular jobs are increasing (Bureau of National Affairs, 1988). The use of a pre-employment testing instrument that includes the element of job analysis adds particular benefits to the hiring process. The step of job analysis identifies tasks and activities related to a specific position (Gatewood & Field, 1990). Retention may be appreciably increased when pre-employment tests are closely related to the job.

One instrument that combines job analysis with pre-employment assessment testing, ACT's (formerly known as American College Testing) Work Keys, is gaining popularity in the U.S. (personal communication, B. Bolin, March 10, 2005). Developed by ACT, Work Keys is not simply a skills test that is administered carte blanche in business and industry. Unlike most other assessment tests available for use today, Work Keys provides a two-tiered system of job profiling and skill assessment, claiming that it will help

businesses cut the cost of recruiting, selection, hiring, turnover, training, overtime and downtime (ACT, 2004). Work Keys can be utilized both as an assessment tool to identify applicant skills and job fit and as an identification tool to aid individuals and employers in targeting skill deficits and providing requisite skills gap training (ACT, 2004).

At the same time that the use of Work Keys is expanding nationally, states are exploring the benefits of developing a transportable skill credential that employees can take with them on their job searches. This credential assists job seekers in determining whether they have the capabilities required for specific positions, and it provides employers with a simple, objective means to determine applicant skill levels. Thus far, a consortium of 39 states have come together to utilize three Work Keys tests (Reading for Information, Applied Mathematics and Locating Information) to develop such a transportable credential (personal communication, B. Bolin, February 22, 2006).

Purpose of the Study

The primary purpose of this research was to statistically compare employment retention results using traditional hiring methods versus combining those

traditional methods with the use of the Work Keys pre-employment instrument in order to determine whether individuals who were hired utilizing Work Keys had higher employment retention rates. Utilizing ex-post-facto data from 12 corporations, this study sought to determine whether statistically significant differences exist between the employment retention rates of employees hired using traditional methods such as applications, interviews and reference checks and the retention rates of employees hired when Work Keys job profiling is conducted and criterion-referenced employee assessment scores are considered as a factor in hiring. Answers to this question could assist employers in translating Work Keys costs into corporate ROI benefits.

Additionally, the data were reviewed to determine whether higher Work Keys test scores resulted in differences in employment retention rates. While all individuals hired are required to meet minimum profile scores in each area assessed, human resource professionals would benefit from knowing if employees were more likely to maintain employment for longer if their test scores are higher.

Because of the country's movement toward development of a portable workforce skills credential, another purpose

of the study was to determine whether the three Work Keys assessment tests given as the transportable Career Readiness Certificate (CRC) were as effective at predicting employment retention as testing applicants on a greater number of Work Keys assessments. Answers to this question could assist employers in determining the most cost-effective tests to offer in their individual employment situations.

Finally, because employer experiences with and opinions of assessments in general and Work Keys specifically affect their use in the U.S., the study queried employers regarding their views of the strengths, weaknesses and uses of the tests as tools in the pre-employment process. This information can provide valuable framing for the data collected and for future study.

Statement of the Problem

The primary problem of this study was to investigate the effects of the Work Keys assessment test on employment retention. As a relatively new instrument developed in the early 1990s, there is not a substantial body of objective research available that evaluates the effectiveness of Work Keys on employee selection, training, supervision, retention and corporate ROI. ACT's anecdotal evidence suggests that Work Keys can be utilized for a number of

beneficial purposes in business and industry, including decreasing application-to-hire time, increasing employee job satisfaction, decreasing supervision and training time and improving employment retention rates (ACT, 2004). However, objective scientific research on the Work Keys instrument is generally unavailable.

If employers are to be expected to embrace Work Keys as a pre-employment assessment tool, conclusive evidence of its statistically significant effect on one or more of the areas of hiring, satisfaction, supervision and training or retention must be provided. Of these areas, retention most appreciably affects economic return on investment. The importance of ROI is more and more important to companies in the 21st century business environment (McTague, 2001; Phillips, 2001). Therefore, study is needed to determine whether Work Keys has an affect on employment retention rates. Employers and states participating in the CRC credential will also benefit from learning if certain Work Keys tests best predict employment retention. This knowledge can help employers select the most cost-effective tests to offer and can assist states that are participating in the consortium in determining whether their credential responds to employer needs.

Research Questions

This study addressed the following research questions about Work Keys and employment retention:

1. Is there a significant difference in employment retention rates between employees hired in part based on results of assessments tied to specific Work Keys job profile scores versus employees hired using only traditional methods?
2. Is there a significant difference in employment retention rates between employees who have higher test scores and employees with lower scores?
3. Is hiring against a Work Keys profile that utilizes only the three Career Readiness Certificate (CRC) assessments as effective at predicting employment retention as a profile that utilizes additional tests?
4. What do employers perceive as the strengths, weaknesses, benefits and disadvantages of using pre-employment assessment testing in general and Work Keys profiling and testing specifically?

Significance of the Study

This study is noteworthy for several audiences. Locating a pre-employment assessment instrument that positively affects employee retention could be a key tool for employers to increase their corporate profit margins.

Considerable attrition reduction could provide U.S. corporations with significant gross profit increases. Availability of a criterion-referenced, job analysis assessment system that can be adapted to and adopted by a wide variety of businesses and industries could result in this benefit being shared by businesses of all types and sizes. Increased profits in business and industry certainly could lead to further corporate expansion and have an effect on the United States' ability to maintain its position as a world leader in the new global economy.

In order to address the problems of skills matching and skills gap training, a growing number of businesses are seeking assistance from educational institutions. This study had particularly important implications for community colleges across the country. Many states have selected Work Keys as a tool in their economic development marketing of the state and their employees. In these states, the community colleges often serve as the primary marketing and distribution arm for Work Keys.

In December 2002, then-Governor Mark Warner of Virginia announced workforce reforms that outlined "the blueprint for systematic changes to create Virginia's workforce development system," (Virginia Workforce Council, 2004) including a transferable and transportable skills

credential to be developed that would be used both for career planning and for identification of qualified employees. Virginia has led the way in development of a regional Career Readiness Certificate Consortium. In 2004, the consortium included 11 states and the District of Columbia. By 2006, this group had grown to include an additional 28 states. The group was charged with development of a portable skills credential that would be recognized by businesses in all states and employment clusters. In October 2004, Governor Warner announced that Virginia's Career Readiness Certificate would be based on the use of three Work Keys assessment tests: Reading for Information, Applied Mathematics and Locating Information. Thus, in addition to Work Keys having a positive effect on the profit margins of corporate America, Virginia and other states adopting the transportable credential have particular interest in the results of this study.

Finally, a review of literature indicates that very limited research has been conducted on the Work Keys assessment in relation to employment retention. This study will make a contribution to the existing literature on Work Keys and employment retention.

Limitations of the Study

This study was limited to companies that had started utilizing the Work Keys assessment instrument in 2003 or earlier, in order to provide sufficient passage of time to collect reasonable retention data. Thus, the number of companies participating in the study was limited, particularly since Work Keys is a relatively new test that was not released for usage until the early 1990s. The test group was further limited because businesses and industries were included only if they had conducted at least 20 Work Keys assessment batteries on incoming employees. This limitation was necessary due to the logistics and costs involved with visits to participating companies. Also, in all but one case, companies participating in the study had positive experiences with Work Keys and were still using the assessment tool.

Because of the newness of the instrument and employee turnover in human resources, corporate takeovers and plant closures, it was very difficult to find employers who had made sufficient use of Work Keys in the past but who were no longer using the system. Thus, employer comments about Work Keys were limited because of the perceived overall success of the assessments in the organizations queried.

Only employers who made use of the Work Keys profiles and assessment results in the hiring process were included in this study, again limiting the number of companies eligible to participate in the study. Some companies utilize Work Keys only for training or promotion purposes.

Many other elements have an effect on retention of employees. This study is limited because it was not able to take into account all of these elements related to economics, hiring, personal situations, and on-the-job factors, such as wage levels and job conditions.

The study was conducted utilizing longitudinal data, and the control group of individuals who were hired without Work Keys assessments began their employment before those who were included in the experimental group. Thus, it is feasible that major changes in work environments at the companies studied may have changed for these two groups of employees. Other global factors that affect retention, such as economics, could have also changed for the two groups under study.

Because Work Keys is a relatively new test, the companies studied had utilized the assessments for an average of 3.3 years, ranging from one company that had used the test for six years, one using it for five years, four using it for four years, one using it for three years

and five using it for two years. The study is further limited since the experimental group had been using the test for a relatively short time period.

Results of the study may also have been limited by the scoring on Work Keys assessments. Most jobs require assessment scores between three and five, which does not offer a large span to demonstrate variability. In response to this need for finer-grained score reporting, ACT recently developed a 25-point scale score system for Work Keys assessments (ACT, 2005). However, this more detailed scoring system is very new and has not yet been utilized extensively by business and industry.

The study's results are also limited geographically. While a variety of industries and localities were included in the study, eight of the 12 companies participating were located in Virginia. Findings might be considerably different in different parts of the country that have significant economic, cultural or technological differences. Further, the companies studied were involved primarily in manufacturing, and most participants were in the production and skilled labor areas. Two participating companies were service oriented and one was from the medical sector. Results could be appreciably different for

professional-level positions or other fields or employment cluster sectors.

Also limiting the study were the types of data collected. The study was limited to the data readily available from employer data bases, as employers were hesitant to allow outside individuals access to individual employee records. The study was also limited to data available at all companies. Thus, demographic data were not analyzed. This data (e.g., the number of years of previous employment held by an employee or the number of jobs held by an individual) may have proven to have an effect on employment retention.

Assumptions

This study incorporated the following assumptions:

1. Applicants were trying to obtain the best scores possible on the assessment tests they were taking, understanding that there was a connection between higher scores and job attainment.
2. Employers were providing significant weight to Work Keys scores as a factor in determining which applicants would be hired.
3. Job profiles conducted at all employers were completed utilizing the methods and procedures prescribed by ACT

so that profiles conducted by different profilers achieved valid and reliable results.

4. Applicants vary in the degree of abilities they possess, and these variations can be effectively measured.

Procedures

In the case of half of the participating employers, the researcher collected initial data either during personal visits with the businesses or from their community college partners who maintained employer Work Keys data bases. The remaining data were collected through extensive telephone interviews and subsequent electronic data transfer from the employers. Retention and Work Keys profile and test score information on a purposive sample of employees hired during calendar year 2003 was obtained. At the same time data on a control group of employees, hired during the year prior to the company's implementation of Work Keys, were gathered. Data were inputted into an SPSS program. Chi-square and ANOVA tests were conducted to evaluate the effects of Work Keys on employment retention. Additional qualitative questions were asked of employers to broaden the scope of the study.

Definition of Terms

The following definitions of terms apply to the study:

Career Readiness Certificate (CRC) is a credential indicating assessment score levels of individual test takers. The CRC incorporates the Work Keys assessment tests of Reading for Information, Applied Mathematics and Locating Information and is granted at three levels (bronze, silver and gold), representing the test score levels 3, 4 and 5, respectively, achieved by the test taker.

Employee turnover is the percentage of the workforce who leaves an organization in a particular period, usually measured in annual terms. The term often relates to voluntary departures only. Involuntary separations, such as retirement, poor health, layoffs, military service and firing are usually less controllable reasons for separation and are often excluded from the calculation.

Employment retention is the length of time an individual maintains employment at a particular job. In this study, retention is defined in months, from zero to 12+. Employees who maintained their employment for 13 or more months were considered to have an employment retention score of 12+.

Job analysis refers to the investigation of positions or job classes to obtain descriptive information about job duties and tasks, responsibilities, knowledge, skills and abilities, working conditions and other aspects of the work.

Job fit is "the similarity...between what employees want to experience on the job and what the organization offers. The greater the job fit, the more satisfied employees will be and the longer they will remain in the organization. Job fit not only refers to the actual work being done, but also how well employees can interact with members of the work team and their ability to work within the organizational culture" (Phillips & Connell, 2003, p. 143).

Job profiling is a job analysis system used to assist businesses in identifying skills and skill levels employees must have to successfully perform particular jobs effectively. It also provides individuals with a clear definition of the skill levels needed to qualify for and be successful on the jobs they apply for (ACT, 2001).

Pre-employment assessment refers to a test administered to assess an employee's skills, knowledge, abilities or characteristics.

Recruitment is "a broad term used to communicate the notion of getting someone into the organization...it covers everything from advertising to induction" (Wood & Payne, 1998, p. 2).

Return on Investment (ROI) is the corporate "bottom line" showing the profit a company makes after accounting for expenses. The process shows the ultimate payoff for utilization of specific strategies (Phillips & Connell, 2003, p. 273).

Selection is "the process of collecting and evaluating information about an individual in order to extend an offer of employment. The selection process is performed under legal and environmental constraints to protect the future interests of the organization and the individual" (Gatewood & Field, 1990, p. 3).

Subject matter experts are individuals who are highly knowledgeable about a particular job and who are performing or have recently performed that job.

Traditional hiring methods, or "Classic Trio" (Cook, 1998), refers to methods historically utilized by human resources personnel in making hiring decisions, including the application, interview and reference check.

Organization of the Study

This dissertation is organized into five chapters. Chapter I provides an introduction, noting that organizations and the nature of work have changed dramatically in the United States in the past 20 years because of technological advancements, globalization and new economic demands. These changes in work and the workforce are leading employers toward greater use of pre-employment assessment testing tools, especially tools that combine job analysis with testing in an effort to improve upon job fit. Also discussed in this chapter is the purpose of this study, to statistically compare aspects of employment retention when ACT's Work Keys skill tests were selected as employee assessment tools during the hiring process.

A review of selected literature is found in Chapter II, including discussion of the history and current status of the U.S. workforce, predictions of future workforce and business characteristics, selection procedures, assessment testing and its ramifications for business. Chapter III addresses the methodology, including an overview of the Work Keys assessment tool and the companies that participated in the study. The research design, data collection methods and statistical treatment of the data

used to answer four research questions are then reviewed. These questions include: 1) whether there was a significant difference in employment retention rates between employees hired in part based on results of assessments tied to specific Work Keys job profile scores and employees hired using traditional methods only, 2) whether there was a significant difference in employment retention rates between employees who have higher test scores and employees with lower scores and 3) whether hiring against a Work Keys profile that utilizes more than the three Career Readiness Certificate (CRC) assessments is more effective at predicting employment retention than a profile that only utilizes the CRC's Mathematics, Reading and Locating Information assessments. A fourth qualitative research question queries employers regarding their selection and use of assessment tests in general and Work Keys profiling and assessments specifically. Chapter IV provides results of the study. Chapter V summarizes the results, gives conclusions and makes recommendations for future research.

CHAPTER II

REVIEW OF LITERATURE

Organizations and the nature of work have changed dramatically in the United States in the past twenty years. Since the early 1980s, the literature has discussed the emergence of issues critical to 21st century U.S. business organizations and their workforce. These critical issues include technology, globalization and economics. As adjustment to diverse markets is made, the speed and manner of business changes and the demographics of the workforce widen. Business organizations have found it necessary to rethink the basic strategies used to coordinate available workers with the work to be done.

One strategy increasingly relied on by the human resources industry is that of utilizing pre-employment assessment tests. These instruments offer a wide array of insights into prospective employees, and the tests can meet current legal, ethical and practical considerations. Evidence suggests that tests which include a job analysis component can be particularly useful in screening applicants and assisting human resources professionals in selecting the individuals who are most likely to be successful in particular jobs. One element of employee success is employment retention. Because employment

retention is one factor used to determine corporate profits associated with return on investment (ROI), an increase in employment retention rates should lead employers to increased profits and stronger positions in the global marketplace.

Pre-21st Century Business and Workforce Characteristics

Business and work have changed significantly throughout U.S. history. Before the Industrial Revolution, U.S. business firms in general were small, single-unit enterprises, usually owned and managed by a single individual. A company traditionally had one product line and operated in one geographic area (Chandler, 1977).

The Industrial Revolution, highlighted by mechanization, centralized power and assembly line production, increased the workloads of both employees and managers in U.S. businesses. This change led to segmentation of worker duties and the development of multi-level management structures. During this time period, a hierarchy of managers generally remained in strict control of business operations, with all key corporate decisions being made by top-level executives. White males dominated a homogeneous workforce that reported to work at the same time daily and completed repetitive segments of work that were assigned by managers. Individual segments of worker

output were then added together, resulting in the final product or service. Little mobility was expected or desired, and many workers started and ended their careers in the same occupation, working for the same company they began employment with when they completed their schooling.

Numerous events of the later 20th century began changing the landscape of U.S. business and the characteristics and values of its workforce. The three areas commonly mentioned as facilitating the changes were technology, globalization and economics.

Technology has accelerated the development of new products, services and processes. It has required workers to have broader and more varied skills. Globalization has forced businesses to move into wider, culturally diverse markets and has expanded competition to a worldwide basis. Diverse workers have come to expect a higher level of employee involvement in business operations and decisions, and they have diversified the values and expectations of the workforce and of the organizations they serve. Economic changes have shortened product life cycles (Harte, 1997) and caused a rush to market with concepts such as materials management and lean manufacturing. To achieve success in the timeframe allotted, employees have become part of the corporate decision making process, since front-line

employees with hands-on experience and intimate knowledge of methods and procedures often have a better understanding of specific processes than do their employers.

Predictions of 21st Century Workforce and Organizations

In anticipation of the 21st Century causing a major transformation in the nature of U.S. business organizations, business practitioners, educators and theorists of the late 20th century began to rethink the strategies that would be needed to effectively respond to future business and worker needs. Not all of these predictions of business needs in the 21st Century have come to fruition. Hahn (1980) predicted "higher educational and intellectual demands of emerging technologies may create a larger functionally illiterate class with higher native intelligence than the current class of illiterates" (p. 37). The concept that technology would produce primarily lights-out industries, requiring only a minimal number of highly educated workers, has not occurred to date. In The Irresponsible Society (1980), O'Toole suggested that expanded workers' rights would lead to irresponsible, inconsiderate workers with no initiative and that this malaise would translate into new lows in productivity.

While these particular predictions have not entirely come true, many predictions of the 1980s and 1990s did

portend to be accurate reflections of employers and employees at the start of the 21st Century. In A Nation at Risk (1983), The National Commission on Excellence in Education sought to "define the problems afflicting American education" in order to prepare the U.S. to maintain its economic position in the world. The Commission made recommendations on strengthening the high school curriculum, increasing school days and years, improving teacher preparation and raising expectations and standards of academic performance in higher education.

Johnson and Packer's Workforce 2000 (1987) and Boyette and Conn's Workplace 2000 (1991) discussed workplace structure, culture and educational needs of the future. Johnson and Packer enumerated six challenges facing workforce 2000: (a) stimulating world growth; (b) improving productivity in service industries; (c) improving dynamism of an aging workforce; (d) reconciling the needs of women, work and families; (e) integrating blacks and Hispanics fully into the workforce; and (f) improving workers' education and skills. Boyette and Conn highlighted anticipated organizational changes related to information sharing, worker motivation, employee participation and expectations, paradigms of leadership, educating the 21st century workforce and achieving world-class performance.

The 21st Century Business Organization

At the start of the 21st Century, technology, globalization and economic factors have converged to fundamentally reshape the scope, strategies and structure of U.S. businesses (Nadler & Heilpern, 1998). Technological innovation has flattened organizations, as information technology has decreased or eliminated the need for middle managers. "Companies acquire more fluid shapes, forming and reforming around talent and ideas..." (Cairncross, 2002, p. 204). Osterman (2000) noted that while in 1992 only 28 percent of companies surveyed indicated that at least half of their workforce participated in some type of high-performance work practices, by 1997 that figure had risen to over 50 percent participation.

"Whereas global trade accounted for about one third of total world output in the early 1970s, it approached 45 percent in 1995" (Osterman, Kochan, Locke & Piore, 2001, p. 62). Greater globalization increases competition in the marketplace and requires corporate America to improve its business practices and place greater emphasis on corporate return on investment (ROI). Mergers and acquisitions are constantly redefining companies, and businesses are demanding new and higher level skills from employees in order to cope with the changing environment. New concepts

not thought of 30 years ago include practices such as materials management and Just-In-Time that can lower unused stock, reduce worker down time and decrease time to market.

Changes in economics create periods of low unemployment, causing greater competition among companies for existing workers. At the same time, "companies are more willing to lay off workers, not only in response to business downturns...but even in periods of prosperity as shifts in markets change the mix of labor requirements, or in response to pressures from financial markets to increase returns on capital" (Osterman, Kochan, Locke & Piore, 2001, p. 8). Businesses are responding to competitive challenges with high performance or "knowledge-based" work practices that involve all levels of employees in work planning, continuous improvement practices and decision-making. Companies routinely resort to hiring temporary workers or outsourcing work to meet the challenges of constant flux in their markets. All of these practices have led to a less attached and a less secure labor force.

These changes in technology, globalization and economics have implications for hiring and retention. As emphasis on ROI, employment cycles and employee participation grows, it becomes more important for employers to be able to hire workers quickly, efficiently

and without incurring unreasonable costs that cannot be recouped within an acceptable time period.

Employers need to identify effective ways not only to select employees quickly, but also to be certain that the employees who are selected have the required knowledge, skills and abilities to quickly assimilate into the business and become efficient producers. They need tools to select employees who will have a good "fit" with the particular corporate culture, thereby reducing attrition and production down time and increasing ROI. McTague (2001) provides a simple ROI formula for determining whether testing is cost effective (p. 105) as shown in Table 1.

Table 1. Return on Investment Formula

Formula:

$$[TRC \times \text{Number of Employees on Staff} \times CET] - COT = ROI$$

Abbreviation	Description
TRC	Turnover rate change (Old%-New%)
CET	Cost per employee turnover
COT	Cost of employment testing
ROI	Return on investment

Note. Example: a company with 1,000 employees, noting as little as a .10% increase in employee retention (TRC), where employee turnover cost is valued at \$2,000 and assessment testing costs \$40 per test (with 3,000 tests performed based on a 3:1 test to hire ratio) would result in a ROI of \$80,000: $[.10\% \times \$1,000 \times \$2,000] - 120,000 = \$80,000$

Finally, employers need effective tools and procedures that meet the legalities of 21st Century America: unbiased, valid, reliable policies and measures that will stand up in court.

The 21st Century Workforce

The 21st century workforce, too, has proven to be changing as a reflection of 21st century society and its business organizations. Employee demographics are very different than they were in the first three-quarters of the 20th century, and employee characteristics continue to change and broaden as we enter the new millennium. Concrete changes include average worker age, gender distribution and cultural background.

The Baby Boom, health care advances and impending changes in the social security retirement age have led to a graying of the workforce. A survey from Towers Perrin and the Hudson Institute (1990) noted that over one third of companies surveyed reported that at least 40 percent of their workers were over age 40. Bureau of Labor (2005) statistics show that in 1978, the median worker age was 34.8. By 1998 median worker age had increased to 38.7, and projections suggest that the figure will continue to increase to 40.7 by 2008.

Since the early 1960s, more and more women have been entering the workforce. The Bureau of International Labor Affairs (1992) indicated the labor force participation rates for adult women had moved from less than 40 percent in 1960 to more than 55 percent in 1990. Glickman's (1982) prediction that 50 percent of the labor force in the year 2000 would be women has proven accurate.

Technology and globalization have increased worker mobility and immigration, thereby turning U.S. businesses into true melting pots of culture, values and practices. The traditional white male worker is becoming the minority in many sectors and localities. Kutschner (1989) predicted that the minority workforce would grow from 17 percent in the late 1980s to 25 percent by 2000, a prediction borne out by current statistics.

Along with these major shifts in worker demographics have come changes in employee philosophy and values. A 1991 survey by Jameison & O'Mara found nine factors that respondents identified as the most important work related values: (a) recognition for competence and accomplishments, (b) respect and dignity, (c) personal choice and freedom, (d) involvement at work, (e) pride in one's work, (f) lifestyle quality, (g) financial security, (h) self development and (i) health and wellness. This survey made

no mention of those values deemed most important in the 1950s, such as loyalty to the organization and pursuit of money. As Jamieson and O'Mara noted:

We have moved from an era in which large portions of the workforce were assumed to be similar, and those who were different were expected to adapt, to an era where the workforce is composed of many different individuals, each of whom wants to be supported and valued (p. 8).

As employee values become more self-serving and worker centered, job changes become more frequent. Bureau of Labor Statistics (2005) figures indicate that the median years of job tenure for men age 35-44 has gone from 7.3 years in 1983 to 5.2 years in 2004, and for men ages 45-54 the rates have moved dramatically downward from 12.8 years in 1983 to 9.6 years in 2004. In Free Agent Nation (2001), Pink estimated that 33 million people have adopted some degree of free agency at the start of the 21st century. This allows workers greater control over their employment and leaves employers with little traditional control over the self employed, freelancers, independent contractors and home-based or micro-businesses. Drucker (1995) indicated that in this age of social transformation where knowledge, rather than labor, raw material or capital, has become the key

resource, "the employees—that is, knowledge workers—own the tools of production" (p. 44). This frees workers to move from position to position with ease, taking their knowledge with them and being able to quickly apply it to new situations and settings.

Increased employee diversity and the new values reflected therein have numerous implications and challenges for employers who are trying to match people and jobs. As baby boomers retire, the baby bust generation that follows it may not contain the critical mass of workers to fill available positions. Thus, employers may face fierce competition to attract entry-level workers. As traditional white male workers are replaced by people with disabilities, retirees, immigrants and women not currently in the workforce, unbiased screening mechanisms will be needed to determine who will be a good fit with a particular company or job.

With increased employee emphasis on lifestyle quality and health and wellness, employers are less likely to find employees who are willing to work 60-80 hours a week, separated from their families and personal interests. These demographic and cultural changes, combined with 21st century technology, globalization and economic shifts in the business paradigm, make it progressively more important for

employers to successfully locate employees with the skills and knowledge needed for their particular corporate environments. There is no longer time to hire employees for the mailroom and train them to move into the executive suite over a 20-year time period. However, at the same time, job applicants do not always possess the existing skills required to do the work a company requires. These deficits are both challenging and costly to a business.

Pre-Employment Selection

In The Company of the Future (2001), Cairncross stated, "Nothing matters more to a company than to find the best people for a job...For every business, acquiring and grooming talent is the single most important challenge" (p. 69). This challenge has been heightened by shifts in 21st century organizational structures and employee demographics and values. Holzer (1999) asserted that job mismatches between employees and employers are frequent because of employers' inability to identify skilled applicants. When issues of demographics, employee values and skill needs must all be considered, employers are challenged to match people with jobs that meet both individual and corporate needs. When this is accomplished, both employees and their organizations win. "Motivation, productivity and morale depend, in part, on the fit between the demands and

characteristics of the job and the employee's competence, needs, interests and values" (Jamieson, 1991, p. 45).

To counter increased employee mobility and frequent job changes, employers need fast, effective methods to identify workers with basic adaptation abilities, problem solving and communication skills and the knowledge required for a job. Particularly in an age of inflated grades and pass-through educational systems that cannot always be relied upon to accurately gauge and report student knowledge, effective tools to aid in accurate employee selection are needed. Pre-employment selection tools can meet this mandate. Cascio (1998) stated that hiring the "wrong" employee occurs in 86 percent of cases when employers rely solely on interviews and resumes. Blecher (2001) believes this figure could be reduced to 25 percent with effective pre-employment testing procedures.

The first zenith of employment selection and training theory and practice can be found in the 1940s and early 1950s. At that time, war and industrial mechanization required businesses to cope with increased employee turnover. However, the trend in expanding employee selection techniques to include those beyond "the classic trio" (Cook, 1998), the application, references and interview, waned after the mid-1950s. Research on the

psychometric properties of selection at that time indicated that the advantages of selection tools were minimal (Smith & Robertson, 1988). Studies by Ghiselli (1966) and others indicated that the validity of selection instruments was often as low as a 0.2 correlation. Research in the early 1960s showed many instruments were culturally, sexually or racially biased, leading to a return to the classic trio in employee selection (Smith & Robertson, 1988).

By the 1980s, globalization, technology and economics led businesses to rethink the use of traditional selection procedures. They realized that improved selection could have a considerable effect on corporate productivity and efficiency. Improving selection techniques and tools so that new employees have an improved "fit" with corporate needs leads to higher employee retention rates. Thus, in recent years businesses have placed more emphasis on the use of non-traditional methods of employee selection, particularly pre-employment tests and assessments, group exercises and work samples. In a survey by the American Management Association (1998), 45 percent of 1,085 companies surveyed indicated that they tested applicants for their abilities in basic skill areas such as reading, writing and arithmetic.

Employers are also utilizing a wider variety of selection tools to protect themselves from litigation, maintain employee morale and maintain their customer bases, as clients voice preferences in working with companies that project solidity through stable employment. While many factors can contribute to increased employee retention rates, there is probably no factor with greater effect than selection. How organizations hire significantly impacts retention and attrition (McKeown, 2002).

Research has shown that applications, interviews and references are often inaccurate, unreliable and invalid selection methods (Cook, 1998). Applications can be completed online, negating the employer's ability to screen based on an applicant's ability to write, follow a complex string of instructions or complete a process within a particular timeframe. Interviews can be subjective and time consuming for employers. With today's work/time constraints, Just-In-Time philosophy and lean principles, employers often lack the ability to conduct thorough interviews that could provide time for extensive evaluation of a prospective employee's fit with a job or company (Cook, 1998). Due to the extent of information available via computer and in books today, applicants are often "coached" in interviewing techniques, further skewing the

results of the traditional hiring process. References, too, have been affected by required turn-around times for hiring and by legal restrictions placed on former employers. Today, hiring agencies are often only able to obtain an employee's dates of hire and rate of pay from a previous employer, hampering the hiring company's ability to utilize reference information for any valuable decision-making. References are increasingly suspect as former employers become vague in order to avoid legal consequences.

A 1985 study by the Saratoga Institute (Flynn, 1999) indicated that the average hiring mistake costs a company \$6,500, but it can go as high as \$15,000. Watkins (2003) indicated that factoring in indirect costs could push the costs of losing an upper level executive to 24 times his or her base salary. Dessler (2000) suggested that the hiring and training of an entry-level employee could be estimated at \$5,000 or more.

In 1985 Kelley estimated annual average employee turnover at 30 percent. Hacker (1999) listed seven costs of bad selection and hiring decisions including: (a) advertising costs; (b) travel, recruitment agency fees and interviewer's salary; (c) training costs; (d) inefficiencies during the training period; (e) lost customers or work orders; (f) stress levels, morale issues

and additional workloads (including overtime) of existing workers; and (g) unemployment compensation claims, severance pay and, in some cases, costs of legal actions by disgruntled former employees.

Many factors can affect organizational turnover rates, including the economy, poor management and poor hiring decisions (Gale, 2003; Nadler, 2003). The volatile nature of the U.S. economy, from massive layoffs to hiring blitzes, substantially affects the number of employees being hired and fired in U.S. businesses. During economic downturns, employees are often forced out of their positions by layoffs and outsourcing. During improved economic periods when jobs are stable and employee rewards are more plentiful, employees may be inclined to leave an employer because of ineffective supervision, corporate mismanagement or misguided management.

Even in companies that are financially stable and heralded as visionary practitioners of management techniques, employee attrition affects the corporate bottom line. While partial explanation for this ebb and flow of workers in U.S. businesses can be found in the nature of the American worker culture and in democracy itself, substantial blame for high employee attrition rates can be placed on poor hiring decisions.

Employers and employees both may be to blame for the tendency to jump too quickly to the offer and acceptance of an employment position without full consideration of the long-term meaning of the relationship. In periods of low unemployment, employers are desperate to fill open positions on a production line so that they will be able to maximize output. During alternate periods of high unemployment, employers, almost giddy with the available wealth of education, experience and knowledge available to them, are likely to select the "star" of the applicant pool, whether or not that individual offers the best "fit" for the company's needs. Employees, too, when faced with a choice between positions, tend to look at the most concrete factors to make their decisions: rate of pay, leave policies, distance from home, opportunities for advancement, etc., rather than job fit.

Improving hiring practices by reducing poor hiring decisions, then, could reduce turnover and save U.S. corporations millions of dollars annually. Schmidt and Hunter's (1981) study estimated that the U.S. government could save \$16 billion a year by improving selection methods and procedures. Employers have long used pre-employment interviews and reference checks to screen prospective employees (Friedman, 2002). Due to constraints

placed on the human resources industry by current personnel laws, affirmative action regulations, unions, etc., employers are finding it more and more difficult during the short pre-hire phase to determine who will make the best employees (Agard, 2003). Two-sentence descriptions of previous jobs, a listing of an individual's educational background and interviews averaging 15-minutes apiece do not provide a great number of viable facts on which to base a hiring decision. Additionally, most employers admittedly tend to select employees based on "gut" feelings about the individual in question.

In order to improve the odds of hiring the "right" employees, businesses have moved toward greater use of pre-employment instruments to help them choose the individuals who will have the right skill set and fit with the particular corporate environment, since research consistently supports the concept that job fit is related to employees' decisions to retain their employment (Penttila, 2004; Cable & Judge, 1996; Werbel & Gilliland, 1999). The closer the fit between the employees' skills, values, interests and the requirements of the jobs, the more productive the employees are likely to be and the more satisfied the employers will be with the job performance (Furnham, 2001).

In our democratic system with a plethora of available assessment and testing instruments, though, employers face a problem in selecting a reliable, valid pre-employment tool that will meet the challenge of effectively selecting the employees who will have the best "fit" with company needs. As Phillips and Connell (2003) note, this fit is not only between the individual and the organization, but also the organization's culture and other employees. In one research study (Smith, 1999), more than 70 percent of individuals let go from their organizations were not let go for performance issues, but because they did not fit the organization's culture. At the same time that employees need to provide accurate, complete pictures of their skills, knowledge and abilities, employers need to provide more accurate, realistic information about available jobs that will help prospective employees make more informed choices (Glickman, 1982).

The first step in determining whether a prospective employee has the "right fit" for a particular job and company is to analyze the job in order to clarify the tasks and levels of knowledge, skills and abilities required for success. Other retention-increasing tools such as training can be very costly and have a lower return on investment. Incentives such as raising salaries or perks such as on-

site day care, flexible hours or company cafeteria discounts may have short-term results in improving retention. If employees continue to be unhappy, unfulfilled or poorly matched to their jobs, these factors will not have long-term effects on retention rates. "Compensation is essentially a satisfier, not a motivator. Adjusting it has a one-time, temporary effect on the employee-not a long-term, sustained effect" (McKeown, 2002, p. 80).

Economic theory shows that improved input will result in improved output. Research shows this to be the case in employment terms, as well. Studies such as the case study by Janz (1989) on personnel selection utility theory and Schmidt and Hunter's (1979) rational estimate technique have made it possible for human resources (HR) departments to clearly identify the corporate financial benefits of HR activities (Cooper & Robertson, 1995). This has put HR departments and functions on par with other corporate divisions in terms of being able to show return on investment for specific functions and procedures. Phillips (2001) notes that ROI can be as high as 1,000 percent when comparing the benefits from reduction in turnover to the costs of the solution.

Changes in technology, globalization and economics will likely continue to lead to further changes in employer

needs and employee selection techniques and tools (Schmitt & Chan, 1998). Bridges (1994) argues that technology will continue to demand adaptability and change from employees. Beyond selecting individuals who have basic technology skills and comfort level, it is likely, then, that businesses will have greater need to identify and select individuals who are capable of and willing to learn and adapt throughout their working lives. With increased globalization, including greater diversity in the workplace and more frequent, more distant travel, businesses will seek ways to identify individuals who have the capability to adapt to and work successfully with other cultures. With greater emphasis on return on investment at all levels of the corporate structure, the importance for human resource professionals to financially justify the methods of selection utilized to hire employees is escalating.

Assessment Testing in the Workplace

Use of employment assessment tests in the United States began after the Civil War when the Pendleton Act brought the Civil Service Commission into being, in part to counter abuses under the previously used patronage system of hiring (Backgrounder, n.d.). The Act legitimized the idea that government employees should be hired based on their abilities and fitness for government positions.

Assessment testing was further legitimized and mainstreamed by the development of the discipline of psychology and the expansion of psychological testing (Katzell & Austin, 1992).

By the end of World War II, the military was utilizing a wide range of psychological, aptitude and skill tests, having tested over 9 million recruits. By the 1950s assessment testing was a common practice in U.S. businesses (Gifford, 1989). As test usage proliferated, though, opposition to testing grew. In a survey conducted by the Russell Sage Foundation, respondents voiced concerns related to issues of cultural unfairness, tracking based on intelligence, non-disclosure and inappropriate use of test results (Brim, 1965). In response to criticisms of test misuse, the American Psychological Association (APA) (2002) and The American Educational Research Association (1999) published standards and guidelines on the construction, use and administration of tests.

Beyond professional self-regulation and guidance, numerous federal and state laws and court cases have had significant effects on employment assessment testing. These legal concerns led to a decline in use of pre-employment testing in the 1970s and 80s. An American Society for Personnel Administration/Bureau of National Affairs (BNA)

1971 survey found that only 55 percent of employers were using any types of pre-employment tests, whereas that percentage had been estimated at 90 percent in 1963.

Title VII of the Civil Rights Act of 1964 was a landmark federal regulation, controlling hiring practices in order to eliminate discrimination in employment because of race, religion or gender. Guidelines from the Equal Employment Opportunity Commission (EEOC), Affirmative Action and, specific to employment testing, the Uniform Guidelines on Employee Selection, provided a framework for proper use of testing in employment selection procedures. These guidelines gave an explicit perspective on adverse impact and job-relatedness and established the four-fifths rule, which stated, "a passing rate for any group that is less than four-fifths of the group with the highest passing rate will be regarded as evidence of adverse impact" (1978, p. 941).

Court precedence has been set by a number of relevant employment assessment cases. In 1966, the court ruled in favor of the employer in *Motorola, Inc. v. Illinois* when Motorola was challenged in its practice of requiring black applicants to take a test that required knowledge familiar to a white, middle class culture. While this case ruled for

the employer, it also drew attention to and scrutiny of the pre-employment assessment process.

Griggs v. Duke Power (1971) questioned effect versus intent and barred companies from using tests that negatively affect minorities. The case also brought into question the issue of job relevance in testing. This was further tested in Albermarle Paper Co. v. Moody (1975) when the Supreme Court ruled that pre-employment testing must prove related to the job for which the applicant is being considered. This concept has been strengthened by other similar cases. Rulings such as the U.S. Supreme Court's response to Watson v. Fort Worth Bank & Trust (1988) are likely to only increase the use of testing and assessment in the U.S. In Watson the Court held that subjective employment practices, such as impressions gathered during interviews and supervisor's ratings, are subject to the same standards as employment decisions made on the basis of objective criteria such as tests. In Connecticut v. Teal (1982), the issue was whether discrimination occurred in one step of a multi-step selection process even though the overall process did not show adverse impact on the job applicants. The court held that the focus of discrimination is on the individual, rather than on a minority group as a whole, and no portion of an individual selection process

can be discriminatory even when the overall process is not found to discriminate against a group.

Thus, the courts look favorably on objective pre-employment assessment and testing, perhaps showing more favor toward objective testing than subjective elements found in the "classic trio." Companies are also increasing their use of pre-employment assessment testing with the realization that Return on Investment could be negatively affected by new legal challenges to traditional, subjective hiring practices.

Workplace testing has also grown in response to legal concerns surrounding reference checks. Fear of defamation suits has prompted many employers to limit their public information on current or former employees to dates of employment and job titles. Without historical information on prospective employee capabilities, employers must resort to increased pre-employment testing in order to obtain validation of an individual's capabilities.

Globalization, technology and economics, as well as a rise in negligent hiring and wrongful discharge lawsuits, are serving to increase the use of pre-employment assessments and testing. A Bureau of National Affairs (1988) survey indicated that of 245 members surveyed, nine out of 10 were using some type of pre-employment testing.

While testing is again on the rise, objections to testing continue. There are concerns related to over-reliance on testing, issues related to employer assumptions that good scores mean workers will do well on the job, testing's effect on poor test takers and misuse of testing, particularly wherein employers test skills not required by the job in order to evaluate future growth potential. Concerns are also voiced that employers may see testing as the solution to all employment problems that are actually caused by poor management, poor working conditions or noncompetitive wages.

Increased understanding of testing and its place in hiring, improved mathematical processes and improved tests can serve to allay fears surrounding the use of pre-employment assessment testing. Hacker (1999) defined pre-employment tests and assessments as falling into the eight categories of: (a) honesty, (b) achievement, (c) personality, (d) psychological, (e) polygraph, (f) handwriting analysis, (g) medical examinations and (h) drug/alcohol tests. Grouping physical testing into one category, Arthur (1994) and Tyler (2000) also included tests of physical ability, AIDS and genetic testing. All of these tests can be organized into three main typologies: intelligence or mental aptitude tests, psychological/

personality tests and tests of skills and abilities. These types of tests all have proven to show sizeable relationships to employment success, and they may be the single best predictor of job performance (Hunter & Hunter, 1984; Hunter, 1986; Tett, Jackson, & Rothstein, 1991; Ones, Viswesaran, & Schmidt, 1993).

Cook (1998) listed six criteria for judging selection tests: (a) validity, (b) cost, (c) practicality, (d) generality, (e) acceptability and (f) legality. To this list, most testing professionals and employers would add reliability. Test validity can include: *face validity*, the applicant's perception that the selection tool is related to the job; *content validity*, indicating that the skill being measured is representative of the work activities, is needed for success in the job and is necessary upon entry into the position; *criterion validity*, showing whether a statistical relationship exists between the scores on the instrument and the measures of the job; *performance validity*, indicating the degree to which the test is linked to the job; or *construct validity*, showing that a tested characteristic is required both for successful performance on the test and in the job (Binning & Barrett, 1989; Arthur, 1994).

Testing costs include test administrator training, facility requirements, materials and instrument costs and scoring fees. Increasingly, costs are subjected to evaluation based on the test's return on investment in areas such as employee hiring time, job satisfaction and employee job retention.

Test practicality can be evaluated on elements such as how complicated necessary materials and preparations are for test administration, the length of the tests and the availability of test materials in certain languages. Consideration should also be given to how complicated it is for applicants to take the tests.

Cook (1998) defined generality as the variety of "types of employees the test can be used for" (p. 294). If an employer has more than one job title or type within an organization, selection of a test instrument that would allow the same assessment test to be used for multiple job categories lessens the need to train administrators and maintain supplies for a variety of testing instruments.

The level of acceptability of a testing instrument is measured by the candidates, based on factors such as whether the test is viewed as a "fair" instrument related to the available position and whether the test takers believe they understood the directions given for the test.

Understandably, acceptability can also be determined by the individual's test scores or perceived performance on the test. Test acceptability has also increased since technology and knowledge of learning styles has expanded delivery methods. Traditionally administered by pencil and paper, tests are now often given by computer, video or audiotape, further increasing their acceptability.

The legality of a test would be determined based upon the test's ability to meet the criteria set by the Uniform Guidelines on Employee Selection and to comply with EEOC and Affirmative Action requirements. Reliability, according to the Standards for Educational and Psychological Testing (1999) is defined as the consistency of measurements when the testing procedures are repeated. Reliability indices can be categorized in terms of internal consistency, generalizability and classification consistency.

Gatewood and Field (1990) note that when the purpose of the assessment program is to identify the best individuals to perform a job within an organization, then information about the job is the logical starting point in the development of the tests. Job analysis is the process of gathering of information about a specific job in a particular organization. This analysis, or "profile," provides specific information about the knowledge, skills

and abilities (KSAs) that are required to successfully perform a particular job or task. Job analysis can include information about a position's work activities, environmental conditions and required equipment and tools, in addition to the KSAs or other personal characteristics needed by the worker (Gatewood & Field, 1990).

In addition to the identification of tasks and activities related to a specific position, job analysis can further identify the ideal levels of performance success needed for a position. When seeking to identify assessment tests that can adequately define an individual's skills in relation to a profiled position, employers too often find that pre-packaged tests do not reflect specific KSA levels associated with specific positions within particular companies. This validation issue can lessen the effectiveness of a pre-employment selection program.

McTague (2001) suggests a number of important steps in conducting job analysis. The profiling process should include a thorough review of the job literature, utilization of a team approach including managers, supervisors and employees who know the job, interviews with top-performing employees, or "subject matter experts (SMEs)," and observation of the job itself in order to confirm what the literature and SME evaluations have

suggested and to "add depth, flavor and clarity to the job analysis" (McTague, 2001, p. 38).

Arguments against the use of job profiling for selection and matching purposes note that employees choose jobs based on a wide variety of factors, such as pay, location, job security, etc. This argument would also note that individuals adapt to their jobs and change some aspects of the jobs they perform (Furnham, 2001). While this "anti-profiling" argument does point to the fact that a myriad of factors relate to individual success on the job, it does not successfully negate the benefits of job matching when matching shows a major correlation with success. Another argument against profiling, that jobs are continuously changing and evolving, again ultimately should not lead to stoppage of the profiling process but rather to its continual updating as well as to regular training and updating of existing employees. Particularly in our global, technology-based, fast-changing business world, change necessitates adjustments in the way a job is performed.

Rather than throwing away the benefits of profiling and job matching, employers must remain vigilant in updating their job profiles and continuously training existing employees to be able to meet new job challenges. Tulgan (2000) suggests that in the current age where

obedience and loyalty are no longer the primary traits sought in employees, job profiling based on skill and performance criteria becomes more important and traditional hiring criteria such as credentialing, interviews and references are becoming obsolete. Employers are seeking workers who bring specific skills with them and can "get up to speed quickly and start making valuable contributions right away" (Tulgan, 2000, p. 76).

Summary

Technology, globalization and economics have led employers toward an increased use of pre-employment assessment tests in the U.S. at the start of the 21st century. Research has shown that such enhanced employment selection mechanisms can lead to improved employment retention rates. In turn, higher employment retention rates can have significant effects on corporate return on investment, thereby strengthening an employer's position in the global marketplace. Thus, selecting a pre-employment testing instrument that successfully predicts employment retention can in turn have major effects on an employer's ROI and can improve that employer's position in the marketplace.

The primary purpose of this research was to investigate the effects of Work Keys assessment tests on

employment retention. A better understanding of Work Keys' relationship to employment retention rates would help employers determine whether Work Keys profiling and testing provide an effective means to improve employee retention rates. This information could then be utilized as part of a model that employers could utilize to determine the test's effect on corporate return on investment.

In Chapter III, Methods and Procedures, the population studied, instrument utilized, methods of data collection and statistical analysis are outlined. The purpose of this section is to provide the reader with a framework to better understand the results detailed in Chapters IV, Results, and V, Summary, Conclusions and Recommendations.

CHAPTER III

METHODS AND PROCEDURES

The primary purpose of this research was to investigate the effects of Work Keys assessment tests on employment retention. The study was initiated after hearing Barbara Bolin, former Special Assistant to the Virginia Governor for Workforce Development Issues, speak to a group of business executives at Blue Ridge Community College in 2004. Bolin stated that employers were seeking new ways to quickly, legally and effectively select employees who would prove successful on the job. She noted that one assessment system that was becoming popular in the country was ACT's Work Keys, a skill-based profiling and assessment tool. However, Bolin also stated that before employers would be willing to accept the Work Keys system and the benefits it could provide to them, they would have to be shown a substantial return on investment in exchange for the costs and time associated in developing job profiles and in testing applicants.

To date, there has been no objective research conducted that verifies the benefits of Work Keys. However, there is ample anecdotal evidence of the benefits of the process for both employers and employees, and there are significant amounts of data available from companies using

Work Keys. Data from individual companies had not been compiled in a meaningful form that would show any statistical significance of Work Keys' benefits. Verifying the benefits of this assessment system could lead to the development of a statistical model that all employers could utilize to determine individual company return on investment resulting from the use of Work Keys.

Population

The identification of the population began with the receipt, from Bolin's Office, of a listing of Virginia companies who had conducted Work Keys profiling and assessment testing. In Virginia and many other states, the community colleges serve as Work Keys testing centers. Thus, before initiating contact with the companies listed, the researcher contacted the workforce coordinators at all 23 VCCS schools via email to obtain contact information for individuals involved in Work Keys at each business on Bolin's list. The email also requested names of any additional businesses that the coordinators were aware of that met the basic criteria for this study. A similar query was forwarded to five community college workforce coordinators personally known to the researcher in Texas, Kentucky, North Carolina, South Carolina and Maryland,

requesting names of additional companies in their service areas that had used Work Keys.

Having received responses from all 23 VCCS schools and the five community colleges contacted in the other states, the researcher compiled a list of 27 businesses that had conducted at least one Work Keys job profile and a minimum of 20 assessments. These businesses and organizations were in the service areas of seven VCCS schools and one school in each of the additional five states contacted. In each case the community college workforce office provided contact information and/or an introduction to the businesses with which they worked. From December 2004 through March 2005, the researcher contacted each of the companies on this initial list by telephone and/or email to determine the purposes for which Work Keys data were utilized, their interest in participating in this study and the availability of the data necessary for the study.

The criteria for the research study included having conducted at least 20 Work Keys pre-employment assessments based upon one job profile. Additionally, employers must have been using as a minimum the Reading for Information, Applied Mathematics and Locating Information tests and have available data on Work Keys test scores. If a company had conducted more than one profile, the position for which the

largest group of employees was hired was selected for inclusion in the study. Companies had to have used Work Keys since at least the beginning of 2003 so that sufficient retention data were available. Of those 27 initial companies contacted, 12 met all of the required criteria and agreed to participate in the study.

Data necessary for the study were extracted from the participating companies during a three-month period in late 2005. Details of each employer were obtained, including employment sector, profile scores, assessments used and length of time Work Keys had been in use. Because some employers voiced concerns related to public release and publication of their data, the researcher agreed not to use company names or other defining information that would definitively identify particular organizations. Details that provide information on each employer can be found in tabular form in Appendix A. Individual employee data for experimental and control groups were collected, including retention information for both groups and Work Keys test scores for the experimental group.

Instrument

The Work Keys assessment system was developed to help students, employers, job applicants and incumbent workers improve employee job fit and to efficiently identify skills

gaps (McLarty & Palmer, 1994). ACT worked closely with educators and employers in developing what they hoped would become the first national system to enable individuals, educators and employers to improve the skills and quality of the U.S. workforce. Initially developed in 1991, ACT's goal was to measure individual skill rather than knowledge. ACT first released assessments in Applied Mathematics, Reading for Information, Listening and Writing in 1992. In 1993, Applied Technology, Locating Information and Teamwork were added. Later, Business Writing, Observation and Readiness assessments were developed. ACT continues to evaluate the need for additional skill tests based on workforce trends (C. Noble, personal communication, March 22, 2005).

Beyond offering only a generic assessment of skill areas, Work Keys is a criterion-referenced test that is directly related to the requirements of a specific job. Through use of job profiling, Work Keys offers "a concrete way for organizations to analyze the skills needed for specific jobs and describe those needs to job applicants" (ACT, 2004, "General Information," ¶8). Trained Work Keys profilers conduct the job analyses. In many states these profilers are community college personnel whose colleges serve as Work Keys Centers. Subject matter experts (SMEs),

who are current or recent employees in the specific job that is being profiled, assist the profilers. ACT recommends that SMEs be representative of gender, age, race, ethnicity and disability status. Together these individuals determine what entry-level skills are required for a position. Through an extensive multi-day analysis process, six or eight SMEs and the profiler compile information about the skills required for a job as well as the skill levels necessary for success in the position. Utilizing this system, the Work Keys profiling procedures conform to the Uniform Guidelines on Employee Selection Procedures that was adopted by the Equal Employment Opportunity Commission (Ref. 29 CFR. Part 607).

Work Keys tests are performance based, simulating real-life situations that examinees might face in employment settings. The Applied Mathematics, Applied Technology, Locating Information, Observation, Reading for Information and Teamwork tests are multiple-choice assessments and are administered either by paper and pencil or computer. The Business Writing test provides one prompt, allowing test takers to then provide a written response in paragraph form. The Listening and Writing tests are given via audiotape. These tests are scored twice in order to determine the test taker's writing skill level and their

listening, recording and retention of information abilities. The Observation and Teamwork assessments are administered via videotapes along with multiple-choice questions.

The lowest score available for a particular test is defined as the lowest level an employer would want assessed. The highest-level score is defined as the maximum level an employer would expect an employee to score without specialized training (McLarty & Vansickle, 1997). In order to have mastery of a skill level, a test taker must correctly answer at least 80 percent of the items in the test for a particular level. These levels were statistically verified to be hierarchical. Assessment scores link directly to the skill levels used in job profiling, which gives employers and educators a common language to discuss skill level needs.

The *Work Keys Reading for Information* test measures the skill people use when they read and use written text in order to do a job. The written texts include memoranda, letters, directions, signs, notices, bulletins, policies and regulations. The *Applied Mathematics* assessment measures the skill people use when they apply mathematical reasoning, critical thinking and problem-solving techniques to work-related problems. The test questions require the

examinee to set up and solve the types of problems and do the types of calculations that actually occur in the workplace. This test is taken with the aid of a calculator. A formula sheet that includes all formulas required for the assessment is provided. The *Locating Information* test measures the skill people use when they work with workplace graphics. Examinees are asked to find information in a graphic or insert information into a graphic. They also must compare, summarize and analyze information found in related graphics (ACT, 2005). A description of formats of each of the CRC assessments and score relationships to CRC levels can be found in Appendix B. Further details regarding the skill levels, characteristics of items and skills required to successfully respond to each item of the three CRC assessments, Reading for Information, Applied Mathematics and Locating Information, are found in Appendix C.

The skill level definitions "are designed to be arbitrary but standardized, particular to each skill" (McLarty & Vansickle, 1997, p. 298). For example, a skill level of "4" in Applied Mathematics does not mean the same as a skill level of "4" in Listening. Additionally, skill levels are in no way tied to grade levels. However, there is a link between the job analysis and the individual's

assessment scores but not between skill areas (McLarty & Vansickle, 1997). An examinee with a skill level of "5" in an assessment area should have mastery of all levels up to and including 5, but not have mastery of higher skill levels. Work Keys skill levels required for a job correspond to the most complex skill-related tasks associated with that position.

For a test to function as intended, the scores need to be reliable and valid (ACT, 2005). ACT defines reliability as "the correlation between two parallel forms of a test" (Gulliksen, 1987, p. 13), usually reported in terms of a reliability coefficient between 0 and 1. Because Work Keys tests are classification tests, reliability coefficients have limited meaning for the assessments. Thus, the Standards for Educational and Psychological Testing (American Educational Research Association et. al., 1999) recommend that publishers of such tests provide information about the percentage of examinees that would be classified in the same way on two applications of the same form or alternate forms (American Educational Research Association et. al., 1999). ACT has provided data on the "proportion or percentage of examinees who would be classified the same way by two parallel tests" (ACT, 2001, p. 37), that shows exact score consistencies and at-or-above classification

consistencies for multiple-choice assessments. This data is shown in Table 2 (ACT, 2001, p. 39).

Table 2. Predicted Classification Consistency

Type of Classification*	Teamwork	App. Math	App. Tech.	Loc. Info.	Obs.	Read. for Info.
Exact	52	75	59	50	50	46
≥3	94	83	89	91	96	88
≥4	84	93	78	82	90	71
≥5	81	97	88	84	78	79
≥6	91	100	100	93	84	97
≥7	97	--	--	--	96	--

More recently, ACT has evaluated some Work Keys test scores in three categories that reflect test reliability: internal consistency, generalizability and classification consistency (ACT, 2005). ACT reports an internal consistency +0.92 reliability coefficient for two forms of *Reading for Information* and *Applied Mathematics* as tested in 2002 and 2003. These values are considered high for the 30-item test administered and reflect good internal consistency (ACT, 2005).

Cronbach's generalizability theory provides a framework for evaluating measurement precision, including

error variance and error magnitudes related to sampling variabilities. ACT's 2005 generalizability analyses for the Reading for Information assessment were conducted using data based on 1,332 examinees. "The mean, standard deviation, skewness, and kurtosis of number-correct scores for these examinees were 20.142, 4.549, -0.628, and 3.269, respectively" (ACT, 2005, p. 11). These scores are representative of results of ACT studies on other assessment tests in the Work Keys battery. Reliability coefficients were determined to be above +.88 for the Applied Mathematics test and above +.80 for the Reading for Information test, both of which reflect high generalizability.

Standard error of measurement (SEM) is also closely related to test reliability (ACT, 2005). The SEM indicates the amount of error of inconsistency in scores on a test. ACT reported scale score reliability estimates based on 2002 and 2003 testing samples using a 3PL IRT model of 0.79 and 0.87 for Reading for Information and 0.91 and 0.89 for Applied Mathematics. These results suggest that the tests are reliable and scores would remain fairly consistent if examinees were to retest using alternate forms of the tests.

Based on 2002 and 2003 results of a mid-western state's data studied by ACT, classification consistency for all tests is very high. Classification consistency is defined as "the extent to which classifications agree when obtained from two independent administrations of a test or two parallel forms of a test" (ACT, 2005, p. 13). At-or-above classification consistency of Reading for Information scores were estimated to be between 85 percent and 98 percent, and between 88 percent and 97 percent for Applied Mathematics.

The Uniform Guidelines on Employee Selection Procedures (1978) notes that validity may be established through construct, content or criterion-relatedness. Construct validation links a trait or construct believed important for job performance to actual job behavior. Criterion-related validation statistically relates test scores to job performance ratings (ACT, 2001, p. 46), and content validation "demonstrates that the test measures a representative sample of important aspects of the job" (ACT, 2001, p. 46). The ACT Technical Handbook (2001) states that Work Keys uses content validation based on the job analysis conducted for each position. This profiling analysis defines the critical job tasks and relates them to

relevant Work Keys skills and the level of skill required for a position.

More recently, ACT has offered construct-related evidence of test validity in a study of over 120,000 samples (ACT, 2005). This study compared the ACT *Applied Mathematics* test with the ACT Mathematics Test, with a correlation coefficient of +0.81 between number-correct (NC) scores on the two tests and +0.75 between scale scores on the two tests (ACT, 2005). Similar comparisons between the ACT Reading for Information test and the ACT Reading and ACT English tests resulted in correlations between NC scores of +0.66 and +0.71, respectively, and scale scores correlations of +0.62 and +0.66, respectively. This comparative study indicated that the constructs tested in the Work Keys Applied Mathematics and Reading for Information tests significantly correlated with the constructs tested in the ACT Mathematics and English tests.

Methods of Data Collection

Data were collected by the researcher during personal visits to or telephone conversations with each participating employer. During or subsequent to these visits, the employers or their community college partners provided to the researcher either data bases (Access, Excel, etc.) on disk or written information from personnel

files. The data were entered into SPSS by the researcher. A purposive 100 percent sample of workers at each organization who began employment in the selected position in 2003 provided the Work Keys experimental group data for analysis. Data on a purposive 100 percent sample of employees hired in the same position during the calendar year immediately preceding adoption of Work Keys at each organization was also obtained to serve as a control group. The data collected on all individuals included months of employment retention and test scores for the experimental group. In order to standardize data from the variety of employers, individuals who had maintained their employment for 12 months or more were listed as "2" in the employment retention category. Retention of less than 12 months was indicated by a "1" in the retention category. The twelve-month figure was utilized based on employer conjecture that this was on average the "break even" point when new employees become fully cost effective in most positions.

Statistical Analyses

Research Question 1 asked whether there was a significant difference in employment retention rates between employees hired in part based on results of assessments tied to specific Work Keys job profile scores and employees hired using traditional methods only. To

answer this question, a chi-square statistical test was conducted.

Research Question 2 asked whether there was a significant difference in employment retention rates between assessed employees who have higher test scores and assessed employees with lower scores. Chi-square and ANOVA analyses were conducted to answer this question.

Research Question 3 asked whether hiring against a Work Keys profile that utilized more than the three Career Readiness Certificate (CRC) assessments was more effective in predicting employment retention than a profile that utilized only the CRC's Reading, Mathematics and Locating Information assessments. Chi-square analysis of the data was used to explain relationships with retention rates of individuals who took the CRC tests only versus applicants who took the CRC tests plus additional assessments.

Research Question 4 asked qualitatively what employers perceived as the strengths, weaknesses, benefits and disadvantages of using pre-employment assessment testing in general and Work Keys profiling and testing specifically. During interviews with corporate HR managers or other identified Work Keys principals, these questions were posed:

1. What do you perceive as the strengths of skills assessment tests in general?
2. What do you perceive as the strengths of Work Keys profiling and assessment testing?
3. What do you view as the weaknesses of skills assessment tests in general?
4. What do you view as the weaknesses of Work Keys profiling and assessment testing?
5. Why did your company decide to use skills assessments in general?
6. Why did your company decide to use Work Keys profiling and assessment testing?
7. What are the benefits of using Work Keys as part of the hiring process at your organization?
8. What are the disadvantages of using Work Keys as part of the hiring process at your organization?
9. What changes do you anticipate in your use of Work Keys at your organization in the future?

To establish qualitative question validity, the questions were pilot tested with the assistance of three VCCS workforce coordinators who were responsible for Work Keys on their campuses. To establish reliability, an individual other than the researcher independently coded responses and those results were compared with the

researcher's coding. When discrepancies were found, the responses were reviewed to determine their most appropriate categorical location. Constant comparative data analysis was used to develop categories based on the responses and results were reported in narrative form and in number and percentage frequencies of responses.

Summary

The primary purpose of this research was to investigate the effects of the Work Keys assessment test on employment retention. Utilizing data collected from 12 businesses that had adopted Work Keys to test job applicants prior to hiring, the study sought to answer research questions related to businesses' hiring and pre-employment assessment testing procedures and the effects on employment retention and corporate return on investment. The researcher collected both quantitative and qualitative data. Statistical procedures utilizing SPSS were employed to provide answers to the research questions.

Chapter IV will provide the reader with the results of the research study by detailing the data analysis and relating the results to each research question previously posed. The chapter will also discuss non-statistical findings related to the qualitative question noted earlier.

CHAPTER IV

FINDINGS

The data collected for this research study are reported and examined in this chapter. The primary problem of this study was to investigate the effects of the Work Keys assessment test on employment retention. The data collection and analyses are organized around four research questions related to the problem. These questions were addressed using both qualitative and quantitative methods. The discussion includes the following topics: (a) overview, (b) statistical data analyses and (c) summary.

Overview

The population for this study included 12 companies. The companies ranged in size from 140 to 4000 employees. Eight of the organizations were in the production sector, two were in the services sector, one was involved in the medical sector and one was a government organization. Job titles of the profiled areas ranged from welders, machinists and production workers to hotel clerks, nursing assistants and call center operators. The number of employees hired by individual organizations during the study period ranged from 23 to 221. Three organizations utilized only the Reading for Information, Applied Mathematics and Locating Information tests. The remaining

nine companies used from one to three additional tests. More detail about these companies can be found in Appendix A.

Data obtained for this study included retention data, test score results and question responses from employers. Because of differences in the methods of data maintenance by individual companies and the low rate of employee turnover in some organizations, retention data were recorded in two groups: employees who retained employment less than 12 months and employees who maintained employment for 12 or more months. Quantitative data were analyzed using the Analysis of Variance (ANOVA) parametric statistic when possible, and chi-square, a non-parametric statistical technique that tests for the difference between categorical variables, when interval data were not available. The statistical significance was tested at $p < .05$, $.01$ or $.001$, meaning that the incidence of a relationship occurring by chance alone is less than 5 percent, 1 percent or .1 percent, respectively. The data reported includes actual p values for each analysis. These p values are interpreted as the likelihood of a relationship occurring due to normal variations in the population from which the sample has been taken. The Statistical Package for Social Sciences (SPSS) was used in the data analysis.

In addition to chi-square and ANOVA statistical significance, expected and actual counts and percentages within rows or columns were reported in order to indicate the direction of the results and to determine whether individual cells skewed results in terms of practical significance. The data obtained from the qualitative questions posed to employers were recorded and explored utilizing total counts, frequencies of responses and rank order of responses within each question.

Statistical Data Analyses

Research Question 1 Findings

Research Question 1 asked whether there was a significant difference in employment retention rates between employees hired in part based on results of assessments tied to specific Work Keys job profile scores and employees hired using only traditional methods. The experimental group included 757 individuals who had been tested with Work Keys before being hired by participating companies. The control group contained 608 individuals who had been hired by participating companies in the year before Work Keys testing began. These individuals were hired utilizing the classic trio of application, interview and references in the process.

The hypothesis for Research Question 1 can be stated as: H_1 : There was a difference in job retention for employees hired using Work Keys profile scores and employees hired using traditional methods. To address this hypothesis, a 2 X 2 contingency table analysis was conducted to assess the relationship between the hiring tools used by an organization and employment retention. The two variables were the independent variable of experimental [hired using Work Keys] or control [hired without using Work Keys] groups and the dependent variable of employment retention [<12 months' retention or ≥12 months' retention].

The chi-square critical value at .001 with 1 degree of freedom is 10.8. The obtained Pearson Chi-Square value (1, $N=1365$) of 14.838, $p=.000$, indicated that the hypothesis should be accepted, with very little likelihood of a Type 1 error.

Results of the cross tabulation analysis indicated that 87 percent of participants hired using Work Keys were employed more than 12 months, while less than 80 percent of the participants hired using traditional employment methods remained at work for more than 12 months. While it would be expected that 635 individuals with Work Keys would retain their employment at least 12 months, 661 employees actually maintained employment for 12 months or more. Although the

cross tabulation indicated that 510 individuals hired without Work Keys could be expected to maintain employment for 12 or more months, only 484 did so. Thus, while 12.7 percent of employees hired with Work Keys left employment in under 12 months, 20.4 percent of the group hired without Work Keys left in this short time frame. The findings of the chi-square and cross tabulation analyses related to this research question are outlined in Table 3.

Research Question 2 Findings

Research Question 2 asked whether there was a significant difference in employment retention rates depending on employee test scores. The hypothesis for Research Question 2 can be stated as: H_2 : There were differences in test scores for employees based on the length of their employment. To address this hypothesis, one-way analyses of variance (ANOVAs) were conducted to compare the mean test scores within each assessment test and the two employment retention groups [employed less than 12 months and employed 12 or more months], as well as the relationship between the three CRC assessment scores, cumulatively, and employment retention group. The number of cases analyzed was dependent upon the test under analysis.

Table 3. Summary of Computed Chi-Square Statistics from the Analysis of Hiring Groups Retention Rates

Chi-Square

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	14.383	1	.000

Cross Tabulation

		Retained <12 mos.	Retained ≥12 mos.	Total
With Work Keys	Count	96	661	757
	Expected Count	122	635	757
	Percent within Work Keys	12.7%	87.3%	100.0%
Without Work Keys	Count	124	484	608
	Expected Count	98	510	608
	Percent within no Work Keys	20.4%	79.6%	100.0%
Total	Count	220	1145	1365
	Percent within Work Keys or no Work Keys	16.1%	83.9%	100.0%

For each ANOVA, the dependent variable was the individual test scores, and the independent variable was the number of months of employment retention, reported nominally either as <12 months or ≥12 months. Post hoc tests were not performed because there were fewer than three groups.

Of the eight analyses conducted, only the Applied Mathematics and the CRC Total ANOVA results were significant. The Applied Mathematics (1,N=757)=11.222, $p=.001$ results surpassed the critical value of $F=10.83$ at the .001 level. The CRC Total (1,N=757)=5.006, $p=.026$ results surpassed the critical value of $F=3.84$ at the .05 level. ANOVA results of the six other Work Keys tests included Reading for Information (N=757), with a significance of .116, Locating Information (N=757), resulting in a significance of .923, Applied Technology (N=281) with a significance level at .996, Observation (N=218), having a significance of .691, Listening (N=108) showing a significance level of .503 and Teamwork (N=51) indicating a significance level of .281. Results of each ANOVA are provided in Table 4.

Chi-square analyses were then conducted to evaluate the relationships between scores within each assessment test and employment retention, as well as the relationship between the three CRC assessment scores, cumulatively, and employment retention. The number of cases analyzed was dependent upon the test under analysis. For each chi-square test, the independent variable (test scores) included from four to five levels depending on levels of scores reported for the test under analysis. The dependent variable was the

Table 4. Summary of ANOVA Results from the Analyses of Individual and CRC Assessment Tests and Retention Rates

Assessment/Group	N	Mean	Std. Dev.	df	F	Sig.
Reading <12	97	4.27	1.186			
Reading 12+	660	4.45	1.075			
Reading Total	757	4.43	1.091	1	2.477	.116
Mathematics <12	97	3.90	.995			
Mathematics 12+	660	4.27	1.013			
Mathematics Total	757	4.22	1.018	1	11.222	.001
Locating Information <12	97	3.96	.735			
Locating Information 12+	660	3.95	.682			
Locating Information Total	757	3.95	.688	1	.009	.923
Applied Technology <12	39	3.77	.742			
Applied Technology 12+	242	3.77	.737			
Applied Technology Total	281	3.77	.737	1	.000	.996
Observation <12	31	3.87	.846			
Observation 12+	187	3.94	.840			
Observation Total	218	3.93	.839	1	.158	.691
Listening <12	27	4.04	.192			
Listening 12+	81	4.07	.264			
Listening Total	108	4.06	.247	1	.452	.503
Teamwork <12	9	3.67	.500			
Teamwork 12+	42	4.00	.883			
Teamwork Total	51	3.94	.835	1	1.187	.281
CRC Tests <12	96	12.09	2.543			
CRC Tests 12+	661	12.67	2.324			
CRC Tests Total	757	12.60	2.359	1	5.006	.026

number of months of employment retention, reported nominally either as <12 months or ≥12 months.

Of the eight analyses conducted, only the Applied Mathematics (4,N=757)=19.16, $p=.001$ and CRC Tests

(11,N=757)=20.98, $p=.034$ chi-square results were significant. The critical value of the chi-square distribution (4,757) at .001 is 18.5. The critical value for the chi-square distribution (11,757) at .05 is 19.7. Results of each chi-square analysis are provided in Table 5.

Table 5. Summary of Chi-Square Results from the Analysis of Individual and CRC Assessment Tests and Retention Rates

Assessment	N	df	Value	Significance
Reading	757	4	9.46	.051
Applied Mathematics	757	4	19.16	.001
Locating Information	757	3	.959	.811
Applied Technology	212	3	2.04	.563
Observation	218	3	.589	.899
Listening	108	1	.458	.498
Teamwork	51	3	3.974	.264
CRC Tests	757	11	20.98	.034

Cross tabulation results of the tests showing significance indicated that expected counts for employees retained 12 or more months were less than expected for an Applied Mathematics score of three (168 actual employees remained vs. an expected count of 186 individuals), while

employees who scored higher maintained employment at higher-than-expected rates. Over 46 percent of employees who scored a three left employment within 12 months, while those who scored higher left at much lower rates, from one percent for those who scored a seven, 5.2 percent for those who scored a six, 21.9 percent for those who scored a five and 25 percent for those who scored a four. Cross tabulation statistics showing the actual and expected counts and associated column percentages for each score level for the Applied Mathematics test are shown in Table 6.

Cross tabulation results of the CRC Total tests that showed significance indicated that expected counts for employees retained 12 or more months were lower than expected for scores of nine (50 actual employees remained vs. an expected count of 53.3 individuals), ten (96 actual employees remained vs. an expected count of 104.8 individuals), 11 (86 actual employees remained vs. an expected count of 89.1 individuals), 15 (64 actual vs. 64.6 expected) and 18 (16 actual vs. 18.3 expected), while employees who scored 12, 13, 14, 16 or 17 maintained employment at higher-than-expected rates. No employees obtained CRC Total scores of 19 or 20.

Table 6. Summary of Cross Tabulation Results from the Analysis of the Applied Mathematics Assessment Test and Retention Rates

Applied Math Score		Retained <12 mos.	Retained ≥12 mos.	Total
3	Count	45	168	213
	Expected Count	27.0	186.0	213
	Percent within Retention	46.9%	25.4%	28.1%
4	Count	24	236	260
	Expected Count	33.0	227.0	260
	Percent within Retention	25.0%	35.7%	34.3%
5	Count	21	189	210
	Expected Count	26.6	183.4	210
	Percent within Retention	21.9%	28.6%	27.7%
6	Count	5	49	54
	Expected Count	6.8	47.2	54
	Percent within Retention	5.2%	7.4%	7.1%
7	Count	1	19	20
	Expected Count	2.5	17.5	20
	Percent within Retention	1.0%	2.9%	2.6%
Total	Count	96	661	757
		100%	100%	100%

Employees who scored nine, 10 or 11 left employment at rates of 11.5 percent, 25 percent and 16.7 percent, respectively, within 12 months, while those whose CRC Total

scores were higher left at rates from 2.1 percent for those who scored a 16 or 17, 4.2 percent for those who scored a 13, 5.2 percent for those who scored an 18, 10.4 percent for those who scored a 12 or 15 and 12.5 percent for those who scored a 14. Cross tabulation statistics showing the actual and expected counts and associated column percentages for each score level for the CRC Total tests are shown in Table 7.

Research Question 3 Findings

Research Question 3 asked whether hiring against a Work Keys profile that utilized more tests than the three Career Readiness Certificate (CRC) assessments was more effective in predicting employment retention than a profile that utilized only the CRC's Reading, Mathematics and Locating Information assessments. The experimental group included 294 individuals who had been tested with the CRC group of tests plus at least one additional test (CRC+). The control group contained 463 individuals who had been tested using only the three CRC tests (CRC). The hypothesis for Research Question 3 can be stated as: H_3 : There was a difference in job retention between employees hired using tests beyond the CRC trio and employees hired using the

Table 7. Summary of Cross Tabulation Results from the Analysis of the CRC Assessment Tests and Retention Rates

CRC Combined Score		Retained <12 mos.	Retained ≥12 mos.	Total
9	Count	11	50	61
	Expected Count	7.7	53.3	61
	Percent within Retention	11.5%	7.6%	8.1%
10	Count	24	96	120
	Expected Count	15.2	104.8	120
	Percent within Retention	25.0%	14.5%	15.9%
11	Count	16	86	102
	Expected Count	12.9	89.1	102
	Percent within Retention	16.7%	13.0%	13.5%
12	Count	10	85	95
	Expected Count	12.0	83.0	95
	Percent within Retention	10.4%	12.9%	12.5%
13	Count	4	95	99
	Expected Count	12.6	86.4	99
	Percent within Retention	4.2%	14.4%	13.1%
14	Count	12	111	123
	Expected Count	15.6	107.4	123
	Percent within Retention	12.5%	16.8%	16.2%
15	Count	10	64	74
	Expected Count	9.4	64.6	74.0
	Percent within Retention	10.4%	9.7%	9.8%
16	Count	2	32	34
	Expected Count	4.3	29.7	34
	Percent within Retention	2.1%	4.8%	4.5%
17	Count	2	23	25
	Expected Count	3.2	21.8	25
	Percent within Retention	2.1%	3.5%	3.3%
18	Count	5	16	21
	Expected Count	2.7	18.3	21
	Percent within Retention	5.2%	2.4%	2.8%

Table 7 Continued.

CRC Combined Score		Retained <12 mos.	Retained ≥12 mos.	Total
19	Count	0	2	2
	Expected Count	.3	1.7	2
	Percent within Retention	0%	.3%	.3%
20	Count	0	1	1
	Expected Count	.1	.9	1
	Percent within Retention	.0%	.2%	.1%
Total	Count	96 100%	661 100%	757 100%

three CRC assessments only. To address this hypothesis, a 2 X 2 contingency table analysis was conducted to assess the relationship between the test combination and employment retention. The two variables were the independent variable of experimental [CRC plus additional test(s)] or control [CRC trio of tests only] groups and the dependent variable of employment retention.

The chi-square critical value at .01 with 1 degree of freedom was 6.6. The obtained Pearson Chi-Square value (1, N=757) of 8.862, $p=.003$, indicated that the hypothesis should be accepted, with very little likelihood of a Type 1 error.

Results of the cross tabulation analysis indicated that 91.9 percent of participants hired using the CRC trio plus at least one additional test were employed more than

12 months, while less than 85 percent of the participants hired using the CRC trio only remained at work for more than 12 months. While it would be expected that 257 individuals tested with CRC+ would retain their employment at least 12 months, 270 employees actually maintained employment for 12 months or more. Although the cross tabulation indicated that 404 individuals hired without tests beyond the CRC could be expected to maintain employment for 12 or more months, only 391 did so. Thus, while 8.2 percent of employees hired with CRC+ tests left employment in under 12 months, 15.6 percent of the group hired without additional tests left in this short time frame. The findings of the chi-square and cross tabulation analyses related to this hypothesis are outlined in Table 8.

Research Question 4 Findings

Research Question 4 asked employers to respond to nine questions related to pre-employment assessment tests in general and Work Keys specifically. Questions were posed during in-depth in-person or telephone interviews with the individual at each organization who was responsible for Work Keys administration. Results indicating the response

Table 8. Summary of Computed Chi-Square Statistics from the Analysis of CRC Groups Retention Rates

Chi-Square

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.862	1	.003

Cross tabulation

		Retained <12 mos.	Retained ≥12 mos.	Total
CRC + additional tests	Count	24	270	294
	Expected Count	37	257	294
	Percent within CRC+	8.2%	91.8%	100.0%
CRC tests only	Count	72	391	463
	Expected Count	59	404	463
	Percent within CRC only	15.6%	84.4%	100.0%
Total	Count	96	661	757
	Percent within CRC+ or CRC only	12.7%	87.3%	100.0%

provided, the number of employers who provided that response, the percentage of employers providing the response and ranking of the responses were provided. Employers were encouraged to provide as many answers to each question as they felt were appropriate.

Survey Question 1 asked what the employer perceived as the strengths of skills assessment tests in general. Seven of the 12 employers (58 percent) had experience with assessment tests other than Work Keys. The five employers who had no experience with other tests did not respond to the question. Five different answers were provided to this question.

All of the employers who had experience with pre-employment assessments other than Work Keys indicated that they felt that such tests brought objectivity to the hiring process that could not be obtained through the subjectivity of the application review, interview and reference check. Because assessment tests provide scores, six employers also indicated that tests were helpful in selecting the best people for the job. Assuming that the test was assessing a skill needed for the job, and that the test was valid and reliable, employers felt that individuals who scored highest on the test should prove to be the most skilled employees.

Four employers noted that the receipt of a high school diploma did not guarantee a certain set of skills or a particular level of skill in any area. Thus, assessment tests provided employers with more specific information about an individual's knowledge, skills or abilities than

could be garnered from a diploma, certificate or even from a transcript. Three employers mentioned that assessment tests could highlight an individual's strengths and limitations. Two employers stated that selecting an assessment test forced the employer to determine specific skills that were required to be able to perform a particular job, something that might remain somewhat nebulous without the use of assessment tests. Table 9 provides a matrix of the responses to Survey Question 1.

Table 9. Strengths of Assessments in General (N=7; 58%)

Rank	Response	No.	Percent
1	Provides objectivity	7	100.0
2	Helps prioritize hiring	6	85.7
3	Gives more information than diploma	4	57.1
4	Shows applicant strengths/weaknesses	3	42.9
5	Helps employer determine skills needed	2	28.6

Survey Question 2 asked what the employer perceived as the strengths of Work Keys assessment tests. The 12 employers queried provided a total of 11 different responses to this question. Ten of the twelve respondents mentioned that Work Keys was objective and because of this,

along with its reliability and validity, it met Equal Employment Opportunity Commission (EEOC) requirements. Not only was this response ranked No. 1 based on the number of employers who provided it, but also it was mentioned first by eight of the 10 employers.

Nine individuals acknowledged that one strength of Work Keys was that it forced employers to identify specific skills required for a position. This skill list could be utilized for numerous other purposes by an organization, from providing job-training checklists to meeting ISO requirements for skill listings.

Seven employers interviewed felt that the skills gap training developed by Key Train, which maps closely to Work Keys skill areas, was a strength of the assessments. The close relationship between the tests and the gap-training program allowed test takers to improve their test scores in an efficient manner.

Six employers suggested that another benefit of Work Keys assessments was that it seemed to improve employee self esteem. By doing well on the tests, selected employees knew they had good skills and could do the job. This improved self-esteem may be reflected in lower absenteeism, stronger work ethic and less training time required to bring a new employee to full job capabilities. Three of

these employers also mentioned that self-esteem seemed to relate to employees' desires to further their educations. Each employer had noticed a significant increase in the use of their organization's tuition assistance program after the implementation of Work Keys.

Six employers also suggested that a strength of Work Keys was that it provided prospective employees with a baseline that defined fit with the company and the job. Applicants knew at the very start of the application process if they met the defined fit criteria that had to be obtained in order to be considered for a position.

Five employees mentioned that having ACT behind Work Keys was a strength. The respected name of this organization, along with the validity and reliability testing they provided on their instruments, suggested to employers that the test does what ACT claims.

Four employers indicated that the transportability of the Work Keys test results was a strength of the assessment tool. These employers were primarily from a geographic area that had heavily invested in Work Keys at both the secondary and corporate levels. Employers often found that applicants came to them already having been tested in high school or at another company. This not only saved the

company the cost of the testing but also cut the time-to-hire significantly.

Three employers noted that use of Work Keys "toughened" the application process, and this heightened the prestige of the position and the company. Three employers also felt that it was a strength that Work Keys can be administered externally by local community colleges. This saved employers in staffing and cost and also provided greater objectivity in the hiring process.

One employer suggested that use of Work Keys increased supervisor perceptions that tested employees would have lower training needs and higher retention rates, perhaps leading to a self-fulfilling prophecy of more successful employees. Table 10 provides a summary of employer responses to Question 2.

Survey Question 3 asked what the employer perceived as the weaknesses of assessment tests in general. Seven of the 12 employers (58 percent) had experience with assessment tests other than Work Keys. The five employers who had no experience with other tests did not respond to the question. Seven different answers were provided to this question.

All individuals responsible for hiring who had experiences with assessment tests other than Work Keys

Table 10. Strengths of Work Keys Assessments (N=12; 100%)

Rank	Response	No.	Percent
1	Test is objective/Meets EEOC	10	83.3
2	Provides skill identification/job training checklist	9	75.0
3	Matches with follow-up gap training	7	58.3
4a	Provides baseline for hiring	6	50.0
4b	Improves employee self esteem/further education	6	50.0
5a	ACT's known name	5	41.7
5b	SMEs provide profiling information	5	41.7
6	Test scores transportable	4	33.3
7	Toughens application process	3	25.0
7	Administered externally	3	25.0
8	Supervisor perception of higher retention rates & less training required	1	8.3

indicated that their main concern about using pre-employment assessment tests was that it could require the employer to screen out applicants who might have become successful employees. Without testing, employers had more flexibility with the subjective elements of hiring and they had the option of hiring an employee whose skills might be

slightly less than preferred but who, for instance, had excellent references and work history.

Six responding employers believed that the testing situation could be intimidating to applicants. This could manifest itself in test anxiety and lead to prospective employees scoring poorly on assessments. It could also cause a good applicant to become less interested in the position or lead him or her to discontinue the application process.

Five employers indicated that the cost of testing was a weakness. Costs included not only those related to purchase of testing materials and scoring but also to test administrator training, testing time and expense. Because of today's emphasis on ROI, human resource departments are increasingly required to justify the costs of testing and show that the up-front testing costs are balanced by increases in employee satisfaction, production, retention or other factors after hire.

Three employers noted that a weakness of assessment tests could include legal issues. Unless employers were very careful to select tests that had been validated and proven reliable and met all Uniform Guidelines on Employee Selection criteria, they could find themselves answering

charges of discrimination in drawn-out, costly legal battles.

Another weakness of assessment tests noted by employers related to the expertise required to administer assessment tests. A poorly trained test administrator or proctor could have an effect on test results and could even cause legal challenges from disgruntled test takers. Employers noted that both expertise and attitude were factors in selecting an effective test administrator.

Finally, when discussing assessment test weaknesses, one employer stated that time was a major issue in her organization. Other than the time noted above related to test administrator costs, testing also increased the time-to-hire, and for companies in a growth mode that needed to move quickly, the additional time required to test and score pre-employment assessments could effect an organization's production level. Table 11 provides a matrix of responses to Question 3.

Survey Question 4 asked what the employer perceived as the weaknesses of Work Keys assessment tests. The 12 employers queried provided a total of 12 different responses to this question. A number of the responses provided to this question closely mirrored the responses

Table 11. Weaknesses of Assessments in General (N=7; 58%)

Rank	Response	No.	Percent
1	May screen out good applicants	7	100
2	Testing intimidates applicants	6	85.7
3	Cost	5	71.4
4	Legal issues	3	42.9
5	Administrator expertise	2	28.6
6	Time-to-hire	1	14.3

provided for Question 3, weaknesses of assessment tests in general. Similar answers included response 1, voiced by 100 percent of the respondents, regarding the assessment process's tendency to screen out good employees; response 2, noted by 11 of 12 employers, regarding applicant intimidation; response 3, indicated by 9 individuals, related to the issue of time; response 5(a), with 7 providing this answer related to cost of the instrument; response 8(a) administrator expertise; and, response 8(b) creating negative applicant feelings toward the job or employer, each suggested by one employer.

Responses regarding Work Keys weaknesses that were not included in the more generic question regarding weaknesses of pre-employment assessment tests in general included the

fourth ranked response, that even Work Keys test questions were somewhat generic and did not provide a perfect match with the specific job that an applicant would be performing. For example, the Applied Mathematics test included questions utilizing scenarios involving a stereo store clerk, a waiter and a baker to frame its mathematical questions. The eight employers who indicated that the generality of the questions was a concern mentioned that because the questions were generic, applicant skills specifically related to a position's requirements might not have been tested. Additionally, applicants taking the test may have been confused, disheartened or turned off regarding the nature of the job for which they were applying if they thought they might have been required to have all of the types of knowledge involved in the test questions.

Three employers indicated that they were still frustrated because Work Keys was not a universally utilized tool in education and business. They would have liked to see it used in their areas by the school systems, because they felt that the test provided a more effective explanation of an individual's skill levels than did a high school diploma or even a transcript. These employers also believed that it would be beneficial to the corporate

community if Work Keys were utilized by more businesses so that it would be more fully transportable. Employers voiced satisfaction in the CRC concept, which might expand Work Keys' usage by both education and business.

Three employers also mentioned that a weakness of Work Keys was that it did not directly test for attitude or work ethic. Universally, employers voiced concerns that lack of these traits was the most common difficulty they had in hiring, supervising and retaining employees. While employers realized that an employee's attitude and work ethic could be improved if there was a better job fit, as provided through the use of Work Keys, they were still hopeful for the "magic fix" that would allow them to quickly select the individuals who would come to work on time, be team players and be able to follow instructions accurately.

Two employers noted concerns over the amount of time that was required of SMEs in the profiling and replicating process. While accepting that this time was a necessary evil in order to produce an accurate battery of testing instruments that met legal challenge, taking six to 10 of the best workers or supervisors off the production line or work rotation for two or more days was a challenge for employers.

Two employers also stated that they had noticed that a few individuals who were good test takers were able to predict the correct answers to some of the Work Keys test questions and perhaps scored higher than they would have simply because of their test taking abilities. Thus, this weakness may not have given employers an accurate picture of an applicant's job skills. Table 12 provides a summary of employer responses to Question 4.

Survey Question 5 asked why the employer decided to utilize skill assessment tests in general. Four different answers were provided to this question. All 12 participating employers noted the objectivity offered by assessment tests as the main reason for their use in hiring. While mentioned separately, this response related closely to legal compliance, indicated by 11 respondents. Objectivity and legal compliance both insulate employers from legal complaints of discrimination and favoritism in hiring, which cannot be said about the subjective classic trio hiring tools. Because of the workforce's globalization and diversity, employers indicated that this objectivity was increasingly important.

Eight employers mentioned that assessment testing's ability to help employers "weed out" poor applicants was a reason for utilizing the tests. Respondents noted that such

Table 12. Weaknesses of Work Keys Assessments (N=12; 100%)

Rank	Response	No.	Percent
1	May screen out good applicants	12	100
2	Testing intimidates applicants	11	91.7
3	Takes extra time	9	75.0
4	Generic questions don't fit job	8	66.7
5a	Cost	7	58.3
5b	Difficult to justify ROI	7	58.3
6a	Not fully transportable	3	25.0
6b	Does not test for attitude/ethics	3	25.0
7a	SME time requirement	2	16.7
7b	Good test takers may do too well	2	16.7
8a	Administrator expertise	1	8.3
8b	Turns off applicants	1	8.3

culling was achieved at two levels. Firstly, applicants often opted out of testing if they felt they would not do well. Secondly, employers could use test score results to select only the best applicants.

Two large employers queried mentioned that they utilized pre-employment assessments because they needed a generic, objective tool they could use based on the large numbers of applicants to be screened. The size of the

applicant pool mandated use of a testing instrument to cull the number of applicants to be interviewed to a manageable number. Table 13 provides a matrix of these responses.

Table 13. Reasons for Using Assessment Tests (N=12; 100%)

Rank	Response	No.	Percent
1	Objectivity	12	100
2	Legal compliance	11	91.7
3	Weeds out poor applicants	8	66.7
4	Generic tool required for large number hired	2	16.7

Survey Question 6 asked why the employers selected Work Keys assessment tests as their pre-employment testing tool. The 12 employers queried provided a total of 11 different responses to this question.

The first and second ranked responses to this question were similar to those offered regarding reasons that employers utilize assessment tests in general: legal compliance (12 responses) and objectivity (11 responses). Nine employers stated that they had selected the Work Keys test because of their positive relationships with their local community colleges. The schools' marketing of Work Keys as an effective assessment tool added credence to the

tests and employers voiced existing interaction with and trust of their community college partners.

Seven individuals noted that they chose Work Keys in part because of the availability of Key Train skills gap training and its parallel to Work Keys test questions. While most employers did not offer skills gap training to low-scoring applicants, they did refer these individuals to local community colleges in hopes that test takers would take advantage of the training and then return to retake the tests. Many of the employers queried also provided testing for incumbent workers for purposes of promotion and they were more likely to maintain their own Key Train materials for use by these individuals. Seven employers also stated that they had selected Work Keys as their company's pre-employment assessment because of its profiling component. This element gave employers the impression of a customized tool that related more closely to a specific job's skill requirements than would a generic assessment test that could be utilized for any position and any organization.

Six respondents said that in part they selected Work Keys because of previous experience with the assessment tool at another employer. Two of these individuals had personal previous experience with Work Keys, and four

employers noted that others in their organizations had recommended Work Keys based on their previous experiences with the tests.

Five employers noted that they selected Work Keys in part because of ACT's reputation and history. They felt that ACT was a well-known organization, particularly because of the SAT test, and this added creditability to any test the organization offered. Employers believed that any test developed by ACT would be valid, reliable and would meet the legal requirements needed by companies.

Four employers said they had selected Work Keys in part because of the number of skill assessment areas available. With ten possible tests to include in a job's profile, employers felt that they were offered a good variety of skill areas, while some other assessment tests may only test limited areas such as reading and mathematics.

Three larger employers noted that Work Keys was selected by their organizations because of an increasing return on investment. Although the up-front costs of profiling were expensive, averaging those costs over a large number of test takers made the cost per applicant very reasonable. Also, because the Work Keys profile included a battery of test skill areas, employers found

Work Keys comparable to or more cost effective than having to purchase separate tests from a variety of vendors in order to cover all skill subject areas needed. One employer noted that Work Keys provided a reasonable cost per applicant assessment, since the scoring costs were included in the "package price" they obtained from their local community college.

Two employers mentioned that one of the reasons they had selected Work Keys was because of its transportability in their region. Numerous employers and their school system participated in Work Keys testing, which meant many applicants came to them with assessment scores already completed. This saved the company a good deal in testing costs.

One employer, who regularly hired employees with fairly low-level skills, suggested that Work Keys had been selected in part because the skill levels of the test instrument matched those needed by their employees. The employer had found that some assessments tested at skill levels higher than those needed by this company, and thus another instrument might cause many good applicants to be screened out of the application process because they could not meet the minimum score levels other tests offered. Table 14 provides a summary of responses to this question.

Table 14. Reasons for Using Work Keys (N=12; 100%)

Rank	Response	No.	Percent
1	Legal compliance/EEO	12	100
2	Objectivity	11	91.7
3	Relationship with/expertise of community college	9	75.0
4a	Match with available gap training materials	7	58.3
4b	Profiling component: skill correlation	7	58.3
5	Previous experience with Work Keys	6	50.0
6	ACT's reputation	5	41.7
7	Variety of assessment skill areas available	4	33.3
8	Low cost when large number tested	3	25.0
9	Transportability	2	16.7
10	Test levels match skill level needs	1	8.3

Survey Question 7 asked what the employers saw as the benefits of using Work Keys at their organizations. Responses to this question, framed somewhat differently than the earlier-posed question regarding Work Keys' strengths, provided somewhat different reactions regarding the positive aspects of the assessment tool. The 12

employers queried provided a total of 13 different responses to this question.

Nine employers responded that they had data that suggested Work Keys was responsible for reducing the amount of time it took to train a new employee. This had multiple ramifications for employers. Employees who could be trained more quickly required less supervision, were happier with their jobs and their performance, and were more quickly able to maximize their contribution to the company's production.

Eight employers noted that they had seen an increase in employees' participation in further educational opportunities since the inception of Work Keys testing. They suggested that this may be related to increased employee confidence in their academic abilities. One employer stated that use of the company's tuition reimbursement policy had tripled since Work Keys testing was implemented.

Seven employers felt that employees hired after the implementation of Work Keys required less supervision than employees hired before testing began. Again, this had significant relationship to employee satisfaction, costs and production rates.

Six employers mentioned retention improvement as a benefit of using Work Keys testing. Although employers had little statistical information that backed up this belief, each had a sense that employees who were tested with Work Keys had higher job retention rates than those hired solely based upon the classic trio. Three of these employers did note that they felt that isolating retention as a factor would be very difficult, but that it was an important factor because of its affect on ROI.

Five employers stated that using Work Keys had proven to be a benefit because their overall hiring costs were lower. Because Work Keys was used in these organizations at an early point in the application process, employers were quickly able to screen out applicants who did not have the skills to perform the jobs for which they were applying. While testing involved its own cost, this up-front screening saved the employers a great deal of interview time and costs on other screening procedures (drug tests, background checks, etc.).

Employers ranked three benefits of Work Keys sixth based on their responses: Enhancement of employee self esteem and confidence, increased production efficiency and improved internal promotability. These professionals had a sense that employees who took Work Keys tests felt better

about themselves and their capabilities because they had done well enough on the tests to be hired. This factor, along with others noted above, tended to lead to increased production rates for the companies. Because employees came on board with appropriate skills, employers also found that they were more readily and more quickly able to promote employees from within. Advantages of doing so included having existing knowledge of employee work ethics and capabilities and employees having current experience with the specifics of the organization's culture and practices.

Three employers noted increased ROI as a benefit of using Work Keys in the hiring process, although, as noted above, they had compiled little hard data to back up that belief. Seven also stated a sense that overall they felt they had a better quality of employee since implementation of Work Keys.

Two employers felt that having Work Keys assessment testing and scoring managed by an outside organization was a benefit of the tests. This lent objectivity to the hiring process and saved the companies personnel time in administration of testing.

One employer found that having Work Keys available as a computer-based assessment was beneficial. This allowed the employer to test more frequently and to test whatever

number of applicants were in the queue with less effect on the overall costs of test administration. One employer also mentioned that a benefit they found in Work Keys was the availability of ACT's website that offers practice questions and a thorough explanation of the test. This allowed applicants to have an understanding of the test and the type of questions they would be asked before arriving for their testing session and served to lessen their test anxiety and concerns over subjectivity, discrimination, etc. Table 15 provides a summary of responses to this question.

Survey Question 8 asked what the employers saw as the disadvantages of using Work Keys at their organizations. Responses to this question provided a different frame of reference from those asked earlier regarding Work Keys' weaknesses. The 12 employers queried provided a total of eight different responses to this question.

Employer responses to Work Keys' disadvantages were less varied and less numerous than those provided related to the assessment's benefits. Responses ranked first to third were similar to those highly ranked in the question related to Work Keys' strengths: Loss of otherwise-qualified applicants, time and cost factors.

Table 15. Benefits of Using Work Keys (N=12; 100%)

Rank	Response	No.	Percent
1	Reduces training time	9	75.0
2	Promotes further education	8	66.7
3	Less supervision required	7	58.3
4	Increases retention	6	50.0
5	Reduces hiring costs	5	41.7
6a	Improves employee self esteem/confidence	4	33.3
6b	Increases production efficiency	4	33.3
6c	Increases internal promotability	4	33.3
7a	Increases ROI	3	25.0
7b	Improves quality of employees	3	25.0
8	Testing outsourced	2	16.7
9	Computer-based-testing offered	1	8.3
9	Website offers practice question	1	8.3

Two employers believed that differences in profiler skills could prove a disadvantage to use of Work Keys. With a "canned assessment," where profiling was not conducted, test administrator skills were less of an issue. A poorly trained profiler could have major implications for the profile that was developed. Two employers also noted that when the positions under consideration required a low level

of skill, test takers literacy skill level could affect results and could, as mentioned above, result in not considering an applicant who could become a good employee.

One employer felt that use of computer-based testing could be a disadvantage when applicants were not computer literate. This company did not offer the choice of computer- versus paper-based testing to applicants. Another employer who was located in an area with high refugee resettlement numbers felt the lack of capability to test in languages other than English or Spanish was a disadvantage for the company. Since the testing was a required step in the application process, the company could lose good applicants who could only read French, Russian or other languages not yet offered by Work Keys.

Finally, one employer saw some disconnects between Work Keys test questions and available skills gap training. This employer believed that if Work Keys and accompanying gap training were offered as a package by the same organization, the questions and training program would more readily mesh. Table 16 provides a summary of responses to this question.

The final Survey Question 9 asked what future changes employers anticipated at their organizations in their use of Work Keys. Only six of the 12 employers queried

Table 16. Disadvantages of Using Work Keys (N=12; 100%)

Rank	Response	No.	Percent
1	Loss of otherwise-qualified applicants	9	75.0
2	Time to hire	8	66.7
3	Cost	7	58.3
4a	Variation of profiler skills	2	16.7
4b	Tie to literacy	2	16.7
5a	Computer based testing	1	8.3
5b	Language restrictions	1	8.3
5c	Skills gap training is a separate package	1	8.3

indicated that they expected any changes in the use of Work Keys in the foreseeable future.

Four of the six employers responding to this question indicated that they planned to profile more job titles in the future. They were pleased with the process and benefits of Work Keys, and some respondents hoped to expand the testing to all positions at their organizations.

Three individuals stated that they were considering reducing the number of tests given during pre-employment assessment. Two of these companies were giving five or more tests, and one was giving three tests. Each felt that the results they obtained on at least two of the tests were

similar enough that they could further limit the number of tests and still obtain valuable hiring information.

Two employers mentioned that they might change the timing of the assessments in relation to the overall hiring process. One employer was giving the test at the start of the application process and was considering moving it to the latter part of the process as a final screening mechanism, while the other respondent was currently giving the test post-interview and was considering modification of their hiring process so that the test would be the first step in the application process.

One employer was considering adding additional Work Keys skill area assessments in their hiring process. This employer currently tested in three skill areas but they felt that the addition of the fourth test recommended by profiling might give them a better picture of the applicant's overall abilities. Table 17 provides a summary of responses to this question.

Summary

The primary purpose of this research was to investigate the effects of the Work Keys assessment test on employment retention. Utilizing data collected from 12 businesses that had adopted Work Keys to test job

Table 17. Anticipated Changes in the Use of Work Keys
(N=6; 50%)

Rank	Response	No.	Percent
1	Will profile more job titles	4	66.7
2	May reduce the number of tests used	3	50.0
3	Changes in timing of assessment in application process	2	33.3
4	Adding additional assessment skill areas	1	16.7

applicants prior to hiring, the study sought to answer research questions related to businesses hiring and pre-employment assessment testing procedures and the effects on employment retention and corporate return on investment. Chapter IV has provided statistical results of the four research questions posed for this study.

The results of Research Question 1 indicated that there were statistically significance increase in employment retention rates when Work Keys was used as a pre-employment screening tool in addition to the classic trio of application, interview and references. The outcome of Research Question 2 suggested that there were statistically significant relationships between employment retention and specific test scores only on the Applied Mathematics and the CRC trio of tests, and that within

these assessments, individuals with low scores were more likely to leave employment in under 12 months. Results of Research Question 3 found that there were statistically significant increases in employment retention rates when additional tests beyond the CRC trio were utilized in pre-employment testing.

The qualitative questions posed to employers in Research Question 4 provided background and additional information regarding employer views of assessment tests and Work Keys. The responses to this question included employer comments regarding the strengths, weaknesses, benefits and disadvantages of assessment tests in general and Work Keys specifically. Data obtained also relayed information on company uses of the tests and future plans for Work Keys' utilization.

In Chapter V, Summary, Conclusions and Recommendations, the data that had been collected and analyzed are summarized and the researcher draws conclusions. Recommendations for further research are also presented in Chapter V.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

In Chapter V, a summary of the study will be presented, the data previously presented will be analyzed and conclusions about the data will be provided. Additionally, recommendations for implementation of the study's results and suggestions for additional research will be offered.

Summary

The purpose of this study was to investigate relationships between Work Keys assessments used for pre-employment testing and employee retention rates. The U.S. was experiencing changes in the characteristics of its businesses and workforce because of technological advancements, globalization and new economic demands (Nadler & Heilpern, 1998; Osterman, 2000). This transformation had caused employers to become increasingly concerned with return on investment (ROI) and selecting employees who had the best skills and abilities to provide a good "fit" with the needs of a job (Cairncross, 2002).

Research had shown that a close matching of employees' skills with their employment positions will increase the possibility that they will remain on the job for longer periods of time (Jamieson, 1991). Recent trends in

demographics, education and the legal field had confounded this need to increase employment retention, however. The workforce had become significantly more diverse in the past 20 years, secondary education no longer adequately prepared students to move directly into life-long positions with one company and legal restrictions placed constraints on employers' abilities to hire the best candidates.

While employers had traditionally utilized a "classic trio" of screening tools including the application, interview and reference checks when hiring new employees (Cook, 1998), businesses were moving toward greater use of alternative hiring tools and practices to accomplish their goals. Increasingly, employers were utilizing pre-employment testing instruments to aid them in choosing employees who would have the best fit with specific positions (Bureau of National Affairs, 1988). Use of pre-employment screening tools that additionally included the element of job analysis increased the possibility of better job fit.

The Work Keys assessment instrument, developed by ACT in the early 1990s, combined job analysis and pre-employment testing and was finding increasing popularity in U.S. businesses as a tool used to screen job applicants. At the same time that the use of Work Keys was escalating,

states were exploring the benefits of developing a transportable skill credential that could assist employers in quickly and objectively determining whether an employee had the skills required for a certain position. The use of three Work Keys tests, Reading for Information, Applied Mathematics and Locating Information, by a growing consortium of states as a portable credential entitled the Career Readiness Certificate (CRC) had further increased the use of Work Keys as a pre-employment testing tool.

To accomplish the purpose of this study, four research questions were posed about Work Keys as a pre-employment assessment tool and its relationship with employment retention. These included:

1. Is there a significant difference in employment retention rates between employees hired in part based on results of assessments tied to specific Work Keys job profile scores and employees hired using traditional methods?
2. Is there a significant difference in employment retention rates between employees who have higher test scores and employees with lower scores?
3. Is hiring against a Work Keys profile that utilizes only the three Career Readiness Certificate (CRC)

assessments as effective at predicting employment retention as a profile that utilizes additional tests?

4. What do employers perceive as the strengths, weaknesses, benefits and disadvantages of using pre-employment assessment testing in general and Work Keys profiling and testing specifically?

As a relatively new test, there was no significant objective research available on Work Keys that could help employers determine the test's effect on employment retention and in turn, on ROI. The results of this study could help employers make that determination. Further, exploring the relationship of the CRC tests to employment retention could be of benefit to the growing consortium that was promoting the use of the transportable credential, as well as to the community college systems that had been charged with marketing and implementing Work Keys in many states.

The population for this study consisted of 12 businesses that utilized Work Keys for pre-employment screening. Data from these employers were collected for the study in late 2005 through personal and telephone interviews and electronic data transfer. The data included individual test scores and at least 12 months of employment retention information. Data were obtained on 757 employees

who had been tested with Work Keys and 608 employees hired using traditional methods. The data were analyzed using SPSS software to answer the three quantitative research questions generated for this study. Chi-square and ANOVA statistical procedures were used to determine the significance of the relationships between Work Keys tests and employment retention. Descriptive statistics including rank and percentage responses to nine questions posed to employers were calculated in order to answer the qualitative research question that was posed in this study.

Conclusions

This study was concerned with determining the relationships between Work Keys assessment tests and employment retention. This information would be helpful to numerous groups, including employers, ACT, the CRC Consortium, community colleges, school systems and other training organizations.

Research Question 1 Conclusions

The first research question asked whether there was a significant difference in employment retention rates between employees hired in part based on results of assessments tied to specific Work Keys job profile scores and employees hired using traditional methods. The hypothesis related to this question stated: H_1 : There was a

difference in job retention in terms of employees hired using Work Keys profile scores and employees hired using only traditional methods.

This hypothesis was tested using chi-square, with independent variables of experimental [hired using Work Keys] and control [hired without using Work Keys] groups and the dependent variable of employment retention. The dependent variable was divided into two groups: employment retention lasting less than 12 months and employment retention lasting 12 or more months.

The resulting Pearson chi-square value of 14.838 exceeded the critical value of 10.8 established for the $p \geq .001$ level of significance. Therefore, it was determined that statistically the two employment groups differed significantly in their job retention rates.

Cross tabulation results showed that over 87 percent of the individuals who were hired using Work Keys pre-employment assessment tests retained their employment for 12 months or more, while fewer than 80 percent of those hired without the use of Work Keys testing maintained employment for at least 12 months. These results supported the contention of Cairncross (2002), McKeown (2002) and Furnham (2001) that improved pre-employment selection

techniques and tools would lead to improved employee fit and increased employment retention.

This higher retention rate for employees hired using Work Keys compared with employees hired using traditional methods showed a statistical difference in retention rates and could help an employer determine whether this percentage was of practical significance within their company. To be of practical significance, the costs, time and other factors related to testing must be weighed against the increased number of employees who would be retained with testing. In conclusion, for Research Question 1, the hypothesis was accepted, and it was determined that when Work Keys was utilized in the pre-employment process, employee retention rates were improved.

Research Question 2 Conclusions

The second research question asked whether there was a significant difference in employment retention rates depending upon the specific test scores received by applicants. The hypothesis related to this question stated: H_2 : There was a difference in job retention in terms of employees' specific Work Keys test scores on each of the assessments or on the CRC total score.

This hypothesis was tested using an ANOVA, where retention served as the grouping variable and test score

levels provided the dependent variable. The results of the ANOVA indicated that only the mean scores on the Applied Mathematics test and the CRC trio of scores showed significant differences. The Mathematics comparison of mean scores resulted in $F=11.222$, exceeding the 10.83 critical value of F at the .001 level of significance. The mean scores on the CRC trio of tests resulted in an F of 5.06, exceeding the critical value of 3.84 at the .05 level of significance.

Chi-square, with independent variables of each assessment test's score levels and the dependent variable of employment retention, was also utilized. The retention variable was divided into two groups: employment retention lasting less than 12 months and employment retention lasting 12 or more months. The resulting Pearson Chi-square values exceeded the critical values established only in the Applied Mathematics test (4, $N=757$) $F=19.16$ and in the CRC total score (11, $N=757$) $F=20.98$. The Mathematics test value exceeded the critical value of $F=18.5$ at the .001 level, while the CRC total score F value exceeded the critical value of $F=19.7$ at the .05 level of significance. Therefore, it was determined that statistically only the Applied Mathematics and CRC scores were related to job retention rates.

Thus, the hypothesis was accepted for this research question when related to the Applied Mathematics or CRC Total tests, but the hypothesis was rejected when related to the other Work Keys tests, including Reading for Information (N=757) with a significance of .116, Locating Information (N=757) that resulted in a significance of .923, Applied Technology (N=281) with a significance level at .996, Observation (N=218) that had a significance of .691, Listening (N=108) with a significance level of .503 and Teamwork (N=51) that resulted in a significance level of .281.

Cross tabulation results for the Applied Mathematics assessment showed that fewer employees than expected maintained their employment for at least 12 months when they scored a three on the test (the lowest possible score) and more employees than expected remained employed for at least 12 months when they scored a four, five, six or seven on the test. While between one percent and 25 percent of employees scoring four, five six or seven left employment before 12 months, 47 percent of those who scored a three on the Mathematics test left within this short time frame. The percentage of employees who left within 12 months fell for each higher test score level. These figures suggest that individuals who score lower on the Work Keys Applied

Mathematics assessment were less likely to maintain employment.

Cross tabulation results for the CRC assessment trio of Reading, Mathematics and Locating Information offered similar results to that noted above for the Mathematics test. Individuals with a total CRC score of nine, 10 or 11 (lower total scores) tended to leave their jobs more frequently in under 12 months than individuals having higher score totals on the three tests. Over 53 percent of employees who left within 12 months had these lower score totals, whereas only 27 percent of those leaving had scores of 12, 13 or 14 and 15 percent of those leaving had scores of 15, 16 or 17. While few in number, only 5.2 percent of individuals scoring at the highest levels of 18, 19 or 20 left employment within 12 months. These results may again suggest that employees tend to leave jobs more quickly if they have only the minimum required skills for their positions.

Caution should be noted that the results of the CRC ANOVA and chi-square analyses were primarily a reflection of the strong significance of the Applied Mathematics test, since neither the Reading for Information nor the Locating Information tests showed significance. The Reading for Information test bordered on significant results at $p =$

.051, but it was the Applied Mathematics results at $p = .001$ that clearly affected the CRC Total significance of $p = .03$. Again, employers must weigh the practical significance of these findings in their business settings. In some cases, particularly with lower-paying or physically challenging jobs, employers might not have enough applicants with higher scores to be able to select only those individuals for employment. Economic factors including an area's unemployment rate would also affect the number and quality of applicants available for hire.

The conclusion reached for Research Question 2, therefore, was that employees' specific test scores in the Applied Mathematics test and the CRC Trio areas could aid in predicting improved retention rates for employees, but the scores on other Work Keys tests were not related to length of employment.

Research Question 3 Conclusions

The third research question asked whether hiring against a Work Keys profile that utilized more than the three Career Readiness Certificate (CRC) assessments was more effective in predicting employment retention than a profile that utilized only the CRC's Reading for Information, Applied Mathematics and Locating Information assessments. The hypothesis related to this question stated:

H₃: There was a difference in job retention between employees hired using additional tests beyond the CRC trio and employees hired using the three CRC assessments only.

This hypothesis was tested using chi-square, with independent variables of CRC+ [hired using additional Work Keys tests as well as the three CRC tests] and CRC [hired using the three CRC tests only] groups and the dependent variable of employment retention. The dependent variable was divided into two groups: employment retention lasting less than 12 months and employment retention lasting 12 or more months.

The resulting Pearson chi-square value of 8.862 exceeded the critical value of 6.6 established for p at the .01 level of significance. Therefore, it was determined that statistically the two testing groups differed significantly in their job retention rates. Thus, the hypothesis was accepted for this research question and the conclusion was made that hiring against a Work Keys profile that uses one or more tests beyond the CRC trio results in better prediction of employment retention.

Cross tabulation results showed that over 92 percent of the individuals who were hired using the CRC plus additional tests retained their employment for 12 months or more, while fewer than 84 percent of those hired only using

the three CRC tests maintained employment for at least 12 months. These results supported Tulgan's (2000) and ACT's (2005) argument that job profiling improved job fit. When an organization profiled a job, it selected the skills and tests most needed. This study showed that retention rates were improved when more tests were utilized to determine that fit. In conclusion, for Research Question 3, the hypothesis was accepted, and it was determined that hiring against a Work Keys profile that uses one or more tests beyond the CRC trio results in better prediction of employment retention.

Research Question 4 Conclusions

The fourth research question was qualitative in nature and the results were achieved through extensive interviews with human resource personnel in organizations utilizing Work Keys. The survey questions asked employers to provide their opinions based on experiences with assessment tests in general and Work Keys specifically.

Only seven of the 12 employers who were interviewed had experiences with assessment tests other than Work Keys. This group provided five different responses to the question regarding strengths of assessment tests in general. All employers responding to this question noted that tests in general helped provide objectivity to the

hiring process. Over 85 percent stated that assessment testing helped them prioritize hiring, and over half stated that they felt assessment tests provided them with more information than a high school diploma. Three of the seven respondents indicated that assessment tests showed them applicant strengths and weaknesses, and two mentioned that the assessment process helped them determine the skills that were needed for specific positions.

The question regarding strengths of Work Keys specifically resulted in 11 different responses from the 12 employers who were interviewed. As with assessments in general, the highest ranking response (83.3 percent) was that the tests provided objectivity in the hiring process. Other responses to this question on Work Keys strengths that were provided by over half of the respondents, in rank order, included that Work Keys provided skill identification and job training checklists to employers (75 percent), that the tests were matched with follow-up gap training (58.3 percent) and that the tests provided a baseline for hiring (50 percent) and that the testing improved employee self esteem and the probability that employees will further their educations (50 percent). Five employers noted that strengths of Work Keys were ACT's established name (41.7 percent) and subject matter experts'

participation in the profiling process (41.7 percent). Thirty-three percent of employers said that the transportability of the Work Keys scores was a strength, twenty-five percent felt that a strength of Work Keys was that it toughened the application process and that it was administered externally, and one employer (8.3 percent) felt that supervisors perceived that Work Keys caused higher retention rates and less need for training of new employees.

Employers provided six different responses to the question regarding the weaknesses of assessment tests in general. Again, only seven of the 12 employers who were interviewed had experiences with other tests and were able to respond to this question. All of the respondents indicated that the main weakness of assessment tests was screening out good applicants. Employers also mentioned testing's intimidation of applicants (85.7 percent), cost (71.4 percent), legal issues (42.9 percent), administrator expertise (28.6 percent and increases in the time-to-hire (14.3 percent) as weaknesses of assessment tests in general.

Employers provided many similar responses when queried about the weaknesses of Work Keys specifically. Responses in rank order included that Work Keys could screen out good

applicants (100 percent), intimidate applicants (91.7 percent), take extra time (75 percent), include questions not related to a particular job (66.7 percent), increase costs (58.3 percent), create difficulties in justifying in terms of ROI (58.3 percent), not be fully transportable (25 percent), not test for attitude and ethics (25 percent), increase the time required of SMEs (16.7 percent), give good test takers an unfair advantage (16.7 percent), have parallels between administrator expertise and test results (8.3 percent) and turn off applicants (8.3 percent).

When surveyed about the reasons employers used assessment tests, employers all responded that their main reason was to increase objectivity (100 percent). Most (11 respondents) mentioned legal compliance (91.7 percent) as part of their decision to use assessments, eight (66.7 percent) noted that testing could weed out poorly qualified applicants, and two employers (16.7 percent) stated that they needed to use a generic tool because of the large number of employees hired annually.

When asked specifically why they had decided to use Work Keys, the 12 employers again unanimously noted the test's provision of legal compliance, while 91.7 percent noted objectivity, 75 percent indicated that the participation of the community college in the program

affected their decision to use Work Keys and 58.3 percent selected the assessment because of its match with gap training materials. Fifty-eight percent also mentioned the profiling component as one reason they selected Work Keys, while 50 percent noted previous experience with Work Keys as a reason that they were using the tests. Five employers (41.7 percent) selected Work Keys because of ACT's reputation, 33.3 percent liked the variety of assessment skill tests available, 25 percent stated that the cost of Work Keys was low when a large number of applicants were being tested, 16.7 percent mentioned transportability as a reason the assessment was selected, and one employer (8.3 percent) indicated that Work Keys was selected because its test levels matched her company's skill level needs.

Employers voiced 13 different benefits of using Work Keys tests. Seventy-five percent felt it reduced training time, while 66.7 percent believed that use of the tests promoted further education in their organizations. Fifty-eight percent saw that new hires required less supervision when Work Keys was used, and 50 percent felt that use of the tests increased employment retention. Reduction in hiring costs was noted by 41.7 percent of respondents, and 33.3 percent indicated that benefits included improving employee self esteem, production efficiency and internal

promotability. Twenty-five percent said they saw increases in ROI as well as reductions in hiring costs with Work Keys. Two employers (16.7 percent) found benefits in outsourcing Work Keys testing, while 8.3 percent noted benefit in use of Work Keys' computer-based testing and the program's web site.

Eight disadvantages created by use of Work Keys were noted by employers, including a loss of otherwise-qualified applicants (75 percent), increases in time-to-hire (66.7 percent) and costs (58.3 percent), variations in profiler skill levels (16.7 percent), requirements of literacy of test takers (16.7 percent), and computer based testing, language restrictions and not having the gap training as part of the Work Keys' package (8.3 percent each).

Only six employers planned to make any changes in their use of Work Keys in the coming year. Four of those responding (66.7 percent) indicated that they hoped to profile additional job titles in the future, three (50 percent) were considering reducing the number of tests utilized, two (33.3 percent) planned to change the sequencing of Work Keys in the application process, and one (16.7 percent) planned to add additional skill assessment areas. Overall, the conclusion resulting from Research Question 4 was that employers viewed Work Keys as a valid

and beneficial pre-employment assessment tool. Employers who were using the tests planned to continue with their use and felt the strengths and benefits of assessment testing in general and Work Keys specifically outweighed the assessment's weaknesses and disadvantages.

Recommendations

This study was implemented to evaluate the effects of Work Keys as a pre-employment assessment on employment retention. The research results and conclusions suggested a number of recommendations for employers who were currently using, or who were considering use of, Work Keys, as well as for other groups and individuals associated with the use of Work Keys. These additional groups include the ACT organization, the CRC Consortium, community colleges that market or may consider marketing Work Keys, school systems and other organizations that are considering providing Work Keys testing.

Results of Research Question 1 showed Work Keys to be a viable factor in increasing employment retention. Continued use of the test instrument by business and industry was recommended. Because of the significant level of the relationship with retention that was established by the research, additional employers may wish to consider use

of Work Keys as a beneficial pre-employment test instrument.

While Research Question 2 indicated that a majority of the specific scores on applicants' individual Work Keys assessment tests did not show significant statistical relationships with retention, the relationship suggested between retention and the Applied Mathematics test could provide employers with a means to select one particular employee from a pool of otherwise-equally-qualified applicants. When other factors are similar among applicants, an employer might be best served to select the applicant with an Applied Mathematics score that is not that profile's lowest acceptable score.

Since Research Question 3 suggested that use of Work Keys assessments beyond the CRC trio does show an increase in employment retention, employers may wish to consider inclusion of additional tests in their employment screening. During the profiling process when importance of numerous tests are ranked by the participating Subject Matter Experts and skill areas deemed most closely related to the position are selected, employers may wish to consider utilizing more rather than fewer tests.

Although the results from this research did show statistical significance, employers should weigh all

practical factors when determining how many assessment areas should be included in their testing battery. Businesses must judge the costs of testing and additional time-to-hire, in addition to considering in their individual organizations whether the differences between retention rates of 92 percent and 84 percent are practically significant in terms of return on investment.

The results of the qualitative research question indicated that employers voiced many similar strengths, weaknesses, benefits and disadvantages in the use of assessments in general and in the use of Work Keys specifically. Responses to questioning regarding Work Keys elicited a wider variety of answers, but this may be related to the fact that almost half of the respondents had not had experience with any other pre-employment assessment tests beyond Work Keys. The most often mentioned reason for using assessment testing related to the element of objectivity provided by testing, as well as Work Keys' ability to meet EEOC requirements. These strengths reflected business's increasing concern with legal compliance and reducing the subjectivity of the hiring process. For these reasons, more employers may wish to consider use of pre-employment assessments.

Because employers frequently mentioned the profiling component and available skills gap training as benefits of Work Keys that were not available with other testing instruments, employers seeking to add pre-employment assessment testing to their application process may want to give serious consideration to this instrument. The greatest concerns with Work Keys and other assessment tests related to possible screening out of applicants who would have become good, long-term employees. There was also concern that testing intimidates applicants and may have affected test results or attitude after employment. Cost and time factors were also frequently mentioned, reflecting the current emphases on globalization of business competition and return on investment. Employers should individually consider these negative factors when deciding upon use of pre-employment testing in general or Work Keys specifically.

The study's results suggest that ACT is on a solid course in providing a valuable pre-employment assessment tool to the business community. ACT may wish to pay particular attention to the employer responses provided in Research Question 4, and work further with employers and test providers on streamlining the assessment process and developing assessments of employee attitudes and ethics.

ACT is also urged to continue supporting research that aids employers in considering all effects that Work Keys testing can have on ROI. Obtaining further data in this area may serve to quell some of employers' concerns about the costs of utilizing the Work Keys system.

Because employer responses indicated a concern about the generic nature of test questions, it is recommended that ACT consider developing test forms specific to industries that extensively utilize Work Keys testing, such as the trades, production, customer service and the medical field. Development of Work Keys tests in additional languages beyond English and Spanish may also be of benefit to significant numbers of employers. To overcome employer concerns about test taker intimidation, ACT could consider expansion of online and written test preparation materials that could be made available to test takers, as well as increased training to test administrators on alleviating test taker anxiety.

Because Research Question 2 indicated that the only significant relationship established between an individual test and retention was on the Applied Mathematics test, and because there was only borderline significance indicated with the Reading for Information test and no significant relationship with the Locating Information test, the CRC

Consortium might wish to consider deleting the Locating Information test from its triumvirate in order to reduce costs and time, particularly since these were often-mentioned concerns by employers. This response may be precluded, however, when the numbers of companies utilizing the Locating Information test is considered and when other important employment factors beyond retention are evaluated.

While Research Question 3 suggested that giving applicants a greater number of tests provided better retention results than testing in fewer areas, because of employer concerns regarding time and costs, it would not be recommended that the CRC Consortium include additional tests for its transportable credential. The Reading for Information, Applied Mathematics and Locating Information were the most-often utilized Work Keys tests across a broad range of position profiles. These tests reflected very basic skills required by almost every organization and individual employers were certainly free to utilize the CRC information while requiring further testing on additional skills for specific positions.

The results of this study also reinforced community colleges' support for and marketing of Work Keys as a valid assessment tool. Community colleges that are not currently

actively marketing Work Keys may wish to expand this service to their business communities, armed with the knowledge that use of the tests can boost an organization's employment retention and ROI. Based on the results of Research Question 2, community college profilers may also wish to recommend that employers consider expanding the number of tests utilized in the hiring process when there is ambiguity regarding the number of tests that should be utilized as part of a specific profile.

Because of their close association with Work Keys and employers, community colleges would also be in position to provide valuable consulting to employers regarding the positioning of testing in the hiring process. Research Question 4 noted that a number of employers were reconsidering their placement of the testing during hiring, and community colleges should have the expertise to aid an employer in selecting the most advantageous time to conduct assessments.

It is also recommended that high schools consider having at least their career and technical education students take the CRC trio of tests during students' final year. This would provide graduates with certification that could be used when they search for employment. If there are significant numbers of students whose test scores are high

enough to satisfy employer profile score levels, it would indicate to the business community that high schools are preparing students sufficiently for available jobs and that schools are meeting their mandate to be effective partners with business and industry. The growing use of Work Keys by employers, as well as the rapid expansion of the CRC credential in the states, suggests that high school graduates armed with this credential will benefit when they are seeking employment. This recommendation could be expanded to include all organizations providing training to populations of job applicants, including dislocated worker programs, social service organizations, community colleges and private training providers.

The results and conclusions of this research study suggested that further research on Work Keys would be of benefit to employers. Although not often practical in business and industry, comparing Work Keys retention rates with rates found when other pre-employment assessment tests were used would be beneficial in helping employers select the tools that would provide the best reflection of future retention rates. Comparing Work Keys with other tests that do, and tests that do not, utilize profiling would also allow employers to determine whether the profiling element adds significantly to the test's benefits. Because Work

Keys is a relatively new assessment system, additional longitudinal studies that evaluate the effectiveness of the tests over two, five and ten years would also provide a greater magnitude and depth of understanding about the benefits of Work Keys to employers.

Most employers who were surveyed did not anticipate significant changes in their use of Work Keys. However, the results regarding Work Keys were skewed toward approval of the test since it was difficult to locate organizations that had used Work Keys extensively and then stopped using the test because of dissatisfaction with the tool. It should be recommended, therefore, that additional analysis be conducted utilizing data from employers who have stopped using Work Keys or other tests. This analysis would provide a more objective picture of pre-employment assessment testing and its relationship to employment retention.

Because of the limited geography and types of industry represented in this study, further study in other areas of the country and with other industry clusters and position types are also recommended. Additionally, none of the participating employers in this research used either of the Work Keys Writing assessments offered. Studying these tests in relation to employment retention would be beneficial to the overall understanding of the effects of Work Keys.

Additional study that would isolate the effects of Work Keys on employment retention would be beneficial in helping employers determine the specific return on investment provided by this pre-employment instrument. The current study was unable to account for factors such as management and supervision, corporate culture and employee personal differences. In-depth analysis that isolates Work Keys effects from these other factors could provide employers with the data necessary to develop a true Work Keys ROI formula. Further, because Work Keys is often used with incumbent workers as well as with job applicants, research on the benefits of the test instrument on other factors such as employee supervision rates and production capabilities would be of benefit to business and industry. Lastly, effects of a profiled position's minimum required test scores were not factored into this study. Research in this area may provide employers with more information specific to their individual situations.

These recommendations would help employers isolate the benefits of Work Keys on employment retention and on other areas related to employment and could then lead to completion of a repeatable model of return on investment that would aid each employer in determining the benefits of the assessment tool in their individual situations. Such

clarification and corroboration with the current findings would provide a more thorough understanding of the effects of Work Keys on employment retention specifically and on corporate return on investment in general.

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APPENDIX A

Companies Participating in the Research Study

Area	Sector	No. Exp.	No. Ctrl.	Year WK Began	Tests Used
Southeast	Production	44	38	2001	RI, AM, LI
Northeast	Service	69	61	2003	RI, AM, LI, OB
Southeast	Production	24	15	2003	RI, AM, LI, OB, AT
Southeast	Production	28	27	2001	RI, AM, LI, AT
Southeast	Production	221	147	2003	RI, AM, LI
Southeast	Production	109	82	2001	RI, AM, LI, AT
Southeast	Government	28	37	2000	RI,AM,LI,OB,AT,TW
Southeast	Production	30	26	1999	RI, AM, LI, OB
Southeast	Production	23	37	2001	RI,AM,LI,OB,AT,TW
Southeast	Production	29	18	2002	RI, AM, LI
South Central	Service	108	86	2003	RI, AM, LI, LS
South Central	Medical	44	34	2002	RI, AM, LI, OB

APPENDIX B

Work Keys Assessment Formats and CRC Relationships

Assessment	No. Items/ Messages	Computer Based Time	Paper- Pencil Time	Audio or Video Component	Low Score	High Score	CRC Bronze Score	CRC Silver Score	CRC Gold Score
Reading for Info.	33	55 min.	45 min.	N	3	7	3	4	5
Applied Math	33	55 min.	45 min.	N	3	7	3	4	5
Locating Info.	38	55 min.	45 min.	N	3	6	3	4	5
Business Writing	1 prompt	30 min.	30 min.	N	1	5	NA	NA	NA
Writing	6 mes.	NA	40 min.	Y	1	5	NA	NA	NA
Teamwork	36	NA	64 min.	Y	3	6	NA	NA	NA
Observation	36	NA	60 min.	Y	3	6	NA	NA	NA
Listening	6 mes.		40 min.	Y	1	5	NA	NA	NA
Applied Technology	32	55 min.	45 min.	N	3	6	NA	NA	NA
Readiness	20 read 15 math	NA	40 min.	N	3	7	NA	NA	NA

APPENDIX C

Content of Career Readiness Certificate Work Keys
Assessments (ACT, 2004, p. 12-13)

Reading for Information

Level	Characteristics of Items	Skills
3	<ul style="list-style-type: none"> • Reading materials include basic company policies, procedures, and announcements • Reading materials are short and simple, with no extra information • Reading materials tell readers what they should do • All needed information is stated clearly and directly • Items focus on the main points of the passages • Wording of the questions and answers is similar or identical to the wording used in the reading materials 	<ul style="list-style-type: none"> • Identify main ideas and clearly stated details • Choose the correct meaning of a word that is clearly defined in the reading • Choose the correct meaning of common, everyday workplace words • Choose when to perform each step in a short series of steps • Apply instructions to a situation that is the same as the one in the reading materials

4	<ul style="list-style-type: none"> • Reading materials include company policies, procedures, and notices • Reading materials are straightforward, but have longer sentences and contain a number of details • Reading materials use common words, but do have some harder words, too • Reading materials describe procedures that include several steps • When following the procedures, individuals must think about changing conditions that affect what they should do • Questions and answers are often paraphrased from the passage 	<ul style="list-style-type: none"> • Identify important details that may not be clearly stated • Use the reading material to figure out the meaning of words that are not defined • Apply instructions with several steps to a situation that is the same as the situation in the reading materials • Choose what to do when changing conditions call for a different action (follow directions that include "if-then" statements)
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5	<ul style="list-style-type: none">• Policies, procedures, and announcements include all of the information needed to finish a task• Information is stated clearly and directly, but the materials have many details• Materials also include jargon, technical terms, acronyms, or words that have several meanings• Application of information given in the passage to a situation that is not specifically described in the passage• There are several considerations to be taken into account in order to choose the correct actions	<ul style="list-style-type: none">• Figure out the correct meaning of a word based on how the word is used• Identify the correct meaning of an acronym that is defined in the document• Identify the paraphrased definition of a technical term or jargon that is defined in the document• Apply technical terms and jargon and relate them to stated situations• Apply straightforward instructions to a new situation that is similar to the one described in the material• Apply complex instructions that include conditionals to situations described in the materials
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6	<ul style="list-style-type: none"> • Reading materials include elaborate procedures, complicated information, and legal regulations found in all kinds of workplace documents • Complicated sentences with difficult words, jargon, and technical terms • Most of the information needed to answer the items is not clearly stated 	<ul style="list-style-type: none"> • Identify implied details • Use technical terms and jargon in new situations • Figure out the less common meaning of a word based on the context • Apply complicated instructions to new situations • Figure out the principles behind policies, rules, and procedures • Apply general principles from the materials to similar and new situations • Explain the rationale behind a procedure, policy, or communication
7	<ul style="list-style-type: none"> • Very complex reading materials • Information includes a lot of details • Complicated concepts • Difficult vocabulary • Unusual jargon and technical terms are used, but not defined • Writing often lacks clarity and direction 	<ul style="list-style-type: none"> • Figure out the definitions of difficult, uncommon words based on how they are used • Figure out the meaning of jargon or technical terms based on how they are used • Figure out the general principles behind policies and

	<ul style="list-style-type: none">• Readers must draw conclusions from some parts of the reading and apply them to other parts	apply them to situations that are quite different from any described in the materials

Content of Career Readiness Certificate Work Keys
Assessments (ACT, 2004, p. 2-3)

Applied Mathematics

Level	Characteristics of Items	Skills
3	<ul style="list-style-type: none"> • Translate easily from a word problem to a math equation • All needed information is presented in logical order • No extra information 	<ul style="list-style-type: none"> • Solve problems that require a single type of mathematics operation (addition, subtraction, multiplication, and division) using whole numbers • Add or subtract negative numbers • Change numbers from one form to another using whole numbers, fractions, decimals, or percentages • Convert simple money and time units (e.g., hours to minutes)
4	<ul style="list-style-type: none"> • Information may be presented out of order • May include extra, unnecessary information • May include a simple chart, diagram, or graph 	<ul style="list-style-type: none"> • Solve problems that require one or two operations • Multiply negative numbers • Calculate averages, simple ratios, simple proportions, or rates using whole numbers and decimals

		<ul style="list-style-type: none"> • Add commonly known fractions, decimals, or percentages (e.g., $\frac{1}{2}$, .75, 25%) • Add up to three fractions that share a common denominator • Multiply a mixed number by a whole number or decimal • Put the information in the right order before performing calculations
5	<ul style="list-style-type: none"> • Problems require several steps of logic and calculation (e.g., problem may involve completing an order form by totaling the order and then computing tax) 	<ul style="list-style-type: none"> • Decide what information, calculations, or unit conversions to use to solve the problem • Look up a formula and perform single-step conversions within or between systems of measurement • Calculate using mixed units (e.g., 3.5 hours and 4 hours 30 minutes) • Divide negative numbers • Find the best deal using one- and two-step calculations and then comparing results

		<ul style="list-style-type: none"> • Calculate perimeters and areas of basic shapes (rectangles and circles) • Calculate percent discounts or markups
6	<ul style="list-style-type: none"> • May require considerable translation from verbal form to mathematical expression • Generally require considerable setup and involve multiple-step calculations 	<ul style="list-style-type: none"> • Use fractions, negative numbers, ratios, percentages, or mixed numbers • Rearrange a formula before solving a problem • Use two formulas to change from one unit to another within the same system of measurement • Use two formulas to change from one unit in one system of measurement to a unit in another system of measurement • Find mistakes in questions that belong at Levels 3, 4, and 5 • Find the best deal and use the result for another calc • Find areas of basic shapes when it may be necessary to rearrange formula, convert units of measurement, or use

		<p>the result in further calculations</p> <ul style="list-style-type: none"> • Find the volume of rectangular solids • Calculate multiple rates
7	<ul style="list-style-type: none"> • Content or format may be unusual • Information may be incomplete or implicit • Problems often involve multiple steps of logic and calculation 	<ul style="list-style-type: none"> • Solve problems that include nonlinear functions and/or that involve more than one unknown • Find mistakes in Level 6 questions • Convert between systems of measurement that involve fractions, mixed numbers, decimals, and/or percentages • Calculate multiple areas and volumes of spheres, cylinders, or cones • Set up and manipulate complex ratios or proportions • Find the best deal when there are several choices

Content of Career Readiness Certificate Work Keys
Assessments (ACT, 2004, p. 9)

Locating Information

Level	Characteristics of Items	Skills
3	<ul style="list-style-type: none"> • Elementary workplace graphics such as simple order forms, bar graphs, tables, flowcharts, maps, instrument gauges, or floor plans • One graphic used at a time 	<ul style="list-style-type: none"> • Find one or two pieces of information in a graphic • Fill in one or two pieces of information that are missing from a graphic
4	<ul style="list-style-type: none"> • Straightforward workplace graphics such as basic order forms, diagrams, line graphs, tables, flowcharts, instrument gauges, or maps • One or two graphics are used at a time 	<ul style="list-style-type: none"> • Find several pieces of information in one or two graphics • Understand how graphics are related to each other • Summarize information from one or two straightforward graphics • Identify trends shown in one or two straightforward graphics

		<ul style="list-style-type: none"> • Compare information and trends shown in one or two straightforward graphics
5	<ul style="list-style-type: none"> • Complicated workplace graphics, such as detailed forms, tables, graphs, diagrams, maps, or instrument gauges • Graphics may have less common formats • One or more graphics are used at a time 	<ul style="list-style-type: none"> • Sort through distracting information • Summarize information from one or more detailed graphics • Identify trends shown in one or more detailed or complicated graphics • Compare information and trends from one or more complicated graphics
6	<ul style="list-style-type: none"> • Very complicated and detailed graphs, charts, tables, forms, maps, and diagrams • Graphics contain large amounts of information and may have challenging formats • One or more graphics are used at a time 	<ul style="list-style-type: none"> • Draw conclusions based on one complicated graphic or several related graphics • Apply information from one or more complicated graphics to

	<ul style="list-style-type: none">• Connections between graphics may be subtle	<p>specific situations</p> <ul style="list-style-type: none">• Use the information to make decisions

VITA

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**ABILITIES IN PROFESSIONAL WORKFORCE DEVELOPMENT &
CONTINUING EDUCATION**

-Fifteen years experience in planning and administration of workforce development programming, higher education continuing education and employment/training initiatives related to adult learners.

-Experienced in processes to plan, develop, implement, deliver and evaluate credit and non-credit education and training programs to business, industry, government and education within SACS and college guidelines.

-Practiced in networking with business and industry owners, managers and HR staff, including maintaining current, ongoing contacts with businesses, organizations, governmental agencies and educational groups to assess needs, develop and market programming to new and existing business, meeting the training needs of line workers, technical staff and executive level managers.

-Skilled in developing curriculum and working closely with faculty to meet education and training needs for adult learners in business, occupational/technical and high-skills technology education, continuing education and customized training.

-Initiated numerous Workforce Development projects, including:

- ✓ developing a Workforce Services newsletter to reach HR staff and CEOs,
- ✓ initiating a Custom Workforce Training Partnership trainers' consortium to expand training opportunities,
- ✓ coordinating an annual area business forum,
- ✓ marketing Work Keys profiling and assessments to area businesses and obtaining two Work Keys project grants

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- ✓ developing an Academy of Senior Professionals to better link the college to its community and obtaining grant funding to support the initial program,
 - ✓ planning and initiating an intensive mechatronics and welding training program to meet employer needs and obtaining grant funding to support program implementation,
 - ✓ organizing and coordinating a division procedures manual and marketing materials, and setting up and maintaining an extensive electronic mailing list and web-based survey questionnaires to quickly assess and market programs to business partners.
- Collaborator with area governments, economic development entities and chambers of commerce, and serve as part of the area economic development team to provide presentations to prospective businesses.
- Practiced in state and national higher education and employment policy and procedure, including SACS self study.

ABILITIES IN MANAGEMENT AND SUPERVISION

- Opened and administer 40,000 sq. ft. Greenfield Education & Training Center, including overseeing \$600,000 budget.
- Conduct strategic planning, environmental scanning and organizational assessment on an ongoing basis to direct college programming. Utilize economic indicators and demographic information to formulate programming direction.
- Lead and supervise staff of faculty, facility managers, paraprofessionals and clerical individuals.
- Collaborate with and respond to various local, state and federal workforce and educational organizations, politicians, etc.

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- Develop resources through grants, donations and collaborations with business, industry and other training providers, partner community colleges, etc.
- Coordinated \$1.2M furniture & equipment purchase and plans for constructing and opening Greenfield Education & Training Center in Botetourt County.
- Plan and coordinate open enrollment schedules each semester of continuing education, business-related classes, arranging faculty, registration, space utilization, etc.
- Develop and manage short-term certificate and diploma programs in numerous areas of workforce training.
- Offer professional and technical customized workforce training to business, industry, governments and other educational institutions.
- Chaired initial accreditation and re-accreditation (SACS) committees with very successful outcomes.
- Teach college-level credit and non-credit classes to traditional and workforce students.

OTHER RELATED ABILITIES

- Effective team member within self-directed workforce development services unit.
- Professional and able to handle multiple projects; organized with superior planning skills.
- Experienced with adult learners in a college environment.
- Effectively interact with a wide socio-economic and cultural group of students and clients.
- Strong public speaker and media contact.

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- Computer literate and well-versed in emerging technologies, office applications and training software such as Blackboard, TrainerSoft, Breeze, etc.
- Knowledgeable of wide variety of training programming, including hard skills required in high-tech industry and soft skills needed in general business practice.
- Self motivated, independent worker.
- Practiced writer, including government reports, newsletters and grants.

EMPLOYMENT

Assistant Professor and Administrative Officer for Workforce Development, Virginia Western Community College's Workforce Development Services/lifelong Learning Division; Greenfield Education & Training Center Administrator, 2000-present.

Workforce Development Coordinator, Virginia Western Community College's Center for Business, Industry & Technology, 1999-2000.

Director of Educational Outreach & Academic Grants, Ferrum College, 1998-1999.

Supervisor, Roanoke City Employment Services Program, 1993-1998.

Employment Specialist, Roanoke City Employment Services Program, 1992-1993.

Director of Counseling & TRIO Counselor, College of Health Sciences & National Business College, 1985-1987.

Assistant Director, Big Brothers/Big Sisters of Roanoke Valley, 1983-1985 & 1987-1992.

Assistant to the Vice President, Japex (U.S.) Corp., 1979-1983.

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EDUCATION

A.B.D., Old Dominion University, Community College
Leadership doctoral program. Anticipated graduation date:
May 2006. Dissertation Title: Evaluating Work Keys
Profiling as a Pre-Employment Assessment Tool to Increase
Employee Retention.

M.Ed., University of Virginia. Degree in
Counseling/College Student Personnel.

B.A., Colgate University. Major in Social Relations.

RECENT PROFESSIONAL DEVELOPMENT

Presentations & Publications

New Horizons (presentation) "Turning the Tables on Service
Learning: Strengthening Community College Ties to the
Community."

NASPA (presentation) "Community College Open Door Policy:
Are Budget Constraints Closing the Door?"

Community College Journal of Research & Practice
(publication, in press) "Is the Community College Mission
in Jeopardy?"

Inquiry (publication, in press) "Increased Reliance on
Adjunct Faculty in the Community College."

Grants Awards

Jessie Ball DuPont Foundation \$200,000 - technology
training center for faculty;

Virginia Community College System \$20,000 -
mechatronics/welding training program development;

Botetourt County Technology \$60,000 - facility technology
expansion;

Virginia Western Foundation \$4,000 - Academy of Senior
Professionals development & implementation.

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Committees and Associations

Chair, Salem/Roanoke County Chamber of Commerce Regional
Development Committee

Ambassador, Botetourt County Chamber of Commerce Membership
Committee

Member, Roanoke Valley Society for Human Resources
Management

Member, American Society for Training & Development

Member, National Association of Student Personnel
Administrators

Member, National Council for Continuing Education &
Training

Participant, VCCS Administrative Leadership Conference &
Training Program