THE RELATIONSHIP OF CONTENT, STIMULUS, AND ORGANIZATIONAL DOMAINS WITH TRANSFER OF TRAINING

By

Barry Rainwater

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Approved:

Linda Howard, Ed.D. — May 26, 2005
Chairperson

Richard T. Rees, Ed.D. — 5/31/05
Committee Member

David L. Morton, D.B.A. — 6/2/05
Committee Member

Russell Abratt, Ph.D. — 6/10/05
Chair, Doctoral Program

J. Preston Jones, D.B.A. — 13 June 2005
Associate Dean, H. Wayne Huizenga School of Business and Entrepreneurship

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Barry Rainwater

Abstract

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Training is a resource that today's companies can draw upon to improve business performance. However, many training solutions are not based on an identifiable need and do not subsequently transfer to the workplace because of a lack of need-based stimuli. Furthermore, many training solutions are not connected with organizational need and thus do not lead to positive changes in business performance.

This study empirically investigates transfer of training and its relationship with the training system. Specifically, this study examines training content, along with its validation, from a systems theory approach as an antecedent of a transfer condition. Further, this study examines stimulus situations in the workplace, or the market for training, also as an antecedent of a transfer condition. Finally, this study looks at the connection between the content of a corporate training program and the organizational domain. Specifically, this study examines training content and its relationship with organizational performance.

The findings reported by this study are based on input from two groups of survey respondents ($N1$=25 & $N2$=146) who provided their perceptions about the essentiality and frequency of use of job tasks for a technical system. Their input was based on a 44-item job task list some of which were included in a training design. Findings were also based on extant financial data associated with each job task. Variables and items were statistically tested using a content validity process, independent-samples t test, paired-samples t test and bivariate correlation analysis. Support was found for nine of the ten hypotheses. These findings represent several implications for corporate management and researchers. Finally, this study recommends future research activities.

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A dissertation is not a product of a single person's work. It is a product that requires both direct and indirect support from many people. To those many people, I would like to sincerely thank you for your help. Your support was from the heart with a generous helping of quality workmanship.

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Chapter I

Introduction

General Background

Human resources development (HRD), or what is commonly referred to as training, is a resource that today's companies can exploit to improve business performance. However, training is not always based on an identifiable need, clearly linked with business strategy, or evaluated for its return on investment. As the following two hypothetical examples illustrate training solutions are sometimes not based on objective research and analysis.

The Actron Company is considering the implementation of a new leadership development program. Becky Smith, the Manager of Organizational Development, was recently certified as a trainer of a popular leadership curriculum by a well-known vendor. She has also convinced her supervisor, the Vice President of Human Resources, that this curriculum would be an excellent program for Actron's managers. The Vice President gives his approval and Becky calls the vendor's account manager and places an order for the initial set of facilitator materials and 50 sets of participant materials - about $25,000 total for the materials. Becky must now schedule the class and convince managers to attend the training because she sees an opportunity for them to

use these skills in the workplace. With 2000 managers and supervisors at Actron, Becky will be very busy for the next couple of years implementing this program.

BLR Consulting has just met with the management team of Reynolds Controls, Inc., and signed an agreement to implement a new total quality management process at Reynolds Controls. The contract is valued at $200,000 for the initial ninety-day pilot. This initiative includes training for designated "quality champions." Bill Jones, the Manager of Product Documentation has just received an email from the Vice President of Quality notifying Bill that he has been selected to attend the quality champion training, next week, for four days. Bill thinks to himself, what is this? I guess the technical manuals for our new Prologic 6500 system will just have to wait.

As these everyday hypothetical examples illustrate, training in today's workplace is a solution, or product, which seeks to satisfy perceived needs and wants, add value to the organization, and ultimately contribute to business success. Further, Howell and Cooke (1989) reported that new technologies and changing work processes have prompted a need for increased training so that employees can keep pace with continuous workplace changes and innovations. Cascio (1998, p. 5) added that for organizations to succeed and prosper in the changing world of work, they would need motivated, technically literate

workers. Likewise, in the life safety industry, the subject industry for this research, the continuous introduction of new products has created a need for continuous training and retraining if life safety companies are to have a technical edge and remain competitive in the ever-changing marketplace. In fact, a commissioned market study for the life safety industry identified three primary opportunities that would increase a company's market share. One of these opportunities was training (Life Safety Industry Presentation, 2002).

Thus, not only do organizations have a need to develop their human resources they must also link it with organizational performance and success. For example, the American Society for Training and Development's (ASTD) 2002 State of the Industry Report identified that the number one trend in shaping today's workplace was the increasing pressure from shareholders for short-term profits resulting in greater pressure on employees to produce results and on training to show a return on investment (Van Buren & Erskine, 2002). In addition, Anthony and Norton (1991) stated that because corporate leaders recognize that their competitive edge is their people, corporate education and training programs have become one of the fastest growing industries in the United States.

W. R. Hambrecht and Company reported that in the United States the education sector, at $772 billion, was only second to

the leading U.S. industry sector, healthcare; and specifically, corporate training represented $66 billion of that sector (Clarke & Hermens, 2001). For example, the life safety company, that is the subject company of this research, spends about $1.3 million annually on customer training with its customers contributing another $2 million in related travel expenses. Its competitors also spend a similar amount with the largest competitor reportedly spending about $5 million annually for technical training.

Unfortunately, Georgenson (1982) estimated that as little as 10 percent of the money spent on training leads to behavioral change back on the job. Ford and Wroten (1984) stated that pressures to develop and implement training programs to address perceived deficiencies in the workforce often prevent a thorough initial analysis of training needs. McGehee and Thayer (1961) stated that many training efforts are begun without any reason, continued with no purpose, and end with no results. Montesino (2002) explained that human resources development professionals in some cases may be focusing on state-of-the-art delivery methods at the expense of the critical link between training and the work environment. So, if one were to measure the success of corporate training, by looking at the transfer of knowledge and skills from the classroom to practiced and sustained work behaviors the success rate appears to be quite low.

Furthermore, based on the financial metrics presented by Clark and Hermens (2001) there appears to be, currently, an estimated economic loss to U.S. corporations of about $60 billion annually. Thus, given these metrics, one could also postulate that the subject company could also be experiencing an economic loss of about $3 million per year based on the transfer rate reported by Georgenson (1982).

Holton (1996) concluded that training activities are under increasing pressure to be evaluated not only on their ability to elicit positive reactions from trainees and show evidence of learning, but also on the extent to which they are able to improve performance and show a business result, i.e., a positive return on investment. Kirkpatrick (1978) presented data, based on his training evaluation model, indicating that the majority of training programs were evaluated using reaction measures (satisfaction with training), approximately half used learning measures (retention of knowledge and skills), and fewer than 20 percent were evaluated using either behavioral (change in work behaviors) or results measures (change in organizational performance). Recently, the ASTD State of the Industry Report for 2002 stated that 78 percent used reaction measures, 32 percent used learning measures, 9 percent used behavior measures, and 7 percent used results measures (Van Buren & Erskine, 2002). Unfortunately, the measurement of transfer of

training has been researched, documented, and applied by academics and practitioners for many years with possibly little advancement, definitive conclusions, or formulas for success. Researchers have proposed models and methods to measure transfer of training (Kirkpatrick, 1978) and others have questioned these models and proposed new models and methods (Baldwin & Ford, 1988; Alliger & Janak, 1989; Holton, 1996; Holton, Bates, & Ruona, 2000).

To understand the problem of transfer, researchers have generally focused on three broad areas: training design, trainee characteristics, and organizational climate (Huczynski & Lewis, 1980; Baldwin & Ford, 1988; Holton, 1996). Holton et al. (2000) referred to this as the transfer system, which are all the factors in the person, training, and organization that influence transfer of learning to job performance. Some researchers (Baldwin & Ford, 1988; Ford & Weissbein, 1997; Holton et al., 2000) have implied that transfer of training can only be explained through a multivariate examination of the problem because of the wide range of variables that can affect training outcomes. In addition, the complexity of their relationships combined with the multidimensional nature of transfer makes the study of training transfer an intricate, complex, and time-consuming task. Therefore, these researchers have suggested one of the first steps in solving the transfer of training problem

must be the identification, modeling, and study of as many significant transfer variables as is possible.

Statement of the Problem

Developing and improving employee and organizational performance in order to create shareholder wealth is a vital issue to the modern company. If the effort is made to train an employee and funds are spent on a training product, then it is reasonable to expect that the company will see an improvement in both the employee's and the company's performance. Therefore, while the transfer rate may vary from organization to organization, the current ten percent transfer rate suggested by Georgenson (1982) is certainly not acceptable and is a business performance problem that needs to be solved.

Thus, organizations need to seek and implement practical solutions that will ensure that the knowledge, skills, and abilities (KSA) taught in training are actually needed by the organization and can be transferred to the workplace given a stimulus to do so. Furthermore, organizations must look for tangible ways to associate training with positive changes in behavior and improved workplace performance to include business improvement. Consequently, it is of paramount importance that training programs are directly connected to the job and the organization. Given the research, which has attempted to define

transfer of training, develop transfer models, and identify variables, there is still no definitive and validated process that clearly and practically explains the transfer of training problem. Thus, many questions remain unanswered.

Purpose of the Research

The purpose of this dissertation is to empirically investigate transfer of training and its relationship with the training supra-system. Specifically, this study looks at training content, along with its validation, from a systems theory approach as an antecedent of a transfer condition. Further, this study examines stimulus situations in the workplace, or the market for training, as a task cue and indicator to use learned knowledge and skills, also as an antecedent of a transfer condition. Finally, this study looks at the connection between the content of a corporate training program and the organizational domain that it presumes to effect. Specifically, this study examines training content and its relationship with business performance as a goal cue and indicator of a transfer condition.

From a research-based perspective, this study seeks to expand upon transfer of training theories and models (Lawshe, 1975; Ford & Wroten, 1984; Baldwin & Ford, 1988; Goldstein & Gilliam, 1990; Rouiller & Goldstein, 1993; & Holton et al.,

2000). This study references these concepts and models in relationship with the training supra-system, and more specifically, the training design process, which has been a frequently overlooked aspect of transfer of training (Baldwin & Ford, 1988). Furthermore, this study investigates the training supra-system from a systems theory perspective and the need for the redesign of training based on changing stimulus demands. Ford and Wroten (1984) stated that more research efforts were needed to develop strategies which provide the feedback linkages necessary to modify existing training programs and to ensure that the programs are better meeting their stated objectives. Finally, this study looks at the training system and its connection with the organizational domain. Holton (1996) stated that for organizational results to occur, training must be linked with organizational goals and have utility or payoff to the organization.

Operationally, this study seeks to detail a training system process that first validates the training content and then further correlates the training solution with an on-going stimulus opportunity and business need for the training. In other words, for transfer to be successful there must first be an individual and organizational need for training and the training solution must be validated to ensure that it does in fact correlate with the day-to-day job performance domain.

Additionally, there must be an on-going and validated behavioral stimulus, or cue, in the workplace to use the training if the trainee is to be expected, and have a situational opportunity, to transfer the training. Finally, training must be must linked with the organizational domain, and more specifically a business metric, if it is to have an associated organizational utility or pay-off. This organizational link further validates the training design, the original need for training, and the need for transfer to improve the job performance domain.

Research Questions

Based on previous research and to further add to the body of knowledge on transfer of training, the purpose of this study is to answer these research questions:

1. To what extent is there a relationship between the training content domain and the job performance domain based on an examination of the content validity metrics of importance and frequency?
2. To what extent is there a relationship between the stimulus domain, the training content domain, and the job performance domain based on an examination and correlation of stimulus and content validity metrics?
3. To what extent is there a relationship between the training content domain, the stimulus domain, and the organizational

domain based on correlations of these domains and their respective metrics?

Research Hypotheses

The hypotheses for this research study, stated in the null and alternative forms, are:

Ho1: There is no relationship between the job performance domain and the content domain of a training program based on an examination of its content validity ratios (CVR).

Ha1: There is a relationship between the job performance domain and the content domain of a training program based on an examination of its content validity ratios (CVR).

Ho2: There is no relationship between the job performance domain and the content domain of a training program based on an examination of its frequency validity ratios (FVR).

Ha2: There is a relationship between the job performance domain and the content domain of a training program based on an examination of its frequency validity ratios (FVR).

Ho3: There is no relationship between content validity ratios and frequency validity ratios (FVR).

Ha3: There is a relationship between content validity ratios and frequency validity ratios (FVR).

Ho4: There is no relationship between the stimulus domain, or transfer opportunities in the workplace, and the job

performance domain based on an examination of its stimulus validity ratios (SVR).

Ha4: There is a relationship between the stimulus domain, or transfer opportunities in the workplace, and the job performance domain based on an examination of its stimulus validity ratios (SVR).

Ho5: There is no relationship between the job performance domain and the stimulus domain based on an examination of its stimulus-frequency validity ratios (S-FVR).

Ha5: There is a relationship between the job performance domain and the stimulus domain based on an examination of its stimulus-frequency validity ratios (S-FVR).

Ho6: There is no relationship between the stimulus validity ratios (SVR) and stimulus-frequency validity ratios (FVR).

Ha6: There is a relationship between the stimulus validity ratios (SVR) and stimulus-frequency validity ratios (FVR).

Ho7: There is no relationship between graduates' perception of task importance (SVR) and an expert panel's perception of task importance (CVR).

Ha7: There is a relationship between graduates' perception of task importance (SVR) and an expert panel's perception of task importance (CVR).

Ho8: There is no relationship between graduates' perception of frequency of occurrence of a job task in the workplace (S-

FVR) and an expert panel's perception of frequency of occurrence of a job task in the workplace (FVR).

Ha8: There is a relationship between graduates' perception of frequency of occurrence a job task in the workplace (S-FVR) and an expert panel's perception of frequency of occurrence of a job task in the workplace (FVR).

Ho9: There is no relationship between the organizational domain, or a business goal/measure within an organization, and the training content domain based on a correlation of content validity ratios and its respective product component revenue value.

Ha9: There is a relationship between the organizational domain, or a business goal/measure within an organization, and the training content domain based on a correlation of content validity ratios and respective product component revenue value.

Ho10: There is no relationship between the organizational domain, or a business goal/measure within an organization, and the stimulus domain based on a correlation of stimulus validity ratios and its respective product component revenue value.

Ha10: There is a relationship between the organizational domain, or a business goal/measure within an organization, and the stimulus domain based on a correlation of stimulus validity ratios and its respective product components revenue value.

Assumptions of the Study

This study is based on certain assumptions:

1. It is assumed that the Lawshe (1975) content validity study, to include the statistical formula and measures used in that study, are viable and appropriate methods for the content validation of training programs.
2. It is also assumed that the Ford and Wroten (1984) study further validates the Lawshe (1975) study and adds additional insight into its use as a valid quantitative method to measure the content validity of a training program. Additionally, this study assumes that the Ford and Wroten "matching technique" is also a viable method for correlating the need for training with the emphasis on training in a training program.
3. It is assumed that both the subject matter experts and the graduates of the training program are capable of making judgments (Lawshe, 1975; Messick 1995) about the requirements of the workplace; and, their responses are unbiased and accurately reflect the requirements of the workplace.
4. It is finally assumed that this study of a specific set of training tasks and the stimulus-response nature of transfer of training is also applicable to other

training programs and the transfer of those tasks to the workplace.

Definition of Terms

The following definitions are applicable to this study:

Training. A planned learning experience designed to bring about permanent change in an individual's knowledge, skills, and attitudes (Noe & Schmitt, 1986). The systematic acquisition of skills, rules, concepts, and attitudes that result in improved performance in the work environment (Goldstein & Gilliam, 1990).

Transfer of training. The extent to which trainees effectively apply knowledge, skills, and attitudes gained in training back to the job (Tannebaum & Yukl, 1992). The application, generalization, and maintenance of new knowledge and skills (Ford & Weissbein, 1997). Baldwin and Ford (1988) further stated that for transfer to have occurred, learning behavior must be generalized to the job context and maintained over a period of time on the job.

Training design. A combination of principles of learning, the sequencing of instruction, and training content (Baldwin & Ford, 1988). Furthermore, Gagne, Briggs, and Wager (1992, p. 27) added that an instructional strategy is a plan for assisting the learners with their study efforts for each performance

objective. This may take the form of a lesson plan or a set of production specifications for mediated materials.

Transfer design. The degree to which (1) training has been designed and delivered to give trainees the ability to transfer learning to the job, and (2) training instructions match job requirements (Holton et al., 2000).

Training needs assessment. A process to determine where the greatest training need exists (McClelland, 1992). A means to identify areas where the organization can obtain maximum value for the training and development dollar (McClelland). A needs assessment consists of an organizational, operations (task), and person analysis (McGehee & Thayer, 1961).

Task analysis. A formal procedure that classifies performance into behavioral categories for which the optimum learning conditions are presumed to differ (Gossman & Martinez, 1988). The primary goal of task analysis is to analyze activities and categorize them into their underlying components (Gossman & Martinez; Gagne, 1962). It is a process of identifying and classifying the performances that are the outcomes of training (Gagne, 1974). It is the basis for several important training system processes to include the derivation of knowledge and skill requirements for training (Gossman & Martinez).

Job performance domain. An identifiable segment or aspect of the job performance universe about which inferences can be made (Lawshe, 1975).

Content domain. A defined segment of the curriculum universe (Lawshe, 1975). The "curriculum" or "course of study" (Gagne et al. 1992). The "instructional program" (Goldstein & Gilliam, 1990.

Content validity. The extent to which overlap, or communality, exists between (a) performance on the test under investigation and (b) ability to function in the defined job performance domain (Lawshe, 1975). Cronbach (1970) as cited in Tenopyr (1977) stated that content validity is evaluated by showing how well the content of the test samples the class of situations about which conclusions are drawn. It has also been defined as the extent to which training content accurately reflects job requirements (Holton et al., 2000).

Stimulus domain. An identifiable segment or aspect of the stimulus universe about which inferences can be made. Further, it is identifiable demands to use learned tasks found in a job performance domain. Operationally, it is stimulus situations, observed as cues, which in turn demands learned responses.

Stimulus validity. The extent to which overlap, or communality, exists between performance on a test under investigation, in this case the training content domain, and an

identifiable stimulus domain that demands the use of learned tasks found in the job performance domain. Operationally it is the extent to which the stimulus domain correlates with the content domain of a training program. Or, the extent to which an employee may be provided with opportunities to use learned tasks based on stimulus situations, or observed cues, in the workplace.

Organizational domain. An identifiable segment or aspect of the organizational universe about which inferences can be made. Further, it is an organizational goal or outcome that drives or is driven by the use of the learned tasks found in the job performance domain.

Organizational validity. The extent to which overlap, or communality, exists between performance on a test under investigation, in this case the training content, and organizational goals or outcomes that drive or is driven by the use of learned tasks found in the job performance domain. Operationally it is the extent to which the organizational domain correlates with the content domain of a training program. Or, the extent to which an employee uses learned tasks based on as association with a goal cue in the workplace.

Scope and Limitations of the Study

Scope. This research study is an empirical study that seeks to add to the body of knowledge on transfer of training. The focus of this study is on product training delivered by a subject company to its external customers, who in turn install, program, and service these products. This study examines a selected product training program, its curriculum, and the transfer of this curriculum to the workplace. Specifically, this study examines the original need for this training, both from a behavioral and business aspect, as well as, the on-going need for this training. This study attempts to validate the training content using statistical measures proposed in previous research (Lawshe, 1975; Ford & Wroten, 1984).

Limitations. This study is limited to the subject company, a selected training program, and the participants of the training program. This study is also limited to analysis based on survey data from graduates of these training programs who are willing to participate in this study.

Summary and Organizations of Chapters

Transfer of training continues to be a widely studied phenomenon in the field of human resources development. Many models have been proposed and researched (Noe & Schmitt, 1986;

Baldwin & Ford, 1988; Kirkpatrick, 1996; Holton et al., 2000) with many questions still to be answered. As companies continue to demand results from its human resources programs and processes, the investment in training and the resulting transfer of training will be under increased scrutiny. If the transfer of training problem cannot be solved, then the very benefit of training may come into question. Therefore, practitioners and researchers alike must continue to seek answers to this problem and look for practical ways to help organizations ensure that transfer takes place.

Chapter One, introduction, provides a basic review of the background for this study, as well as, a statement of the problem. Chapter One also defines the basic research questions posed by this study and the study's hypotheses, in both their null and alternate forms. Finally, the study's assumptions, definitions of terms, and the scope and limitations of the study are also discussed in this chapter.

Chapter Two, review of the literature, discusses the training system and transfer of training. This chapter reviews theories and models that have been associated with transfer of training to include variables, both independent and dependent. This chapter reviews in detail selected variables that are the subject of this research.

Chapter Three, methodology, discusses the research methods to be used in the study, including survey instruments, their validity and reliability. It also defines the variables and the population as well as describes the data collection procedures. Finally, Chapter Three describes the statistical techniques and analyses used in the study.

Chapter Four, analysis and presentation of findings, provides information on the sample frame and survey electronic mail results, sample frame demographics, and descriptive statistics. Chapter Four also provides a description of the hypotheses with supporting statistical test results.

Chapter Five, summary and conclusions, provides an overview of significant findings and their implications for business managers and researchers. It discusses limitations of the study, provides recommendations for future research, and provides conclusions of the study.

Chapter II

Review of the Literature

Training and Transfer of Training

This chapter reviews literature on the training system and specifically focuses on the phenomenon of transfer of training and the conditions and variables that are believed to influence it. A general definition of training and transfer of training is presented along with a review of transfer of training theories and past studies testing proposed models of the training transfer process. This chapter also discusses the core theory of this study, general systems theory, and reviews basic instructional systems design concepts to include training needs assessment and task analysis. Finally, this chapter reviews the content, stimulus, and organizational domains and their relationships with transfer of training.

In general, Noe & Schmitt (1986) defined training as a planned learning experience designed to bring about permanent change in an individual's knowledge, skills, and attitudes. Gagne et al. (1992) explained that changes in behavior take place following an experience with an identifiable situation. They further added that these situations stimulate a change in behavior and the process that makes such a change occur is called learning. Therefore, training is a process that helps

people learn. Holton (1996) further distinguished between learning, which is an internal behavior, and individual performance, which he believed was a more appropriate descriptor of human resources development objectives. Kirkpatrick (1994) also distinguished between "learning," which is an improvement in knowledge and skills, versus "behavior," which is the application of knowledge and skills to the job. Thus, Goldstein & Gilliam (1990) stated that training programs are learning events planned in a systematic fashion that are focused on the work environment. They further stated that the training process is the systematic acquisition of skills, rules, concepts, or attitudes that result in improved performance in the work environment.

Transfer of training is the extent to which trainees effectively apply the knowledge, skills, and attitudes gained in training back to the job (Tannebaum & Yukl, 1992). Ford and Weissbein (1997) added that transfer of learning involves the application, generalizability, and maintenance of new knowledge and skills. Baldwin and Ford (1988) further stated that for transfer to have occurred, learning behavior must be generalized to the job context and maintained over a period of time on the job. Baldwin and Ford identified generalization and maintenance as two distinct outcome variables in the transfer process. Thus, transfer occurs when an employee's individual performance

changes based on a learning situation and that change is generalized to the job performance domain and subsequently maintained for an extended period.

Many also believe transfer to be an improvement in business performance. Swanson (1998), for example, stated that any organization that remains alive would ultimately judge each of its components from a return-on-investment (ROI) framework. Kirkpatrick (1994) identified a change in "results" as one of the four levels of training evaluation. Kirkpatrick stated that results could include increased production, improved quality, decreased costs, increased sales, higher profits, and a better return on investment. Holton (1996) also stated that at the organizational level for results to occur, training must be linked with organizational goals and have utility or payoff to the organization. Anthony and Norton (1991) emphasized that the value of training is the timely development of people necessary to meet the company's goals. Furthermore, Montesino (2002) stated that HRD professionals should look at the strategic link of training as a means to encourage the application of skills learned in training. Therefore, transfer of training is not just a positive change in individual performance, but also a positive change in organizational performance; and ultimately, a payoff for the organization.

Transfer of Training Theories

A theory explains a phenomenon by identifying its main ideas, or concepts, and by stating the relationships among these concepts (Swanson & Holton, 1997). Transfer of training has been researched for many years from many different theory-building perspectives. Some researchers (Thorndike & Woodworth, 1901; McGehee & Thayer, 1961; Gagne, 1962; Bushnell, 1990; Goldstein & Gilliam, 1990) have approached it from an instructional design perspective to include identical elements, teaching general principles, varying training stimuli, and conditions of practice (Gist, Stevens, & Bavetta, 1991, Baldwin & Ford, 1988). While others have approached it from a focus on trainee motivation and ability (Noe, 1986; Noe & Schmitt, 1986; Mathieu, Tannenbaum, & Salas, 1992; Facteau, Dobbins, Russell, Ladd, & Kudisch, 1995); and still others (Rouiller & Goldstein, 1993; Swanson, 1998), have looked at the transfer climate itself to include pre- and post-training interventions, studies of organizational climate, strategic alignment, return-on-investment, or other internal and external work environment factors. Finally, some researchers (Huczynski & Lewis, 1980; Noe & Schmitt, 1986; Baldwin & Ford, 1988; Holton et al., 2000) have incorporated all of these elements into multivariate models. For example, Huczynski and Lewis (1980) developed a model, which illustrated the interaction of course content,

trainee motivation, and work environment in the transfer process.

Instructional design theories. According to Gagne et al. (1992) an instructional system is an arrangement of resources and procedures used to promote learning. However, Holton (1996) stated that one cause of transfer failure is that the training design rarely provides for transfer of learning. Therefore, Gagne et al. explained that we must look for those elements of learning theory that pertain to the events and conditions about which an instructor can do something. In 1979, Royer reviewed learning theories that he believed were associated with transfer of training. Royer identified two classes of theories. The first class, environmental theories, was based on conditions of transfer that were established when the original learning event and the transfer event shared common stimulus properties. Royer stated that environmental theories are facilitative theories associated with a behavioristic tradition; or, observables in the learning situation that connect stimulus events with response events. The second class of theories, cognitive theories, was the product of successful memory search processes and the subsequent retrieval of relevant knowledge and skills based on a given problem. Royer explained that facilitative transfer would be enhanced by increasing the likelihood that

relevant knowledge and skills could be retrieved in appropriate learning situations. Gagne et al. simplified this by stating that the learning situation has two distinct parts, one internal and one external to the person. The internal part is derived from stored memories and the external part is derived from an external stimulation or activation of the internal processes of learning.

According to Royer (1979) one of the earliest proposed environmental theories was from Thorndike and Woodworth (1901) who proposed the theory of identical elements. Thorndike and Woodworth stated, "The general consideration of the cases of retention or of loss of practice effect seems to make it likely that spread of practice occurs only where identical elements are concerned in the influencing and influenced function." In other words, the more similar the learning and the performance situations are in terms of the stimuli present and responses required, the more likely it is that transfer will occur (Desimone, Werner, & Harris, 2002). In contrast, if the trained individual did not recognize that the stimulus in the work setting was identical to the task learned in training, then the transfer could not occur (Royer, 1979).

Another similar environmental theory is the concepts of near and far transfer. Royer (1979) defined near transfer as a situation where the stimulus for the transfer event is very

similar to the stimulus for the original learning event. In contrast, far transfer is a situation where the transfer stimulus is somewhat different than the original learning event. Royer added that far transfer is in fact a situation where a learned event transfers to a real-world problem. Laker (1990) added that far transfer is the extent to which the trainee applies the training to situations that are novel or different. Royer further described far transfer as "stimulus generalization." An example Royer cited of far transfer was the ability to compute the area of a rectangle and later recognize that this skill could be used to calculate the square-footage for room carpet. Royer predicted that the next generation of transfer theories will be similar to environmental theories in the sense that heavy emphasis will be placed on an analysis of the stimulus event.

Royer's (1979) second class of transfer theories was related to the cognitive retrieval of a relevant skill when a particular problem was encountered. He used the example: learning that all ducks have webbed feet, then learning that a mallard was a duck, and subsequently concluding that mallards have webbed feet. Royer, however, stated that the environmental theories described previously seem more directly applicable to near transfer, but what cognitive theory provided was a powerful heuristic for thinking about transfer from learning to real-

world situations. Furthermore, it provided some guidelines for designing training so that it enhanced the likelihood of far transfer. McGehee and Thayer (1961) discussed a related theory, general principles, where trainees are taught, not just skills, but also the general rules and theoretical principles that underlie the training content. They added that learning underlying principles enhances trainees' ability to use newly acquired skills in different work environments. For example, a training design technique mentioned by Royer, and especially relevant in technical training, is the use of application questions, which is to teach participants a skill and then demonstrate its use with several real world problems. Baldwin and Ford (1988) referred to this as "stimulus variability" and stated that positive transfer is maximized when a variety of relevant training stimuli are employed.

Motivational theories. Motivation to transfer training can be described as a trainee's desire to use the knowledge and skills learned in training on the job (Noe & Schmitt, 1986). Therefore, researchers have investigated transfer of training based on theories that posits a connection between the phenomenon of transfer and influential factors such as trainee motivation, expectations of performance, capability, and fulfillment. These include, but are not limited to, theories of

expectancy, equity, goal setting, and self-efficacy (Yamnill, & McLean, 2001; Desimone et al., 2002).

Expectancy theory was first proposed by Vroom (1995) and assumes that motivation is a conscious choice process; and, choice is based on three sets of beliefs: expectancy, instrumentality, and valence. Expectancy represents an individual's judgment about whether applying effort to a task will result in its successful accomplishment (Desimone et al., 2002). Yamnill and Mclean believed, however, that expectancy emphasized an individual's capacity or ability, rather than willingness to perform a specific task. Gist et al. (1991) attempted to distinguished between self-efficacy, which is a judgment of performance capability, and expectancy, which pertains to the consequences. Next, Werner, O'Leary-Kelly, Baldwin and Wexley (1994) stated that trainees must understand their need for training, as well as how this training can help them in the future - the instrumentality of training. Lastly, according to Holton (1996) expectancy theory stated that individuals would be more motivated if they perceive that their effort will lead to rewards they value. Vroom called this valence, which is the value, the person places on a particular outcome. Tannenbaum, Mathieu, Salas, and Cannon-Bowers (1991) also called this training fulfillment or the extent to which training meets or fulfills a trainee's expectations and desires.

Given this knowledge of expectancy theory, several researchers (Noe & Schmitt, 1986; Noe, 1986; Baldwin & Ford, 1988; Mathieu et al., 1992; Tannenbaum & Yukl, 1992; Holton, 1996; Holton et al., 2000) in their studies of transfer have identified trainee ability and/or motivation as influential elements of transfer. For example, Tannenbaum and Yukl (1992) stated it is widely accepted that learning and transfer will occur only when trainees have both ability ("can do") and volition ("will do") to acquire and apply new skills (Wexley & Latham, 1991; Noe, 1986). In the Baldwin and Ford (1988) model trainee characteristics that affect transfer are comprised of trainee ability, personality, and motivation; and, the Holton et al. (2000) transfer system inventory model identified trainee ability and motivation as factors affecting transfer.

Adam's (1963) equity theory was based on the premise that people want to be treated fairly and with relative justice. Adams defined equity theory as a circumstance when a person perceives job inputs and/or outcomes as standing psychologically in an analogous relation to what is perceived as the inputs and/or outputs of another person. Vroom also recognized that individuals seek equity in their jobs; thus, job satisfaction reflects the extent to which rewards received match the rewards the employees perceive should be received (Yamnill & McLean, 2001). Furthermore, Noe (1986) stated that if an individual who

attends training believes that this action will lead to equity in pay, or other types of rewards, then there is a greater chance that learning will occur, and such learning will be transferred to the job. Desimone et al. (2002) added that if employees see other employees who lack the newly acquired skills receiving the same outcomes as themselves (inequity) they may choose not to transfer these skills to the job as a way to restore a feeling of equity.

Another theory that has been purported to have a relationship to human resources development is goal-setting theory. Goal setting theory is a focus on a level of performance an individual is trying to accomplish (Yamnill, & McLean, 2001). Yamnill and McLean further stated that if individuals perceive what they learn is relevant to their goal; they will be more motivated to transfer learning into on-the-job performance. According to Kraiger, Ford, and Salas (1993) goal setting rests on three assertions, 1. Individuals differ in the extent to which they are active in self-management processes, 2. Individual differences in the type and structure of goals have been identified as an important difference between task experts and novices, and 3. Individual differences in the presence and quality of goals may hold additional applications for the extent to which knowledge and skills acquired in training are applied to the job. Wexley and Baldwin (1986) found that both assigned

and participative goal setting conditions were superior to behavioral self-management and control conditions in inducing maintenance of behavioral change. Locke, Shaw, Saari, and Latham (1981) stated that the beneficial effect of goal setting on task performance is one of the most robust and replicable findings in psychological literature.

A final motivational theory that has been discussed in the literature is self-efficacy or social learning theory (Desimone et al., 2002). Derived from social cognitive theory, self-efficacy is a belief in one's capability to mobilize the cognitive resources, motivation, and courses of action needed to meet task demands (Wood & Bandura, 1989). Gist et al. (1991) added that self-efficacy represents a dynamic and comprehensive judgment reflecting a variety of personal and task-specific capability. Furthermore, they stated that perceptions of self-efficacy might result from personal experience with similar training tasks, the development of performance strategies, or verbal persuasion/encouragement. In other words employees with high self-efficacy will make a greater effort to transfer skills based on their mastery of skills and those with low self-efficacy will see only obstacles and shortcomings in their efforts to transfer training (Desimone et al., 2002). Thus, Gist et al. in a study of an interpersonal skills training program, and the subsequent transfer of training, found that

high self-efficacy contributed positively to both initial skills transfer and skills maintenance. Tannenbaum et al. (1991) also found, in a study of military recruits, that training fulfillment was positively related to post training organizational commitment, physical self-efficacy, and training motivation. Tannenbaum et al. stated that training fulfillment refers to the extent to which training meets or fulfills trainee's expectations and desires. Thus, research has shown that self-efficacy can have a positive effect on transfer of training.

Work environment theories. Rouiller and Goldstein (1993) stated that the organizational climate is at least as important as learning in facilitating transfer. Huczynski and Lewis (1980) stated that the work situation could usually be conceived as a field containing forces inhibiting or facilitating the introduction and application of new methods and techniques. Mathieu et al. (1992) also stated that even when learning occurs during training the transfer climate might either support or inhibit its application on the job. In a study by Vandenput (1973), which sought to test organizational variables that influenced transfer of training, Vandenput similarly found that that the organization can either inhibit or facilitate transfer.

Kozlowski and Salas (1997) as cited in Yamnill and McLean (2001) stated that the need for change, training interventions, and training transfer are embedded within the context of work team, sub-unit, and organizational performance. Thus, Kozlowski and Salas proposed an organization theory based on concepts drawn from systems oriented theories. Key concepts included external environment influences, subsystems embedded within larger systems, and the reduction of systems to their individual components. Yamnill and McLean added that organization theory enhances the identification of tangible, work environment characteristics such as structure, reward systems and decision autonomy. Yamnill and McLean concluded that preparing individuals to accept training-induced change and encouraging them to transfer training requires that training is delivered at the appropriate level and is congruent with the organizational system.

Desimone et al. (2002) also proposed a model that represented the key factors affecting employee behavior. These factors were divided into two categories: 1) Internal forces such as employee motivation, attitudes, and abilities; and, 2) External forces to include the external environment, or outside the organization, and the work environment itself, which included personal and organizational outcomes, leadership and supervision, organizational processes and culture, and coworkers

and teams. Desimone et al. believed that in order to change behavior we must first understand the factors that cause employees to behave the way they do on the job. They further stated that although it may be possible in some cases to trace the cause of behavior to one or two dominant forces, they believed that overall patterns of behavior could best be explained by the combination of many factors.

Thus, Holton, Bates, Seyler, and Carvalho (1997) stated that the work environment could be viewed as a transfer of training climate. They defined the transfer climate as a mediating variable in the relationship between the organizational context and an individual's attitude toward the job and behavior on the job. Likewise, Tracey, Tannenbaum, and Kavanagh (1995) found that the social support system within an organization played a central role in facilitating the transfer of training. Therefore, Huczynski and Lewis (1980), Baldwin and Ford (1988), and Holton et al. (2000) have identified organizational climate as a key factor affecting transfer of training and have thus included this construct in their models of transfer of training.

Transfer of Training Models

Theory building is the process of modeling real-world phenomena (Swanson & Holton, 1997). Turban and Aronson (2001)

stated that a model is a simplified representation or abstraction of reality. It is simplified because reality is too complex to describe precisely and because much of the complexity is actually irrelevant in solving the specific problem. A review of the research identified a number of models that have been associated with transfer of training and their relationship with other workplace processes and systems. In fact, transfer of training and linkages to transfer of training are quite numerous. For this study, models are presented from these authors: Kirkpatrick (1994); Noe and Schmitt (1986); Baldwin and Ford (1988); Rouiller and Goldstein (1993); Holton (1996); Holton et al. (2000).

Four levels of training evaluation. Discussions about transfer of training, by both practitioners and researchers alike, usually begin with a reference to Donald Kirkpatrick's (1994) work on training evaluation. While some, such as Holton (1996), believe that Kirkpatrick's work is flawed, others such as the American Society for Training and Development continue to reference Kirkpatrick's hierarchical model when discussing training evaluation (Van Buren & Erskine, 2002).

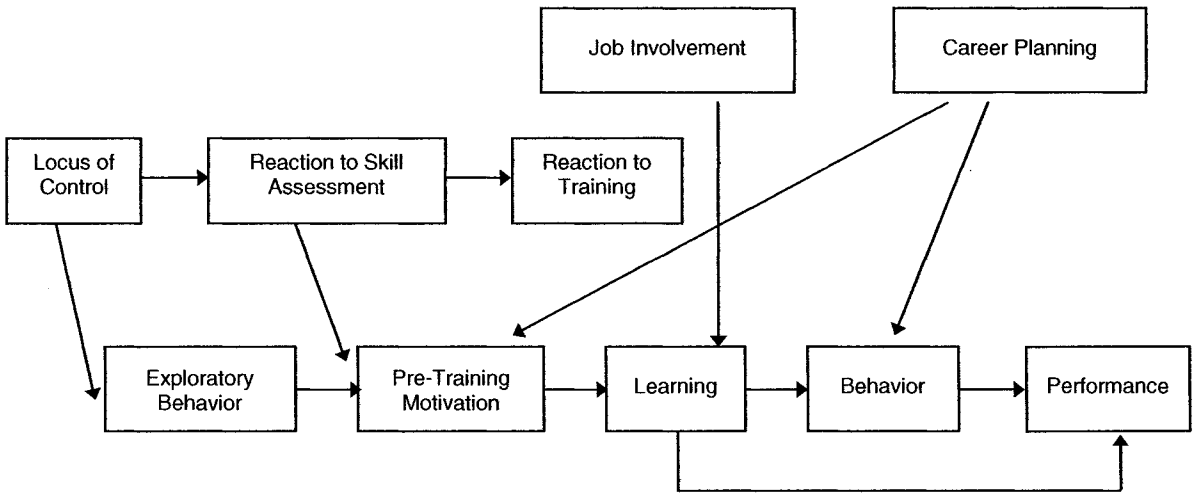
Kirkpatrick (1994) identified four levels of training evaluation: reaction, learning, behavior, and results. According to ASTD research, the most widely used form of

training evaluation is reaction (Van Buren & Erskine), which assesses trainee satisfaction with the training program. Reaction, or level 1, is usually measured through an end-of-course evaluation form. Many corporate trainers refer to this as the "smiley sheet," which typically measures trainee satisfaction with the instructor, course content, and training facilities. Next, is learning, or level 2, which measures retention of the material, which is usually assessed through some form of knowledge and skills testing? Level 3, Behavioral evaluation, measures the change in or improvement in behavior on the job and is the measure most closely associated with transfer of training. However, according to ASTD, it is only used by about nine percent of organizations (Van Buren & Erskine). Finally, results, or a level 4 evaluation, are a change in organizational or business performance. Likewise, it is only used by about seven percent of organizations (Van Buren & Erskine). Therefore, regardless of opinion about the validity of the Kirkpatrick model, it does point to the necessity of measuring behavioral change on the job and business results; and, the current absence of these levels of measurement in corporate training programs.

Motivational influences model. Noe (1986) stated that motivational and environmental influences of training

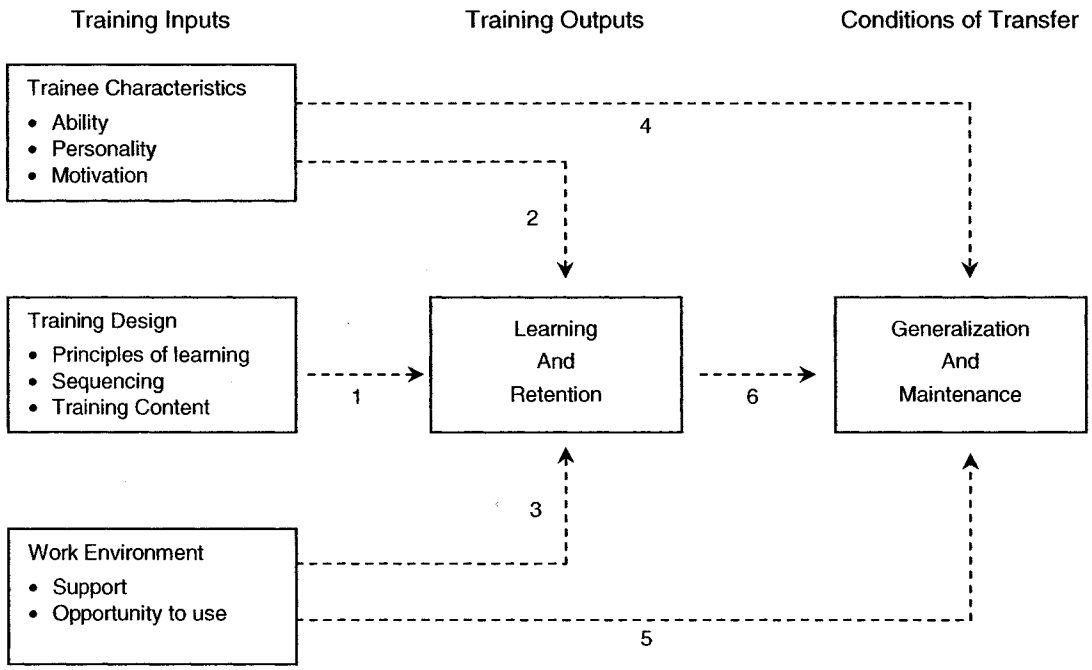
effectiveness have received little attention. Therefore, he analyzed previous research on important motivational and situational factors from organizational behavior theory and research and proposed a model, which described trainees' attributes and attitudes that may influence the effectiveness of training. Noe and Schmitt (1986) further refined and tested this model (see figure 1). The results of their study suggested that job involvement and career planning were antecedents of learning and behavior change. Their study identified a number of causal relationships to include a statistically significant relationship between reaction to skill assessment and reaction to training, job involvement and learning, as well as career planning and behavior change. More specifically, with regard to skill assessment and reaction to training, Noe and Schmitt found that trainees who agreed with the assessment of their skill weaknesses, on which their training needs were based, were more likely to perceive the content of the training to be useful and helpful for skill improvement. Noe and Schmitt further concluded that studies were needed to determine which types of needs-assessment techniques trainees perceive as providing the most useful information concerning skills strengths and weaknesses.

Figure 1. Alternative path model of motivational influences on learning and supervisor behavior and performance ratings (Noe & Schmitt, 1986)



Transfer process model. Baldwin and Ford (1988) reviewed past transfer of training literature and proposed a model of the transfer process (see figure 2). This model was composed of a framework described in terms of training input factors, training outcomes, and conditions of transfer. Training input factors consisted of three sets of variables representing three classes of factors: trainee characteristics including ability, personality, and motivation; training design including principles of learning, sequencing, and training content; and work environment including support and opportunity to use. Next, training outcomes consisted of two variables: retention and learning. Finally, conditions of transfer consisted of generalization and maintenance.

Figure 2. A model of the transfer process, (Baldwin & Ford, 1988).



Baldwin and Ford pointed out the many shortcomings of previous transfer of training research and suggested that additional research investigations were needed to help explain this phenomenon. Research gaps identified by Baldwin and Ford included the need to: 1. Test various operationalizations of training design and work-environment factors that have been posited as having an impact on transfer and 2. Develop a framework for conducting research on the effects of trainee characteristics on transfer.

Related to this study, Baldwin and Ford (1988) stated that training research cannot continue to ignore the job relevance of

the training content as a critical factor affecting what is learned, retained, and transferred to the work setting. They further stated that transfer research has implicitly assumed the job relevance of the training content without attempting to specify what the desired skills or behaviors are or what the training content should be in order to insure skill acquisition. Additionally, they stated that there should be a clear identification of the knowledge, skills, and behaviors expected in order to next make an effective decision related to the value of the training program. They concluded that this could be accomplished through a task analysis, which could detail the importance and frequency of the tasks performed on the job.

Ford, Quinones, Sego, Sorra (1992) explored the job relevance of training by examining the opportunity to perform trained tasks on the job. They conceptualized it as having three dimensions: breath, activity level (frequency), and type of task. Ford et al. defined breath as the opportunity to perform some or all the tasks. Thus, the greater number of trained tasks performed on the job the greater the breadth. Ford et al. defined activity level as the amount of task repetition, or frequency, to which a trainee is exposed to on the job. The more times a trainee performs a task, the more likely that performance will improve. Finally, Ford et al. defined type of tasks by its complexity and difficulty. For

example, some trainees may have the opportunity to perform only the simplest of trained tasks while others may work on the more complex and difficult tasks.

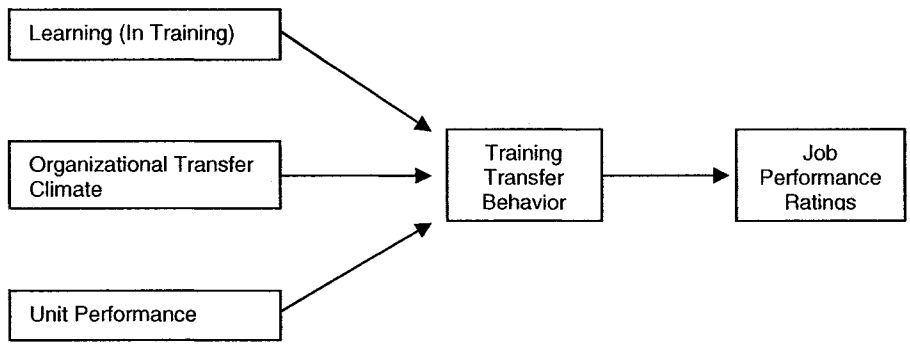
Wood (1986) looked at task complexity and its relationship with task performance; however, he approached it from a basis independent of the trainee and independent of any context in which the task is performed. Wood sought to establish a general theoretical model of tasks. Wood began by stating that tasks contain three essential components: products, acts, and information cues.

Wood (1986) defined "products" as entities created or produced by behaviors that can be observed and described independently of the behaviors that produce the products. Wood defined "act" as a simple to complex pattern of behavioral response with an identifiable purpose. He emphasized that the "required" act is a task component and not a property associated with an individual. Wood described "information cues" as pieces of information associated with the stimulus object that are presented in the form of facts and can be processed to make judgments about an appropriate behavioral response or act. Wood concluded that by establishing a comprehensive analytical framework for tasks, researchers would be better able to produce stronger empirical generalizations about individual-task interactions in the study of task effects.

Organizational transfer climate model. Rouiller and Goldstein (1993) investigated organizational transfer climate and discussed whether it influenced the degree to which trainees transfer behaviors learned in training to their job. According to Rouiller and Goldstein, Harris and Burt (1955) were the first to suggest that a supportive work climate was a factor in the transfer of learning to the job. In 1980, Goldstein suggested that a supportive organizational climate was a critical component that should be part of the training needs assessment process. Goldstein added that a process that only focuses on identifying the skills required for job performance would often fail, because it does not recognize organizational dynamics that affect transfer. Therefore, Rouiller and Goldstein sought to develop a method for the measurement of the organizational transfer climate. Their measures of organizational transfer climate consisted of those situations and consequences that either inhibit or help to facilitate transfer of what was learned in the training content domain. The predicted relationships for their study are presented in figure 3. Specifically, learning, organizational transfer climate, and unit performance has a relationship with training transfer behavior, which in turn leads to job performance. They hypothesized that the more positive the organizational transfer

climate, the more likely that trainees will transfer learned skills to the job.

Figure 3. Relationship between learning in training, organizational climate, and trainee performance in the job setting (Rouiller & Goldstein, 1993)



Rouiller and Goldstein's (1993) measures of organizational transfer climate consisted of situational cues and consequences that either inhibit or help to facilitate transfer of what was learned in the training content domain. Specifically, the situational cues served to remind trainees of their training and provide them with an opportunity to use their training once they returned to the job. These situational cues included goal, social, task, and self-control cues. Goal cues were defined as cues that remind trainees to use their training based on goals established by the trainee in concert with management. Social cues arise from group membership and include behaviors and influences exhibited by supervisors, peers, and subordinates.

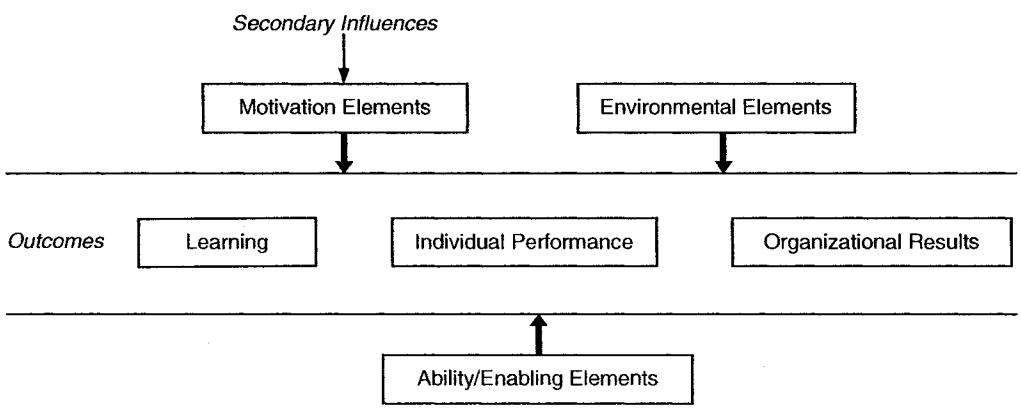
Task cues concerned the nature of the job itself. Finally, self-control cues concerned various self-control processes that permit the trainee to use what they have learned.

Rouiller and Goldstein (1993) identified a number of consequences that affected trainees' use of what they had learned. These consequences included positive feedback, negative feedback, punishment, and no feedback. Positive feedback was related to positive information about the use of the new skills. Negative feedback was where trainees were informed of the negative consequences of not using the new skills. Punishment was where trainees were punished for not using the new skills. Finally, no feedback was where no feedback was given to the trainees about the use or importance of the learned behavior. As result of the Rouiller and Goldstein study, these situational cues and consequences were each separately found to significantly add to the explained variance in the degree of transfer behavior and each independently contributed to transfer behavior.

HRD evaluation research and measurement model. In 1996, Holton published an article that declared that the four-level Kirkpatrick model was flawed and that it was just a taxonomy of outcomes. Holton further stated there is a critical need for a new training evaluation theory and research to give

organizations a more sound methodology for allocating training resources. Holton next proposed a new model, which he posited, was based on existing research and accounts for the impact of the primary transfer of training variables. He further postulated that through statistical analysis that controls for the effects of intervening variables, it might be possible to show an effective training design even when overall group scores indicated poor transfer outcomes. Holton's conceptual evaluation model (figure 4) consisted of three primary outcomes: learning, individual performance, and organizational results. He next proposed that these primary outcomes were impacted by primary and secondary influences. Primary influences were called ability/enabling elements and secondary influences included motivation and environmental elements.

Figure 4. Conceptual evaluation model (Holton, 1996).



Learning transfer system inventory. In 1997, Holton et al. published an article, which studied and attempted to validate the situational cues and consequences proposed by Rouiller and Goldstein (1993). According to Holton et al. their results found a substantially different factor structure suggesting a different direction for future transfer climate research. Their results suggested that trainees perceived the transfer climate according to referents (for example supervisor, peer/task, or self) in the organization rather than psychological cues. Furthermore, their analysis suggested the following transfer climate constructs: supervisor support, opportunity to use, peers support, supervisor sanctions, personal outcomes-positive, personal outcomes-negative, and resistance. Additionally, their data also suggested two important transfer design factors: content validity and transfer design.

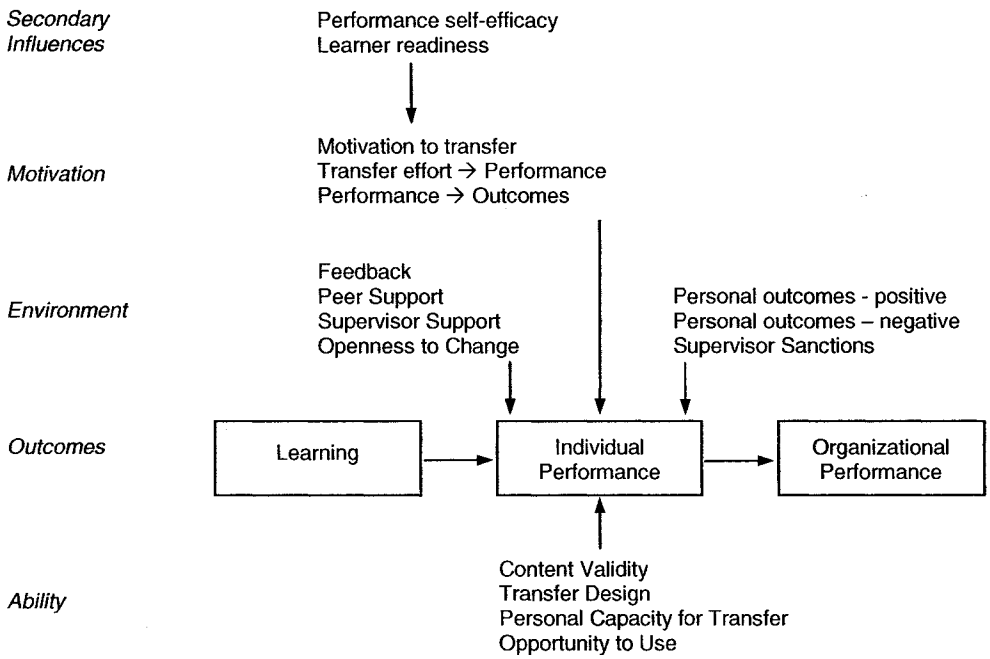
Holton et al. (2000) stated that transfer climate, or the work environment, is but one set of factors that influence transfer. They stated that other influences include training design, personal characteristics, opportunity to use, and motivational influences. They also stated they prefer to use the term transfer system, which is defined as all the factors in the person, training, and organization that influence transfer of learning to job performance. For example, they stated, that

the validity of the training content is part of the system of influences that affects transfer but is not a climate construct.

Thus, Holton et al. (2000) proposed a generalized Learning Transfer System Inventory (LTSI) to assess the transfer system. Their study sought to validate this instrument, which measured sixteen transfer factors (see figure 5) posited to represent the transfer system. These sixteen factors were: learner readiness, motivation to transfer, positive personal outcomes, negative personal outcomes, personal capacity for transfer, peer support, supervisor support, supervisor sanctions, perceived content validity, transfer design, opportunity to use, transfer effort - performance expectations, performance-outcomes expectations, resistance-openness to change, performance self-efficacy, and performance coaching.

Holton et al. (2000) administered their inventory to a sample group of participants and statistically analyzed the data with common factor analysis. Their study revealed an interpretable factor analysis along with revealing a three-order higher order structure of climate, job utility, and rewards. Furthermore, when a second-order factor analysis was conducted, for job utility, the largest first factor correlations were found for items used in content validity, transfer design, opportunity to use, personal capacity for transfer, and peer support.

Figure 5. Learning transfer system inventory: conceptual model of instrument constructs (Holton, Bates, & Ruona, 2000).



General Systems Theory

Researchers and practitioners alike in an attempt to develop definitive theories, models, and processes have extensively studied the transfer of training phenomenon and its relationship with the training system. According to Moore and Kearsley (1996), in order to design training properly one should adhere to systems principles. They stated that systems-based training ensures that it produces an output, which in turn should achieve its intended purpose. Swanson and Holton (1997) added that just an elementary application of systems theory

would cause an enormous increase in the effectiveness and efficiency of human resources development (p. 10). Campbell (1971) also stated that if we are ever to make training a profitable enterprise we must devote considerable time to empirical analysis via the systems approach, forget about the either/or approach to training "evaluation," and focus on behavioral outcomes and their interaction with other organizational subsystems.

General systems theory is a widely published theory that helps to explain the complexities and variability of a system to include the individual parts, both individual participants and subgroups, as well as the looseness of connections among them (Lin, 2002). McClelland (1992) defined a system as a collection of procedures or components that are interactive with each other. Skyttner (1996) added that a system is a set of interacting units or elements that form an integrated whole intended to perform some function. Turban and Aronson (2001) pointed out that systems are a collection of objects such as people, resources, concepts, and procedures intended to perform an identifiable function or to serve a goal. Harrington, Carr, and Reid (1999) emphasized that a system that lacks purpose or value is little more than an object of curiosity. Backlund (2000) also looked at the relationship of systems with other systems and the concept of supra-systems and sub-systems.

Skyttner likewise added that systems are generally complex wholes made up of smaller subsystems.

According to Turban and Aronson (2001) systems are divided into three distinct parts: inputs, processes, and outputs; and, they are surrounded by an environment and often include a feedback mechanism. Inputs are elements that come into the system. Processes are all the elements necessary to convert or transform inputs into outputs. Outputs are the finished products or the consequences of being in the system. Feedback is the flow of information from the output that acts as a control for validation or modification of the inputs and the process. Finally, the environment lies outside the system but may affect the systems performance.

Bertalanffy (1968) distinguished between open and closed systems, which are either interacting with or isolated from their environment (p. 39). Bertalanffy defined open systems as a living system in exchange of matter with its environment, presenting import and export, building-up and breaking-down of its material (p. 141). He explained that in closed systems if the initial conditions or the process were altered, the final state would also be changed. He stated that this is not so in open systems where the same final state may be reached from different initial conditions and in different ways (p. 40).

Therefore, training, like any other workplace process, is input followed by a transformation and then output, which leads to accomplishment of a purpose or the intended outcomes. It is also a process whereby feedback from the environment is critical to ensure that the output of training does in fact accomplish its original purpose. The input for a training design is usually a needs assessment (McGehee & Thayer, 1961; Moore & Dutton, 1978; Goldstein & Gilliam, 1990), which determines if there is a need for a training solution. If so, the next step will include a task analysis (Gagne, 1974), to identify the actual knowledge and skills of the job performance domain. The knowledge and skills becomes a set of tasks that form the training content and leads to its subsequent instructional design and sequencing into a training event (Gagne, 1962). The system transformation is the instructional design process itself, along with the conduct of the learning event (Bushnell, 1990). The output is a trained employee (Bushnell, 1990; Holton, 1996), who will transfer knowledge and skills to the workplace in the form of individual performance if given the stimulus opportunity, motivation, and supporting climate to do so (Baldwin & Ford, 1988). If the transfer of training is successful an organization should achieve the intended outcomes such as productivity, customer satisfaction, profitability (Bushnell, 1990; Swanson, 1998). Feedback for the initial

training design can be accomplished through a content validation process (Lawshe, 1975). Later, the training design can be assessed by investigating the ongoing need for training, or the opportunity to use the training (Ford et al., 1992), leading to the validation or redesign of the course (Ford & Wroten, 1984). Feedback may also take the form of return-on-investment measures (Swanson, 1998), which lead to further validation of the systems design.

Harrington, Carr, and Reid (1999) stated that without an overarching way of looking at the system, there is little possibility of understanding it. For example, Bertalanffy (1968) stated that general systems theory is intended to explain a number of special systems that include decision theory. Thus, according to Simon (1977) a systematic decision making process based on the construction of a model involves three phases: intelligence, design, and choice. It also includes a fourth phase of implementation and possibly a fifth phase of monitoring. The intelligence phase involves an examination of reality to identify and define the problem. In the design phase a model is constructed to represent the system. The choice phase includes selection of a proposed solution to the model and its subsequent validation. The implementation phase results in solving the real problem (Turban & Aronson, 2001).

However, Rease (2001) pointed out that management actions associated with systems are in fact usually not systematic and that management instead uses their best judgment, which the rules of the system can not always deal with given the situation at hand. This may help to explain certain training implementations where a decision is made to conduct training based on a speculation or advocacy of a need rather than a defined problem and a systems approach to training. Management control, however, is a systematic effort to set performance with planning objectives, to design feedback systems, to compare actual performance with standards, to measure deviation, and to assure that all resources are used in the most effective and efficient way possible in achieving objectives (Rease). Therefore, management control decisions are made within established strategies to avoid decisions made without guidance, which could lead to acceptance of any investment opportunity that is likely to improve performance (Rease). These thoughts and practices certainly apply to training and those who implement training solutions.

A Systems Approach to Training

Campbell (1971) suggested that general systems theory leads to certain deductions about the relationship of subsystems (i.e., the training function) to the supra-system (i.e., the

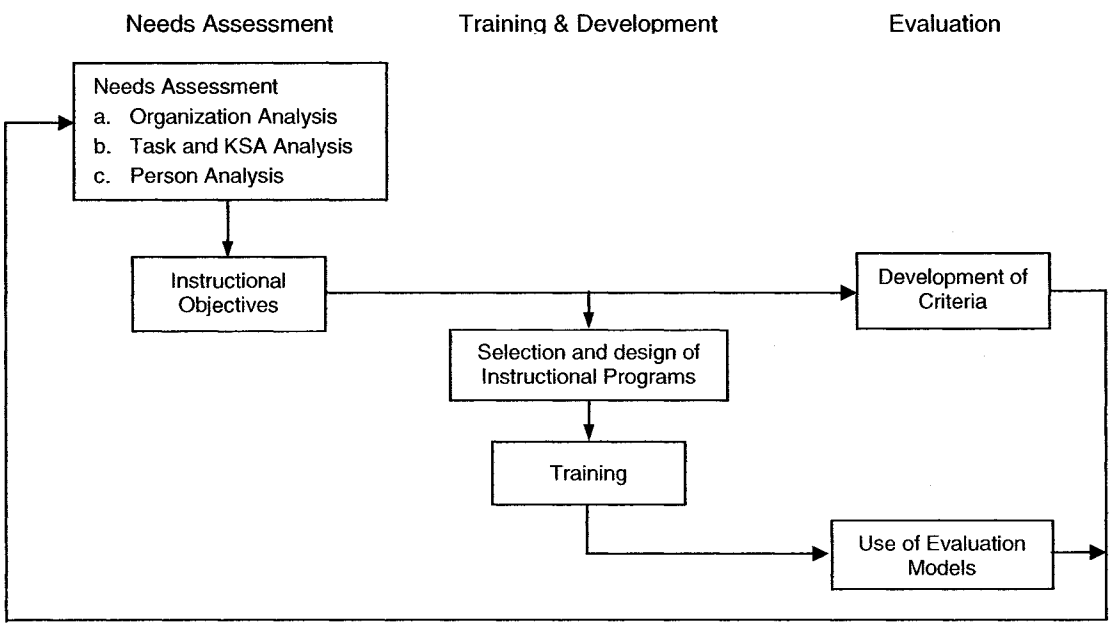
organization). A useful model for describing the systematic development and interrelated components of a training program is based on an instructional systems perspective (Goldstein, 1980). "Instructional systems design" is concerned with understanding, improving, and applying methods of instruction (Reigeluth, 1983). Goldstein added that this includes the specification of instructional objectives, criteria for performance, and evaluation information. It also provides information for the continual modification of the instructional approach (Goldstein). This systems approach to the training model indicates that there should be a logical flow from the initial determination of training needs, to training design, and to training evaluation. Goldstein and Gilliam (1990) proposed a model that conceptualized the training system based on an instructional systems basis. Bushnell (1990) also proposed a model that reinforced the notion of an input-process-output approach to training.

Instructional systems design models. Goldstein and Gilliam (1990) stated that effective training stems from a systematically designed learning atmosphere based on careful analysis of job requirements and the capabilities of the trainees. However, they stated that the simplicity of this statement hides a very complex systems interaction involving

persons, jobs, and organizations. They proposed a model conceptualizing a training system that emphasized careful needs assessment, precisely controlled learning experiences designed to achieve learning objectives, and the collection of evaluation information to provide feedback about the systems effects.

The Goldstein and Gilliam (1990) model (see figure 6) for the conceptualization of a training system was based on an instructional technology model. They stated that this viewpoint considers training to be just one component within a larger set of interacting organizational and societal systems. The Goldstein and Gilliam model is comprised of three basic subsystems: needs assessment, training and development, and evaluation.

Figure 6. An instructional system (Goldstein & Gilliam, 1990)



In their model, the first set of components refers to the needs assessment process that is used to provide critical information necessary to design both the training and evaluation components. They also stated that the needs assessment consists of three sub-components, an organizational analysis, task analysis, and a person analysis (McGehee & Thayer, 1961). An organizational analysis is a systems-wide analysis of organizational components that interact with a training program's design, development, and effectiveness. This includes a look at organizational goals, the training climate, and the internal and external factors in the organizational environment. In other words, is a training solution warranted and is there support within the organization to use the training. Another component of the needs assessment is the task analysis, which looks at the knowledge, skills, and abilities required by the job performance domain. Goldstein and Gilliam stated this is a complex process to determine what needs to be learned in training, before training or, after training. Finally, person analysis is a focus on the trainee's capability to learn and their need for the training intervention. This analysis looks at a target population in relation to the required KSA's for the job domain. As a result of the needs assessment process, this total component provides the systems input for the training

design as well as the measures of success, or instructional objectives, to judge the program's outcomes.

The next step, according to Goldstein and Gilliam (1990), is the training design, which involves the use of instructional design principles, sequencing of learning, and media selection. They stated that the design of training can be a complicated process, and in some cases, there is evidence (Rouiller, 1989) that even when the training event is positive, improved performance may not result. Thus, they stated that it was necessary to treat training programs as interventions that require the ongoing collection of data in order to provide feedback that can be used to modify the program.

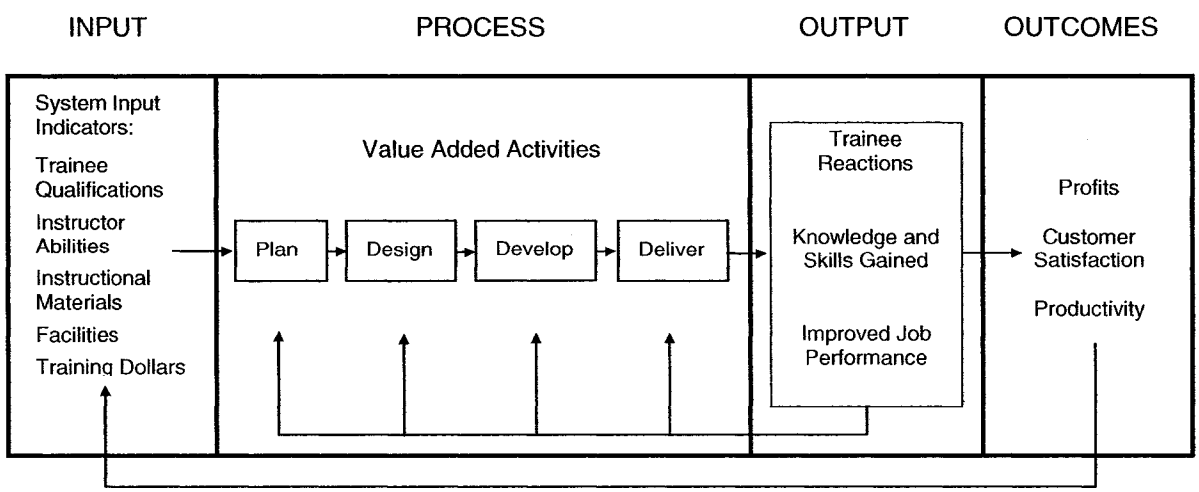
Finally, the evaluation process of the Goldstein and Gilliam (1990) model centers around two procedures, the establishment of success measures (criteria) and the use of evaluation research models to determine the success of the training intervention to include the transfer of training. Goldstein and Gilliam stated that criteria must be established for both the evaluation of trainees at the conclusion of the training program and the evaluation of on the job performance. Kirkpatrick (1994), in his evaluation model, identified these two levels as learning and behavioral change. Goldstein and Gilliam further stated that in addition to criterion development the evaluation process must include the specification of

evaluation designs such as experimental designs to control for different types of internal and external threats to validity that might occur in field settings; as well as, content validity models that help to determine if the needs assessment results are appropriately emphasized in the training design. Finally, they believed that training is a closed-loop system, in which the evaluation, or feedback, process provides for continual modification of the training design. In fact, they stated that this feedback may become available at many different stages and that an effective evaluation process may uncover that the training program is not being implemented as originally planned or there has been a change in the nature of the job domain or the trainees.

In 1990, Bushnell discussed training from an instructional systems design perspective. Bushnell described what he called an Input-Process-Output Evaluation model (see figure 2). He stated that companies that followed this model, such as IBM, Motorola, Xerox, and Federal Express, dramatically lowered the costs of training programs and, at the same time, increased training flexibility and responsiveness. Bushnell added that companies who used this model could readily determine whether training programs were achieving their intended purpose; and, it also enabled them to detect the types of changes that should be made to improve course design, content, and delivery.

At the input stage of the model, the elements (system performance indicators, or SPI's) could be evaluated in terms of their potential contribution to the overall effectiveness of the training program (Bushnell, 1990). These indicators included trainee qualifications, instructor experience, instructional materials, facilities, and the training budget. At the process stage, the model identified the need to plan, design, develop, and deliver the training. Finally, Bushnell distinguished between output and outcome. He stated that output dealt with the short-term benefits or effects of training and outcomes referred to the longer-term results associated with improvements in the corporation's bottom line such as profitability, competitiveness, and even survival.

Figure 7. An input-process-output approach to training evaluation (Bushnell, 1990)



Defining Training Needs

To effectively use training dollars and resources, one must first determine exactly the location, scope, and magnitude of the need (Moore & Dutton, 1978). Needs are deficiency states or imbalances, either physiological or psychological that energize of direct behavior (Desimone et al., 2002). Needs drive behavior through the combination of need activation and need satisfaction (Desimone et al.). Analogously, from a consumer perspective, a need is a state of felt deprivation of some basic satisfaction, wants are desires for specific satisfiers of these deeper needs, and demands are wants for specific products (Kotler, 1991). From a training perspective, a need usually refers to a discrepancy or gap between what an organization expects to happen and what actually occurs (Desimone et al.). These discrepancies, identified through a needs assessment, become the foundation of training, which seeks to correct substandard performance (Desimone et al.).

However, Moore and Dutton (1978) stated there is no justification for expenditures on training programs that do not increase the efficiency and effectiveness of the workforce. Thus, training is not an end but a means to an end; it exists only to help achieve organizational goals and objectives (McGehee & Thayer, 1961). Furthermore, training programs must be

"customer focused;" but, this does not necessarily mean "spend more" it merely infers the concentration of training and development issues on those skills and capabilities which enhance company responsiveness and market focus (Harris & Piercy, 1997).

Therefore, McClelland (1992) stated that a systems approach to needs assessment helps to integrate the assessment process into the strategic plans of the organization. He also stated that a needs assessment helps to align human resources with changes in long-range plans and helps to identify a cost effective and efficient means of meeting knowledge and skills requirements for the future. McClelland further stated that in industries in which technological change is prevalent, the systems approach to needs assessment provides a means of identifying future knowledge and skill requirements and allows organizations to plan for training on a consistent and realistic basis.

Unfortunately, many organizations do not conduct formal needs assessments (Desimone et al., 2002). McGehee and Thayer (1961) stated that the problem is that needs assessment efforts are not typically conducted in a continuing, on-going manner and coordinated and integrated with other organizational functions as a system. According to Desimone et al. it may be because: 1. Needs assessments can be difficult and time consuming, 2. Action

is valued over a preliminary study of needs, 3. Incorrect assumptions are made about needs assessments because available information suggests following training fads, off-the-shelf programs, or following the competition, and 4. There is just a general lack of support for conducting needs assessments based on inability to communicate its value or just a lack of a bottom-line justification.

Campbell (1971) discussed deficiencies associated with needs assessments. Campbell stated there have been both internal and external reasons why organizations have not reached there full potential. He explained that the major internal reason was that there has been a broad and full-scale retreat from the fundamental task of defining what is to be learned. Instead, researchers and practitioners have been more concerned with training hardware and techniques rather than what is to be learned. Campbell stated that the major external reason is that rewards are given for putting together programs and courses that are attractive and elicit a favorable impression rather than a focus again on what is to learned. Thus, Tannebaum and Yukl (1992) concluded that only a limited amount of empirical work on training needs analysis has appeared in the last several years.

Training needs from a marketing orientation. Sinkula (1994) in a discussion about market information processing and

organizational learning stated that, "it is surprising that these two separate streams of research, which have such similar purposes, have gone on without being integrated" (p. 35). The needs assessment process, thus, can be analogously compared with marketing processes that also seek to identify needs and subsequently deliver a product, such as a training product, that satisfies needs. Kotler (1991) referred to this as the marketing concept, which holds that the key to achieving organizational goals consists of determining the needs and wants of target markets and delivering the desired satisfaction more effectively and efficiently than others. Furthermore, market orientation is different from what Kotler also called the "product concept" where the focus is simply on creating the best product regardless of customer input and an identified need. In fact, this difference in orientation may directly point to a key and fundamental issue with the implementation of training products and their subsequent transfer to the workplace. Jaworski and Kohli (1993) stated that because needs and expectations continually evolve over time, delivering consistently high-quality products and services requires ongoing tracking and responsiveness to changing marketplace needs, i.e., being market oriented. From a human resources development perspective, Rothwell and Kazanas (1994, p. 129) similarly described this, as future-oriented training needs assessment.

Ford and Wroten (1984) also stated that a key characteristic of the instructional systems design approach is the emphasis on the continuous use of feedback to modify the existing design.

Kohli and Jaworski (1990) defined market orientation, as the organization wide generation of market intelligence pertaining to current and future customer needs, dissemination of the intelligence across departments, and organizational wide responsiveness to it. They further stated that customer focus is the central element of a market orientation, which includes an analysis of changing conditions in customers' industries and their impact on the needs and wants of customers (Kohli & Jaworski, 1990). Kotler (1991) added that to be market oriented a company must also conduct internal marketing, which is the task of successfully hiring, training, and motivating employees to serve external customers.

Kohli and Jaworski (1990) suggested that the starting point of a market orientation is market intelligence, followed by dissemination of the information, and finally a response. Analogously, training design follows a similar process. The market intelligence phase is the needs assessment, the dissemination phase is the instructional strategy process, and the response phase is the design and delivery of the training product. In fact, researchers have previously associated market orientation concepts with learning organization concepts

(Sinkula, 1994; Slater & Narver, 1995; Sinkula, Baker, & Noordewier, 1997). Thus, Sinkula (1994) similarly described organizational learning as a three-stage process that included information acquisition, information dissemination, and shared interpretation.

To explain, the market intelligence phase refers to the collection and assessment of customer needs/preferences and the forces (i.e., task and macro requirements) that influence the development of and refinement of those needs (Kohli, Jaworski, & Kumar; 1993). This is no different from what Rothwell and Kazanas (1994, p. 117) referred to as environmental scanning, which is a process that monitors trends, issues, or events that may create future learning needs as a result of environmental changes. Next, the dissemination phase of a market orientation refers to the process of market information exchange within the organization (Kohli et al.). Likewise, competency modeling provides for the dissemination of information so that the organization, managers, and workers can fully participate in defining jobs, managing performance, and guiding development (Dubois, 1993). Finally, the responsiveness component is composed of two sets of activities: the response design (plan) and response implementation (execution of the plan)(Jaworski & Kohli). From a training perspective, the response design would imply the training design or redesign and response

implementation would refer to the delivery of the training design or redesign (Bushnell, 1990; Goldstein & Gilliam, 1990). Thus, the process of instructional systems design and market orientation seem to have similar goals with the up front determination of need followed by an appropriate response; versus, the "product concept," which assumes the existence of need. As Baldwin and Ford (1988) stated transfer of training research has implicitly assumed the job relevance of training content without attempting to specify the training need.

Task analysis. Training needs assessment consists of three sub-components, an organizational analysis, person analysis, and task analysis (McGehee & Thayer, 1961; Goldstein & Gilliam, 1990). Organization analysis is concerned with organizational components that interact with a training program's design, development, and effectiveness; person analysis focuses on the trainee's capability to learn and their need for the training; and task analysis looks at the knowledge, skills, and abilities required by the job (Goldstein & Gilliam, 1990). Campbell (1971) stated that researchers should focus on task analysis, terminal behaviors, task achievement, the fidelity of tasks, and sequencing in order to place emphasis on what is to be learned and what the substantive content of a training or development experience should be. However, Frank and Smith (1969) observed

that task analysis and behavioral specification of training objectives seems to be much more prevalent practice in Britain than in the United States.

Gagne (1962) stated that total job performance could be analyzed into a set of component tasks that are relatively distinct from each other. Further, he stated that proficiency on the task components is what mediates total job performance. Lawshe (1975) referred to performance as the "job performance domain." Given these assumptions the basic principles of training design are: (a) identify the task components that make up the desired performance; (b) incorporate these tasks or "mediators" in the training program; and arrange the learning of the tasks in the optimal sequence for transfer to total job performance (Gagne, 1962).

Goldstein, Macey, and Prien, (1982); Macey (1982); and Macey and Prien (1981) as cited in Ford and Wroten (1984) conducted studies to link training needs assessment to the development of new training programs. Their methodology required the specification of task statements, job elements, and critical incidents for the job. Tasks were rated on the importance, frequency, and difficulty of acquiring proficiency. Job elements were rated on importance, difficulty to learn, and opportunity to acquire on the job.

Schmitt and Cohen (1989) also studied task analysis. In their study, job groups responded to a 111-item task inventory using time spent and difficulty rating scales. An expert panel developed the list by first reviewing existing position descriptions to derive a list of task statements. After appropriate revisions were made, a final task inventory was published. A survey was mailed to respondents and a follow-up was mailed to non-respondents one month later. Ratings of the task statements were based on two scales. First, the amount of time spent on each task was rated by using a 7-point scale ranging from "rarely or never do" (1) to "a great deal more than average" (7). Secondly, the level of difficulty experienced in conducting the task was rated using an 8-point scale ranging from "one of the easiest of all tasks" (1) to "one of the most difficult of all tasks (7) and "I don't do this task" (8). The purpose of the Schmitt and Cohen study was to report data regarding responses based on gender and race subgroup differences.

Job Performance Domain

Lawshe (1975) described the "job performance domain," as an identifiable segment or aspect of the job performance universe, which can be operationally defined, and about which inferences can be made. Gagne (1974) added that this is the learnable

components of human performance or the tasks that humans perform to accomplish work. Lawshe further stated there may be several job performance domains within a job performance universe and that we usually seek to identify and operationally define not the total universe but rather a segment of this universe. He stated the reason is that the job performance universe and its parameters are often ill defined, even with careful analysis. Therefore, what Lawshe said we could do is to isolate a specific segment - the job performance domain. Holton et al. (2000) identified the job performance domain as individual performance, or, the outcome of the learning transfer system. Ford and Wroten (1984) used the term job element, which is the knowledge, skills, abilities, and other personal characteristics that leads to job performance.

Content Domain

Baldwin and Ford (1988), in their model of transfer of training, stated that training design included principles of learning, sequencing, and training content. Lawshe (1995) defined training content, or the "content domain," as an identifiable segment of the curriculum universe. Gagne et al. (1992) referred to it as the "curriculum" or "course of study." Goldstein and Gilliam (1990) referred to it as the "instructional program." Lawshe (1975) sought to determine a

quantitative approach for the validation of the training content and he also discussed who makes these inferences or "judgments" about how closely the "content domain" of the curriculum universe corresponds with the job performance domain. Ford and Wroten (1984) also studied content domain and its relationship with the job performance domain and used the same techniques identified by Lawshe to validate this relationship. Ford and Wroten also introduced a method to validate the on-going need to redesign the content domain.

Content Validation

Ford and Wroten (1984) stated that few efforts to evaluate training have focused on content evaluation. Goldstein (1980) noted that in a review of training literature that no procedure exists which empirically evaluates the content validity of an established training program. Ford and Wroten agreed that the existing literature has failed to provide adequate strategies for evaluating training programs in terms of the program's content and its job relatedness. They further stated that the literature has also failed to provide methods for linking training evaluation to training needs reassessment and program redesign. However, Ford and Wroten stated that a content validity strategy seems to be well suited for determining the job relatedness of a training program. Bates, Holton, and

Seyler (1997) added that ensuring training content is consistent with job requirements can positively influence transfer. Baldwin and Ford (1988) stated that in future studies on transfer, researchers should provide evidence of the job relevance of the training material before examining the effects of other input factors on generalization and maintenance of trained skills.

Cronbach (1971) defined validation as a process for examining the accuracy of a specific prediction or inference made from a test score. Cronbach (1970) as cited in Tenopyr (1977) defined content validity as an evaluation that shows how well the content of the test samples the class of situations about which conclusions are drawn. Lawshe (1975) stated that, for example, an academic achievement test is considered content valid if and when (a) the curriculum universe has been defined (content domain) and (b) the test adequately samples the universe. Thus, Lawshe defined content validity as the extent to which overlap, or communality, exists between (a) performance on the test under investigation and (b) ability to function in defined job performance domain. Lawshe also detailed an approach and process on how to determine the extent of the overlap of the training design and the job. Lawshe created a formula to measure content validity known as the content validity ratio (CVR). The CVR was based on responses from a

content evaluation panel. A content evaluation panel was a group of experts who were knowledgeable about the job or in this case the training program. Consequently, Lawshe operationally defined, content validity as the extent to which members of a content evaluation panel perceive overlap between the content domain and the job performance domain.

Lawshe (1975) described the requirements for the expert panel and described the survey design and quantitative measurement process. The survey was simply a list of the training tasks, determined via a task analysis, which asked respondents to rate how essential the task was in the performance of the job performance domain. According to Lawshe two assumptions are made, each of which is consistent with established psychophysical principles:

- Any item, performance on which is perceived to be "essential" by more than half of the panelists, has some degree of content validity.
- The more panelists (Beyond 50%) who perceive the item as "essential," the greater the extent or degree of its content validity (p. 567).

With these assumptions in mind, the following formula for the CVR was devised (Lawshe, 1975; Ford & Wroten, 1984; Cascio, 1998).

$$CVR = \frac{N_E - N_U}{N_T}$$

N_E is the number of panelists indicating essential, N_U is the number of panelists indicating not essential, and N_T is the total number of panelists. Therefore, when fewer than half say essential, the CVR is negative. When half say essential and half do not the CVR is zero. Finally, when all say essential the CVR is 1.0 (adjusted to .99); and, when more than half of the respondents and less than all say the task is essential, the CVR is somewhere between zero and .99. Lawshe goes on to describe how to establish the significance level of the results along with a content validity index (CVI), which is simply the mean value. Hence, the CVI represents the extent to which there is perceived overlap, or communality, between the training content and the job performance domain.

Lawshe (1975) further discussed the statistical validity of CVR values and indicated that given a set number of panelists the CVR values must have a minimum value in order to satisfy the requirements for a one tailed test ($p = .05$). For example, to satisfy a $p = .05$ value using a one tailed test, a panel must be composed of at least 14 members to achieve a minimum CVR of .51. The data for this statistical test (Table 1) was contributed by Dr. Lowell Schipper, Bowling Green State University, who did the original computations for the One Tailed Test (Lawshe).

Table 1

Minimum Values of CVR, One Tailed Test, p =.05 (Lawshe, 1975)

No. of Panelists	Minimum Value
5	.99
6	.99
7	.99
8	.78
9	.75
10	.62
11	.59
12	.56
13	.54
14	.51
15	.49
20	.42
25	.37
30	.33
35	.31
40	.29

Lawshe (1975) applied his content validation process to a subject work environment and specifically a clerical job classification. The study utilized the "Clerical Task Inventory," which consisted of 139 standardized clerical tasks and the "Purdue Clerical Adaptability Test." The Purdue test was divided into sections such as arithmetic computation, spelling, and word meaning. An expert panel of fourteen (Panel A) was formed who were familiar with the clerical jobs within the company. Panel A evaluated the "essentiality" of the Purdue test questions against each of the 139 tasks. The end result was a CVR value for each task. Next, a team of eight panelists

(Panel B) were supplied with a copy of the Clerical Task Inventory and asked to identity which tasks were appropriate for "Job A." Panel B identified 47 tasks. Thus, the two procedures (Panel A & B) produced (a) a table of CVR values for each test (Purdue test) relevant to each task (Clerical Task Inventory) and (b) a list of 47 tasks constituting Job A. Lawshe next stated that to determine the content validity index for each test it is necessary to identify those tasks (called determinants), which have significant CVR values ($> .51$, $p < .05$). For example, of the 47 tasks, seven tasks had significant CVR values ($> .51$) for the computation test. Thus, a content validity index was computed for the computation test based on these seven determining tasks. Lawshe further pointed out that by using a pool of tasks, this procedure helps to minimize the impact of any inherent unreliability in the judgments of panelists.

Later, Ford and Wroten (1984) referencing Lawshe (1975), also focused on linking training evaluation with the validity and redesign of training programs. Their article presented two studies and supporting methodologies, which sought to address deficiencies in the literature. Literature, according to Ford and Wroten, that had failed to provide adequate strategies for evaluating training content and identify methods to address training needs reassessment and redesign.

In study 1, Ford and Wroten (1984) used Lawshe's (1975) content validity ratio (CVR) approach to establish the job relatedness of the training content. The sample population for their study was a midwestern police department that each year trained approximately 100 recruits via a 600-hour training program. The training content for the existing course had been developed previously based on perceived workplace needs. To validate these needs the study first identified three independent panels, two panels of trainers and one panel of recent graduates. The panels independently generated a job task list. Next, the task lists were combined, duplicates were eliminated, and tasks not taught in the course were eliminated. Based on the task list, a survey was constructed, which sought to evaluate the job relatedness of each task.

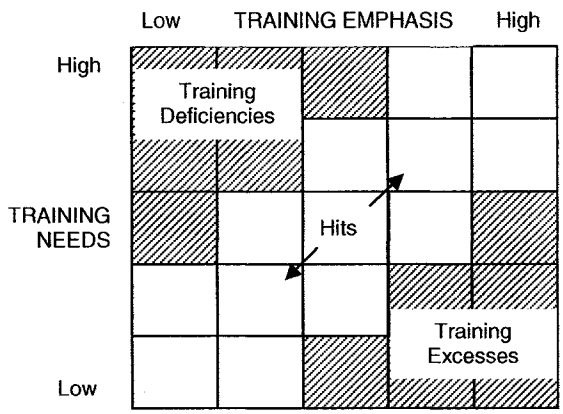
Three sample groups completed the survey, one group was composed of 64 experienced patrol officers, another was composed of 31 patrol sergeants, and the final group was composed of 20 police personnel from neighboring communities. The experts independently rated the importance of each task using a seven-point scale ranging from "no importance" to "extreme importance." A decision rule was also established whereby a rating of five, six, or seven was considered important while ratings of four or below was considered unimportant.

The range of responses (CVR values) for each task ranged from -.85 to .93. Additionally, 62% of the tasks had significant CVR values (CVR > .17; $p < .05$). Furthermore, the intergroup correlations that revealed that all three groups had very similar perceptions of task importance ($r > .80$, $p < .001$). Ford and Wroten concluded that the high level of intergroup agreement supported the quality of the expert judgments. They further stated that the CVR and CVI values supported the conclusion that the content had a significant degree of job relatedness.

In study 2, Ford and Wroten presented a new methodology, the "matching technique," (see figure 8) which they used to compare current training emphasis with training needs. The matching technique was also used to identify areas requiring training redesign. This process sought to identify training "hits" and "misses." Training hits referred to tasks taught in training that reflected a workplace need. Training misses were defined as two types: deficiencies and excesses. Deficiencies were tasks that had a high degree of need in the work environment but were not part of the training program. Training excesses were tasks that received an excessive amount of emphasis in training relative to an actual training need. An assumption behind the number of misses, was that the greater they were the less effective the training program and the

greater need for training redesign. When related to transfer of training, a lack of a match between the training program and opportunity to perform also indicated a necessity to redesign or even discontinue the training intervention.

Figure 8. Matching technique (Ford & Wroten, 1984)



In the Ford and Wroten (1984) redesign study, the task list from Study 1 was divided into categories and sub categories. Next, a content validity index (CVI) was calculated for each category and subcategory by averaging across the content validity ratio (CVR) values. The "training need" for the matrix was measured using the CVI values and "training emphasis" was measured by classroom hours. In addition, 35 recent graduates and 15 training staff members rated each task. The ratings of training emphasis and importance were highly correlated ($r = .68$; $p < .05$) suggesting a large number of training "hits." Furthermore, an examination of the tasks at the category level

showed an overall fit of training time to training need with one exception. This category was further examined at the subcategory and task level, which revealed the specific tasks with training excesses or deficiencies. Ford and Wroten stated that this further illustrated the power of the matching technique by identifying training areas requiring redesign.

Ford and Wroten (1984) concluded that their matching technique proved to be a useful process for validating and redesigning training programs. However, they did state that researchers must be careful when operationally defining training needs and training emphasis. For example "time spent" on a training task in a classroom may or may not be an appropriate indicator of training emphasis.

Stimulus Domain

According to the ASTD State of the Industry Report for 2002 only nine percent of organizations use behavioral improvement measures to evaluate the success of training programs (Van Buren & Erskine, 2002). Therefore, Gist, Bavetta, and Stevens (1990) stated that a significant challenge exists for training researchers to develop a typology of tasks for which organizational training is conducted and to specify, based on such a typology, the domain within which trained skills may transfer. They stated that in the absence of an adequate

typology and specification of transfer domain, much of the transfer research could be considered atheoretical. Furthermore, they added, that the greater conceptual understanding of the variability in tasks encountered by trainees in the workplace would not only guide research but it would also facilitate the transfer of research findings into organizational practice. Royer (1979) likewise concluded that the next generation of training-related environmental theories would place heavy emphasis on an analysis of the stimulus event.

Researchers have discussed the concept of stimulus-response in the training literature for more than a century. Hofding (1892) as cited in Royer (1979) suggested that the recall of learned knowledge and skills consisted of four components: A-a-b-B. During learning the stimulus event (A) produces the internal sensory trace (a), which in turn becomes associated with the internal representation of the response event (b), and (b) gives rise to the overt response (B). Hofding further stated that after learning, successful recall is dependent on A (or a stimulus similar in some sense to A). Gagne (1974) and Gagne et al. (1992) referred to it as the stimulus situation; and stated that what the student does is highly dependent on the situation. They further stated that it might be desirable for the training objective to include a description of the environmental conditions under which the behavior is to be

performed on the job. Royer's (1979) discussion of environmental theories, such as the theory of identical elements (Thorndike & Woodworth, 1901) and near and far transfer (Mayer, 1975, as cited in Royer) also discussed the concept of a stimulus complex. In contrast, McGehee and Thayer (1961) discussed the theory of general principles, which is where students are taught the underlying principles of a topic because of stimulus variation. Baldwin and Ford (1988) also discussed stimulus variability, in reference to training design, and Royer discussed stimulus generalization, which is when a learned response is elicited by different stimulus events. Thus, Royer concluded that a stimulus event is an observable in the learning situation that connects stimulus events and response events.

Wood (1986) identified the stimulus-response concept as consisting of three essential components: products, acts, and information cues. He further described acts and information cues as task inputs. Similarly, Desimone et al. (2002) described a task analysis method, "stimulus-response-feedback," which breaks down each task into three components. They stated the first component is the stimulus, or cue, that prompts the employee to perform the task. The second component is the response, which is the use of the learned task. Finally, the third component is feedback, which is information about how well the behavior was performed. Rouiller and Goldstein (1993) also

discussed a model of organizational transfer climate, which included situational cues that either inhibit or help to facilitate transfer. Therefore, based on Lawshe's definition of content domain and stimulus domain research (Royer, 1979; Baldwin & Ford, 1988; Wood, 1986; Rouiller & Goldstein, 1993), stimulus domain can be defined as an identifiable segment or aspect of the stimulus universe about which inferences can be made. Further, it is identifiable demands to use learned tasks found in a job performance domain. Operationally, it is stimulus situations, observed as cues, which in turn demands learned responses.

Stimulus Situations and Stimulus Validation

Ford et al. (1992) stated that there is a need to better integrate information on training program content and on-the-job opportunities to gain a greater understanding of training transfer and training effectiveness. They further stated that the training literature has failed to investigate, whether, or how often, trained tasks are actually performed once on the job. Thus, Baldwin and Ford (1988) suggested that "opportunity to perform" is an important transfer climate construct. This construct refers to the extent to which trainees are provided with or obtain work experiences relevant to the tasks for which they are trained (Ford et al., 1992).

Baldwin and Ford (1988) stated that the combination of task importance and frequency and a taxonomy of situations can provide a baseline for determining how often one should expect trained behaviors to be exhibited on the job. They stated this would force the explicit recognition that an important component in developing transfer measures of generalization is the identification of how often and in what situations a trainee could reasonably be expected to demonstrate the trained behaviors. Laker (1990) discussed this detection of initiation and likewise stated that the degree of initiation could be measured by frequency, consistency, or intensity of the individual's use of the skills and behaviors acquired during training. Royer (1979) as well recognized the concept of a stimulus complex and a transfer event. To validate their hypotheses, Ford et al. studied Air Force technical trainees after they completed training and found significant differences in opportunity to apply training and wide variations in the length of time before trainees first performed the tasks for which they had been trained.

Baldwin and Ford (1988) consequently discussed two important variables that impact conditions of transfer, generalization and maintenance. According to Baldwin and Ford, generalization is the extent to which trained skills and behaviors are exhibited in the transfer setting based on a

taxonomy of situations. Maintenance is the length of time that trained skills and behaviors continue to be used on the job and thus is a function of time elapsed (Ford & Baldwin; Ford & Weissbein, 1992). Ford and Weissbein stated that generalization involves more than mimicking trained responses; it requires trainees to exhibit trained behaviors in response to different settings, people, and situations. Ford and Weissbein pointed out the need for trainee adaptability, or to adjust one's knowledge and skills in the face of novel situations. Thus, given the changing nature of the workplace (Howell & Cooke, 1989), trainees must be prepared to adapt to different and changing situations (Ford & Weissbein). Equally, training programs must also adapt and evolve to meet the changing needs of the workplace (Ford & Wroten, 1984). Therefore, researchers and practitioners must identify processes and empirical methods that will track changing workplace needs and validate existing training program designs.

Jaworski and Kohli (1993) suggested that because needs and expectations continually evolve over time, delivering consistently high-quality products and services requires ongoing tracking and responsiveness to changing marketplace needs. Thus, Ford and Wroten (1984) stated that training programs established through a strong initial needs assessment should periodically reassess training needs for possible revision. The

Ford and Wroten study thus asked course graduates to assess the essentiality of tasks based on the changing work environment implying a change in stimulus situations. Furthermore, their study sought to validate this change. Therefore stimulus validation can be defined as the extent to which overlap, or communality, exists between (a) performance on a test under investigation, in this case the training content domain, and (b) an identifiable stimulus domain that demands the use of learned tasks found in the job performance domain. Operationally it is the extent to which the stimulus domain correlates with the content domain of a training program. Or, the extent to which an employee may be provided with opportunities to use learned tasks based on stimulus situations, or observed cues, in the workplace.

Organizational Domain

Researchers have long identified the business outcomes of a training intervention as an important construct of the transfer of training process (McGehee & Thayer, 1961; Kirkpatrick, 1994; Holton 1996; Swanson, 1996, 1998). Narver and Slater (1990) stated that if an organization is to create superior value for its customers it must draw upon and integrate effectively, as well as adapt as necessary, its entire human resources capability as well as other capital assets. Furthermore,

Swanson (1998) stated that organizations are economic entities and if they are to remain alive they must judge each of their components from a return-on-investment (ROI) framework. However, according to the ASTD State of the Industry Report for 2002 only seven percent of organizations use business performance measures to evaluate the success of training initiatives (Van Buren & Erskine, 2002). In contrast, Holton (1996) suggested that organizations should not engage in HRD interventions unless the expected utility or payoff warrants investment of the resources.

In a review of the literature about the financial benefit of HRD, Swanson (1998) summarized that HRD programs imbedded in a purposeful performance improvement framework, and systematically implemented, will yield very high returns on investment. However, Baldwin and Ford's (1988) seminal work on transfer of training, to include their proposed model of the transfer process, did not identify business performance as a desired outcome of the transfer process. Their paper simply stated that training outcomes are the amount of original individual learning that occurs during the training program and the retention of that material after the program is complete. In contrast, Holton's (1996) conceptual evaluation model consisted of three primary outcomes: learning, individual performance, and organizational results. Holton defined

learning as the achievement of the learning outcomes, individual learning as the result of the learning being applied to the job, and organizational results as the organizational consequence of the change in individual performance.

Swanson (1996) believed that this difference amongst researchers about appropriate outcome variables is based on the influence of psychological theory rather than training and development logic based on economic, system, and psychological assumptions. Swanson stated that it has been common to read of change, employee satisfaction, intent to transfer, and learning as dependent variables of HRD. However, Swanson stated that as far back as 1962, Gagne has challenged researchers to stop looking at what happens inside the learner and to start studying the organization. Instead, Swanson stated that researchers must address the dependent variable at three outcome levels: individual, work process, and organization. Swanson explained that a basic premise must be that economic requirements are the primary explanation of organizational performance, system requirements are primary at the process level, and psychological requirements are primary at the individual level. Thus, Swanson proposed that the dependent variable, the outcome, is the ultimate reason for human resources development and that people who own and run organizations are most concerned about survival, return-on-investment, effectiveness and efficiency of goods and

services, quality of goods and services, customer requirements, and customer satisfaction. Thus, effective training interventions must likewise have a positive effect on these economic, or organizational domain, requirements and measures if it is to be a successful business endeavor.

Additionally, the organizational domain may in fact have a dual dependent-independent variable relationship with the training system. As Swanson (1996) stated training initiatives seek to drive change at the individual, work process, and organizational levels. However, the training design itself, based on a proper needs assessment, is in fact driven by the needs of individuals, work processes, and the organization. To explain, from a marketing perspective, driving markets, or change, implies influencing the structure of the market and/or behaviors of market players in a direction that enhances the competitive position of the business (Jaworski, Kohli, & Sahay, 2000). Thus, a training intervention seeks to similarly enhance an organization's capability and improve business performance. In contrast, market driven refers to a business orientation that is based on understanding and reacting to the preferences and behaviors within a given market structure (Jaworski, Kohli, & Sahay). Thus, analogously the training design is based on an understanding of organizational preferences, behaviors, and

needs; and is therefore, driven by and dependent on these forces.

According to Desimone et al. (2002) organizational outcomes are things valued by the organization, such as teamwork, productivity, and product quality. Moreover, McGehee and Thayer (1961) defined training as a formal procedure to facilitate employees' learning so that their resultant behavior contributes to the attainment of the company's goals and objectives. McGehee and Thayer further added that training is a tool to assist in the production of goods and services of social utility at a competitive price, which results in a profit for the organization. Holton (1996) identified the importance of the organizational domain as an outcome of transfer of training. Additionally, Laswhe (1975) identified and discussed the performance domain, which looked at individual level performance. Thus, based on the collective research of others such as McGehee and Thayer (1961), Lawshe (1975), Holton (1996), Swanson (1996,1998) the organizational domain can be defined as an identifiable segment or aspect of the organizational universe about which inferences can be made. Further, it is an organizational goal or outcome that drives or is driven by the use of the learned tasks found in the job performance domain.

Organizational Validation

Tannenbaum and Yukl (1992) stated that the selection and development of appropriate organizational-level criterion measures remains a critical requirement of training evaluation. However, Campbell (1988) as cited in Tannenbaum and Yukl (1992) cautioned that there can be problems with global measures of performance since training is but one of many variables that could impact overall organizational performance. Campbell thus advocated the use of targeted measures based on specific training objectives.

Bushnell (1990) further distinguished between output and outcome. He stated that output dealt with the short-term benefits or effects of training and outcomes referred to the longer-term results associated with improvements in the corporation's bottom line such as profitability, competitiveness, and even survival. An analog to HRD's impact on the organizational domain is Kohli and Jaworski's (1990) identification that profitability is a consequence of a market rather than a part of it. Narver and Slater (1990) also suggested that the overriding objective in a market orientation is profitability. Likewise, for training to be successful its outcome must be based on its profitability, or financial benefit, to the organization. Brinkerhoff (1987) as cited in Desimone et al. (2002) identified this as the sixth stage of

training evaluation, which is the impact and worth to the organization.

Swanson (1998) reviewed various methods to validate a training program's financial outcome. In his review of the literature, Swanson discussed "financial analysis methods" (FAM), which were cost-benefit analyses conducted after the training event and "forecasting financial benefits" (FFB) methods, which were decision-making investigations conducted before a training implementation. Lee (1996) also discussed similar methods, which he called "pay-back" and "pay-forward" calculations. Swanson identified a number of research studies that used either FAM or FFB and their resulting validation of the HRD intervention. Swanson concluded that the literature provided evidence that HRD interventions that focused on appropriate dependent variables and systematically executed will have a positive return-on-investment.

Other researchers have also identified targeted measures of financial performance that validate organizational performance initiatives and specifically human resources development. Ellinger, Ellinger, Yang and Howton (2002) discussed four measures of financial performance: return on equity, return on assets, Tobin's q, and market value added and their use as tools to validate HRD initiatives. Lam and White (1998) in a study of human resources orientation and corporate performance discussed

such organizational validation measures as: return on assets, growth in sales, and stock values. Casio (1989) as cited in Tannenbaum and Yukl (1992) presented guidelines for incorporating measures of net present value and break-even analysis into the training design process. Phillips (1984) as cited in Rothwell and Kazanas (1994) identified a number of hard data measures for evaluating training results. These ranged from output measures such as items sold, shipments, and inventory turnover; cost measures such as budget variances, project cost savings, and programs costs; time measures such as processing time, work stoppages, and lost time days; and finally, quality measures such as scrap, waste, error rates, and rework.

Therefore, the research suggests that there are a considerable number of targeted organizational measures that can be used to validate the results of a training program despite the limited percentage of organizations that do so. Thus, based on the research of Lawshe (1975), who defined the individual performance domain, and the research of others (Bushnell, 1990; Tannenbaum & Yukl, 1992; Kirkpatrick 1994, Holton, 1996, Swanson, 1996,1998), who have emphasized the importance of the organizational domain and its measurement and validation, organizational validity can be defined as the extent to which overlap, or communality, exists between (a) performance on a

test under investigation, in this case the training content, and (b) a organizational goal or outcome that drives or is driven by the use of learned tasks found in the job performance domain. Operationally it is the extent to which the organizational domain correlates with the content domain of a training program. Or, the extent to which an employee uses learned tasks based on as association with a goal cue in the workplace.

Summary

Transfer of training has been widely studied over the past several years with researchers looking for a solution to the problem. Researchers have looked at the training design, the trainee, and the organizational environment as factors affecting transfer of training. Many have attempted to define a fixed set of variables that can definitively assess the transfer climate. In years past, training theory mostly focused on instructional design. Researchers have also attempted to tie transfer of training with psychological theories. For example, it has been linked with theories associated with individual motivation, such as expectancy theory, goal setting theory, or equity theory. In contrast others have suggested a systems approach to training to include a needs analysis composed of task, individual, and organizational analysis, followed by training design, and ultimately validation of the content domain. Regardless, there

is still no consensus as to how to effectively measure transfer of training, but there is an overall consensus that it is a multivariate and complex topic that must be solved. In fact, the very survival of corporate training may rest on this research as corporate leaders continue to seek answers as to the effectiveness of training and its value to the organization.

Chapter III

Methodology

Introduction

The purpose of this study was to empirically investigate transfer of training and its relationship with the training system. Specifically, this study looked at training content along with its content validity in relation with the job performance domain. This study also examined stimulus situations in the workplace as a task cue and indicator to use learned tasks; and, as a means to establish stimulus validity in relation with the content and job performance domains. Finally, this study looked at the connection between training and the organizational domain by examining training content and its relationship with business performance as a goal cue and indicator of transfer; and, as a means to establish the organizational validity of a training program.

This chapter provides the rationale for the research design, a description of the research methodology, and discusses the survey instruments to include their validity and reliability. The research questions and hypotheses are stated, and the variables and research populations are defined. Finally, a pilot test, data collection procedures, and

statistical techniques and analyses are identified and discussed.

Rationale For the Research Design

The phenomenon of transfer of training has been researched and documented by practitioners and academics for many years with possibly little advancement, definitive conclusions, or formulas for success. Researchers have proposed models and methods to measure transfer of training (Kirkpatrick, 1978) and others have questioned these models and proposed new models and methods (Baldwin & Ford, 1988; Alliger & Janak, 1989; Holton, 1996; Holton et al., 2000).

From a research-based perspective, this study sought to expand upon existing transfer of training theories and models (Lawshe, 1975; Ford & Wroten, 1984; Baldwin & Ford, 1988; Goldstein & Gilliam, 1990; Rouiller & Goldstein, 1993; & Holton et al., 2000). This study referenced this previous research and specifically the training design process, which has been a frequently overlooked aspect of transfer of training (Baldwin & Ford, 1988). Furthermore, this study investigated the training design process from a need and stimuli based perspective and explored quantitative methods that lead to the validation of the training design. Finally, this study looked at the training

system and its connection with the organizational domain and the resulting measurement of the success of training.

Methodology

This research was comprised of three phases. Phase one was the determination of the content validity of a training design in relationship to a job performance domain. Phase two was the identification and presence of workplace stimuli that cue the use of learned tasks, the determination of stimulus validity, and its correlation with the training content and the job performance domains. Phase three was the organizational validation of the link between the training content domain, the stimulus domain, and the organizational domain.

In the first phase of this study, survey data were collected from a subject matter expert panel to determine the relationship between the content domain of a training program and its associated job performance domain. For this study, a training program on a fire alarm system, and specifically a 17-item job task list (Appendix A), operationalized the content domain. These 17 items, and 27 other related job tasks, represented a total set of 44 possible job tasks associated with the installation of a fire alarm system, and thus operationalized the job performance domain. The items for the survey were based on this 44-item job task list. Thus, the job

task list was not limited to tasks found only in the training program (17 of the 44 items) but all tasks associated with the application of the product to ensure a complete understanding of the job performance domain and the breath of possibilities for the design of a training program. Once constructed, refined, and piloted, the "training content questionnaire" was administered to a group of subject matter experts who rated which tasks were "essential" to the performance of the job performance domain. Based on this input, content validity ratios (CVR) were calculated for each job task. A content validity index (CVI) was then calculated to determine the overall content validity of the training design. The expert panel also rated the frequency of occurrence of these job tasks in the job domain as an additional step to establish content validity. The frequency measure was referred to as the frequency validity ratio (FVR). The foundation for this phase of the study was previous research conducted by Lawshe (1975) who introduced the CVR approach for the validation of course content, Ford and Wroten (1984) who used this same quantitative method in their study of training design and redesign, and Baldwin and Ford (1988) who suggested that the relevance of training content could be measured by a combination of task importance and frequency.

The next phase of the study was the application of the original survey instrument with graduates of the training program. This phase was referred to as the stimulus validation phase, which sought to determine if opportunities actually existed in the workplace to use the training and to what extent graduates (fire alarm technicians) perceived these tasks to be important, or essential, to their job performance domain. The content validity ratio process designed by Lawshe (1975) was used to quantify the results along with Baldwin and Ford's (1988) suggestion of the use of importance and frequency measurements. However for this phase of the study, CVR values were referred to as stimulus validity ratios (SVR) and stimulus-frequency validity ratios (S-FVR) to distinguish between survey responses from phase one and two of the study.

The results of the content validation study (CVR and FVR values) were correlated with the results of the stimulus validation study (SVR and S-FVR values) providing evidence as to the validity of the training design or the need for redesign. This aspect of the study was based on the "matching technique" concept described by Ford and Wroten (1984), which correlated CVR values with time spent on a task during training. For this study, the match was determined by correlating phase one CVR values with phase two SVR values.

The final phase of this study was a look at the connection between the training content and the organizational domain. Specifically, this study looked at extant financial data associated with the sale of product components taught in the course. These product components were employed in the field based on the needs of the marketplace. Each of the 44 survey items (Appendix A) identified a product component or group of product components. CVR and SVR values determined in phase one and two were correlated with total annual sales of the respective product component. The higher the product revenue value (quantity sold for one year x product list price = product revenue value) the higher the perceived financial importance of the product component to the organization and thus the more essential its related training task to the job performance domain. The foundations for this phase of the study were based on the content validation process (Lawshe, 1975), the matching technique (Ford & Wroten, 1984), and return-on-investment approaches identified by Swanson (1998).

Survey Instrument

A custom designed survey was used for this research study. This survey was administered electronically to participants via a secure Internet web site. The basis for the survey design was previous research conducted by Lawshe (1975), Ford and Wroten

(1984), and Baldwin and Ford (1988). The custom survey was pilot tested to ensure an appropriate level of validity and reliability.

Survey instrument rationale. The survey instrument for this study was based on the research of Lawshe (1975), Ford and Wroten (1984), and Baldwin and Ford (1988). A review of the literature did not reveal other quantitative methods to assess the content validity of a training design. Cascio (1998) reiterated the work of Lawshe as a viable method to assess content validity to include the concept of a content evaluation panel, or expert panel, and the use of the content validity ratio (CVR) formula and process.

Survey instrument. The research approach and the design of the survey were based on the work of Lawshe (1975), Ford and Wroten (1984), and Baldwin and Ford (1988). However, items for the survey were based on a 44-item job task list representing the job performance domain, which was specifically the installation of a fire alarm system by a trained fire alarm technician. Trainers responsible for the design and delivery of the course, and who were considered to be subject matter experts on the product, determined the task list. The survey was electronically administered to two groups of respondents, a

panel of subject matter experts (SME's), and a sample of course graduates. The instructions differed however given the different orientation of the SME's and the graduates.

The survey used two scales, importance and frequency. The "importance" scale was a three-point scale ranging from "not necessary" to "useful but not essential" to "essential." A decision rule was established whereby a rating of "3" was considered essential for the CVR calculation. Lawshe (1975) used the same three-point scale to measure the essentiality of job tasks. Lawshe tabulated the responses and those tasks marked as "essential" by more than half the panelists had some degree of content validity. Ford and Wroten (1984) later used a seven-point scale to rate the importance of each task ranging from "no importance" to "extreme importance." Ford and Wroten similarly created a decision rule whereby ratings of above average importance or higher (five, six, or seven) were considered essential. For this study, the original Lawshe three-point scale was used to clearly distinguish between the importance scale and the six-point frequency scale. This difference in scale structure helped to avoid scale confusion for the survey respondent.

The "frequency" scale used a six-point scale ranging from "no installations" (0%) to "every installation" (100%). Baldwin and Ford (1988) identified frequency as a measure to help

validate course content, but a review of the literature did not identify any study that has used this variable in the study of course content validation. This study applied the CVR process to the frequency measurement. The frequency measurement was referred to as the frequency validity ratio (FVR). A decision rule was established whereby ratings of "5" and "6" were considered a high level of frequency for the FVR calculation.

Finally, while the responses on the survey deal with general job performance domain issues and not with the job performance of any individual respondent, all information provided was kept strictly confidential, and was available on an individual basis, only to the researcher.

Validity. Validity refers to the extent to which an empirical measure adequately reflects the real meaning of the concept under consideration (Babbie, 2001, p. 143). Cascio (1998, p.100) added that validation is not simply determined by a single study but instead many investigations that decide the degree to which the evidence supports the inferences made by the empirical measure. Messick (1980) pointed out that different kinds of inferences require different kinds of evidence; or, both the data and rationale that cement those facts into a justification of test-score inferences.

Inferences about validity based upon content related evidence are concerned with whether or not a measurement procedure contains a fair sample of the universe of situations it is supposed to represent (Cascio, p. 101). When making inferences about a job performance domain, Lawshe (1975) defined content validity as the extent to which overlap, or communality, exists between (a) performance on the test under investigation and (b) ability to function in the defined job performance domain. Cascio (1998, p. 101) stated that there are three assumptions that underlie the use of content-related evidence: 1) The area of concern can be conceived as a meaningful, definable universe of responses; 2) A sample can be drawn from the universe; and 3) The sample and sampling process can be defined with sufficient precision to enable judgment about how adequately the sample of performance infers performance in the universe. Messick (1995) also emphasized the importance of the specification of boundaries when examining the content relevance of the domain. In this study, the identifiable segment, or sample, drawn from the universe was the field application of a fire alarm system, which was defined by a 44-item job task list. This task list served as the test items for this study's survey instrument.

Operationally, content-related evidence may be evaluated in terms of the extent to which members of a content evaluation

panel, or subject matter experts, perceive overlap between the test and the job performance domain (Lawshe, 1975). Messick (1995) also stated that both the content relevance and representativeness of assessment tasks are traditionally appraised by expert professional judgment. Lawshe stated that this extent of overlap could be determined quantitatively through a content validity ratio (CVR) measurement process. The survey for this study was based on this quantitative approach of content validity. Lawshe (1975) and Ford and Wroten (1984) used this quantitative approach in their studies of training design and concluded that it is a viable quantitative method to assess content validity. Therefore, this study employed this same method of content validation.

Reliability. Reliability is a matter of whether a particular technique, applied repeatedly to the same object, yields the same result each time (Babbie, 2001, p. 140). Tests of reliability take many forms but generically it is referred to as the reliability coefficient, which seeks to measure a procedure's freedom from unsystematic errors (Cascio, 1998, p.88). To determine the reliability of their study, Ford and Wroten (1984) established three groups of respondents, who independently completed the content validity questionnaire. Intergroup correlations revealed that all three groups had very

similar perceptions of task importance ($r > .80$, $p < .001$). Ford and Wroten concluded that the high level of intergroup agreement supported the quality of the expert judgments. For this study, reliability was established through a systematic review of the survey instrument by a design team along with a pilot test to determine if responses reflected a discernable and useful result. Furthermore, this study's use of two panels (expert panel & graduates) was similarly tested for intergroup agreement by correlating their respective validity ratios.

Research Questions and Hypotheses

The purpose of this current study was to answer these research questions:

1. To what extent is there a relationship between the training content domain and the job performance domain based on an examination of the content validity metrics of importance and frequency?
2. To what extent is there a relationship between the stimulus domain, the training content domain, and the job performance domain based on an examination and correlation of stimulus and content validity metrics?
3. To what extent is there a relationship between the training content domain, the stimulus domain, and the organizational

domain based on correlations of these domains and their respective metrics?

This study considered Research Question 1 with the following hypothesis stated in the null (Ho) and alternative (Ha) forms.

Ho1: There is no relationship between the job performance domain and the content domain of a training program based on an examination of its content validity ratios (CVR).

Ha1: There is a relationship between the job performance domain and the content domain of a training program based on an examination of its content validity ratios (CVR).

Ho2: There is no relationship between the job performance domain and the content domain of a training program based on an examination of its frequency validity ratios (FVR).

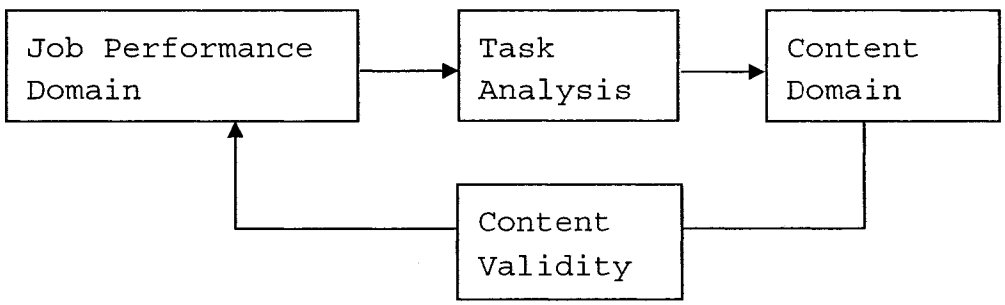
Ha2: There is a relationship between the job performance domain and the content domain of a training program based on an examination of its frequency validity ratios (FVR).

Ho3: There is no relationship between content validity ratios and frequency validity ratios (FVR).

Ha3: There is a relationship between content validity ratios and frequency validity ratios (FVR).

Figure 9 shows the hypothesized framework of the research elements.

Figure 9. Relationship between job performance domain, task analysis, content domain, and content validity



This study considered Research Question 2 with the following hypotheses stated in the null (Ho) and alternative (Ha) forms.

Ho4: There is no relationship between the stimulus domain, or transfer opportunities in the workplace, and the job performance domain based on an examination of its stimulus validity ratios (SVR).

Ha4: There is a relationship between the stimulus domain, or transfer opportunities in the workplace, and the job

performance domain based on an examination of its stimulus validity ratios (SVR).

Ho5: There is no relationship between the job performance domain and the stimulus domain based on an examination of its stimulus-frequency validity ratios (S-FVR).

Ha5: There is a relationship between the job performance domain and the stimulus domain based on an examination of its stimulus-frequency validity ratios (S-FVR).

Ho6: There is no relationship between the stimulus validity ratios (SVR) and stimulus-frequency validity ratios (S-FVR).

Ha6: There is a relationship between the stimulus validity ratios (SVR) and stimulus-frequency validity ratios (S-FVR).

Ho7: There is no relationship between graduates' perception of task importance (SVR) and an expert panel's perception of task importance (CVR).

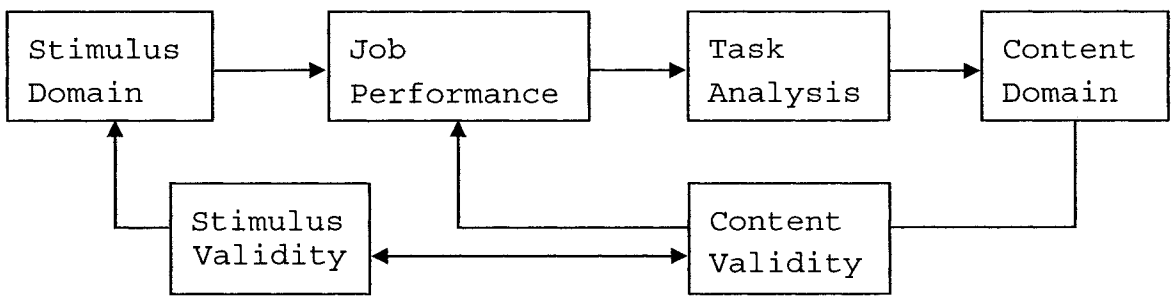
Ha7: There is a relationship between graduates' perception of task importance (SVR) and an expert panel's perception of task importance (CVR).

Ho8: There is no relationship between graduates' perception of frequency of occurrence of a job task in the workplace (S-FVR) and an expert panel's perception of frequency of occurrence of a job task in the workplace (FVR).

Ha8: There is a relationship between graduates' perception of frequency of occurrence a job task in the workplace (S-FVR) and an expert panel's perception of frequency of occurrence of a job task in the workplace (FVR).

Figure 10 shows the hypothesized framework of the research elements.

Figure 10. Relationship between content domain, content validity, stimulus domain, and stimulus validity.



This study considered Research Question 3 through the following hypotheses stated in the null (Ho) and alternative (Ha) forms.

Ho9: There is no relationship between the organizational domain, or a business goal/measure within an organization, and the training content domain based on a correlation of content validity ratios and its respective product component revenue value.

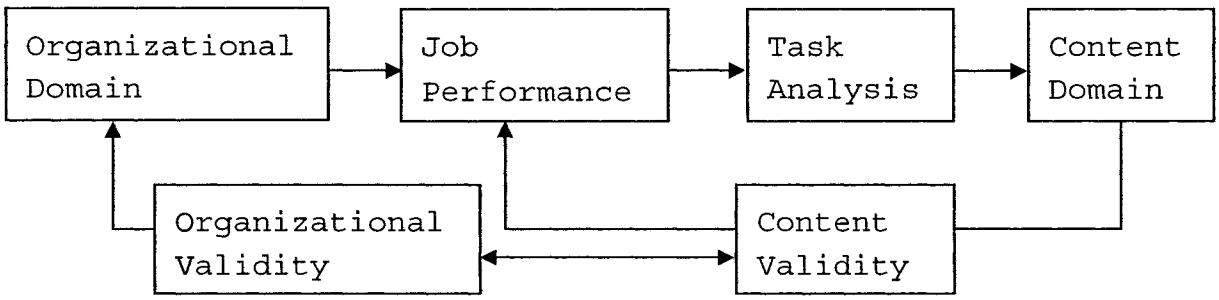
Ha9: There is a relationship between the organizational domain, or a business goal/measure within an organization, and the training content domain based on a correlation of content validity ratios and respective product component revenue value.

Ho10: There is no relationship between the organizational domain, or a business goal/measure within an organization, and the stimulus domain based on a correlation of stimulus validity ratios and its respective product component revenue value.

Ha10: There is a relationship between the organizational domain, or a business goal/measure within an organization, and the stimulus domain based on a correlation of stimulus validity ratios and its respective product components revenue value.

Figure 11 shows the hypothesized framework of the research elements.

Figure 11. Relationship between content domain, content validity, organizational domain, and organizational validity.



Variables

Dependent variables. Dependent variables are variables assumed to be dependent on or caused by another (Babbie, 2001, p. G3). For this study the dependent variable was the content domain of the training design. Previous research (Lawshe, 1974; Ford & Wroten, 1984; Ford & Baldwin, 1988) established the empirical framework for this study. In this study, the focus was on the training content as a dependent variable based on the needs of the job performance, stimulus, and organizational domains rather than behavioral changes that occurred in the job performance domain based on the effects of a training design. In other words, the job performance domain, and the training need for this domain, was the antecedent for the training content.

Lawshe (1975) defined the job performance domain, the content domain, and a content validity process for correlating this relationship. Ford and Wroten (1984) further discussed the content domain, and content validity, along with defining a process to continuously sample the job performance domain to ensure that the training design remains aligned with the needs of the job performance domain. Analogously, Kohli, Jaworski, and Kumar (1993) discussed the importance of market intelligence, which is the collection and assessment of customer needs; or in the case of training, job performance needs.

Baldwin and Ford (1988) identified training design, and specifically, training content, as a variable in their research on transfer of training. Holton et al., 2000 also identified content validity as a variable in their research on transfer of training; or, the extent what is taught in training matches job requirements. Additionally, Baldwin and Ford stated that to examine the successful generalization of trained behaviors, a clear identification of the knowledge, skills, and behaviors expected to be transferred is needed. Baldwin and Ford further stated that few attempts have been made in the literature to list the criteria of success, or the relevance of the skills, that one should expect on the basis of training objectives and training evaluation criteria. They finally stated that such an

approach was critical to the development of an empirical base regarding transfer.

Independent variables. Independent variables are the presumed cause or effect of a dependent variable (Babbie, 2001, p. G5; Kerlinger, & Lee, 2000, p. 47). Babbie added that the independent variable takes the form of an experimental stimulus, which is either present or absent. Therefore, the independent variable is the antecedent and the dependent is the consequent (Kerlinger & Lee, p. 47). For this study, the independent variables were the job performance, stimulus, and organizational domains.

Lawshe (1975) described the job performance domain, as an identifiable segment or aspect of the job performance universe, which can be operationally defined, and about which inferences can be made. Gagne (1974) added that this is the learnable components of human performance or the tasks that humans perform to accomplish work. Holton et al. (2000) identified the job performance domain as individual performance, or, the outcome of the learning transfer system. Ford and Wroten (1984) used the term job element, which is the knowledge, skills, abilities, and other personal characteristics that leads to job performance. For this study, the job domain is operationalized as 44 job tasks associated with the installation of a fire alarm system.

The stimulus domain can be defined as an identifiable segment or aspect of the stimulus universe about which inferences can be made. Further, it is identifiable demands to use learned tasks found in a job performance domain. Operationally, it is stimulus situations, observed as cues, which in turn demands learned responses. Researchers have alluded to the concept of a stimulus domain in the training literature for more than a century. Hofding (1892) as cited in Royer (1979) suggested that the recall of learned knowledge and skills consisted of four components: A-a-b-B. During learning the stimulus event (A) produces the internal sensory trace (a), which in turn becomes associated with the internal representation of the response event (b), and (b) gives rise to the overt response (B). Hofding further stated that after learning, successful recall is dependent on A (or a stimulus similar in some sense to A). Gagne (1974) and Gagne et al. (1992) referred to it as the stimulus situation. Royer's (1979) discussion of environmental theories, such as the theory of identical elements (Thorndike & Woodworth, 1901) and near and far transfer (Mayer, 1975, as cited in Royer, 1975) identified the concept of a stimulus complex. McGehee and Thayer (1961) discussed stimulus variation in reference to the theory of general principles. Baldwin and Ford (1988) discussed stimulus variability and Ford and Weissbein (1997) discussed the need for

trainee adaptability in the face of novel situations. Royer discussed stimulus generalization, which is when a learned response is elicited by different stimulus events.

Wood (1986) identified the stimulus-response concept as consisting of three essential components: products, acts, and information cues. He further described information cues as task inputs. Similarly, Desimone et al. (2002) described a task analysis method, "stimulus-response-feedback," which breaks down each task into three components. They stated the first component is the stimulus, or cue, that prompts the employee to perform the task. Rouiller and Goldstein (1993) also discussed a model of organizational transfer climate, which included situational cues that either inhibited or helped to facilitate transfer. They added that these situational cues serve to remind trainees of their training and seek to stimulate the transfer process. Thus, these situational cues can be described as a stimulus domain, or a causal variable, that must exist in order for trained skills and behaviors to have a need to transfer. For this study the stimulus domain was operationalized as course graduates' perception of opportunity to use each of the 44 job tasks in the workplace.

Stimulus validity can be defined, as the extent to which overlap, or communality, exists between performance on a test under investigation, in this case the training content domain,

and an identifiable stimulus domain that demands the use of learned tasks found in the job performance domain. Operationally it is the extent to which the stimulus domain correlates with the content domain of a training program. Or, the extent to which an employee may be provided with opportunities to use learned tasks based on stimulus situations, or observed cues, in the workplace. Researchers have sought ways to link transfer of training with the work environment and validate the situational opportunities that lead to transfer. Baldwin and Ford (1988) suggested it could be measured by a combination of task importance and frequency and a taxonomy of situations. Laker (1990) suggested that the degree of initiation could be measured by intensity, frequency, or consistency of the individual's use of the skills and behaviors acquired during training. For this study, stimulus validity was operationalized as stimulus validity ratios and stimulus-frequency validity ratios.

The organizational domain can be defined as an identifiable segment or aspect of the organizational universe about which inferences can be made. Further, it is organizational goals or outcomes that drive or is driven by the use of the learned tasks found in the job performance domain. Researchers have long identified the business outcomes of a training intervention as an important construct of the transfer of training process

(McGehee & Thayer, 1961; Kirkpatrick, 1994; Holton 1996; Swanson, 1996, 1998). Holton's (1996) conceptual evaluation model consisted of three primary outcomes: learning, individual performance, and organizational results. Holton defined learning as the achievement of the learning outcomes, individual learning as the result of the learning being applied to the job, and organizational results as the organizational consequence of the change in individual performance. The organizational domain may also have a dual dependent-independent variable relationship with the training system. As Swanson (1996) stated training initiatives seek to drive change at the individual, work process, and organizational levels. However, the training design itself, based on a proper needs assessment, is in fact driven by the needs of individuals, work processes, and organizational strategy. For this study, the organizational domain was operationalized as the revenue value of a product component, or group of components, that are associated with each of the 44 jobs tasks.

Organizational validity can be defined as the extent to which overlap, or communality, exists between (a) performance on a test under investigation, in this case the training content, and (b) organizational goals or outcomes that drive or is driven by the use of learned tasks found in the job performance domain. Operationally it is the extent to which the organizational

domain correlates with the content domain of a training program. Or, the extent to which an employee uses learned tasks based on as association with a goal cue in the workplace. Swanson (1998) reviewed various methods to validate a training program's financial outcome. Ellinger, Ellinger, Yang and Howton (2002) discussed four measures of financial performance and their use as tools to validate HRD initiatives. Lam and White (1998) in a study of "human resources orientation" and corporate performance discussed organizational validation measures. Cascio (1989), as cited in Tannenbaum and Yukl (1992), presented guidelines for incorporating financial measures into the training design process. Phillips (1984) as cited in Rothwell and Kazanas (1994) identified a number of hard data measures for evaluating training results. For this study, organizational validity was operationalized as the correlation between product component revenue values, content validity ratios, and stimulus validity ratios.

Measurement of Variables

The survey instruments (Appendix B & C) contained the task lists and scales used to determine the validity ratios for both the content and stimulus domains. The "importance" scale for these survey instruments was a three-point scale (1 = "not necessary," 2 = "useful but not essential," 3 = "essential.") A

decision rule was established whereby a rating of '3' was considered essential. The "frequency" scale was a six-point scale (1 = "no installations (0%)," 2 = "occasional install (20%)," 3 = "below average (40)," 4 = "above average (60%)," 5 = "most installs (80%)," 6 = "every installation (100%)"). A decision rule was established whereby a rating of "5" and "6" was considered a high level of frequency. The measurement of the organizational domain was based on extant financial data representing product component revenue value for a one-year period. A product component, or group of components, was associated with each of the 44 job tasks.

Dependent variable. This study examined one dependent variable, content domain, based on its reference to a training program. This study also looked at content validation as a process and a variable related to training design. Lawshe (1975) defined content domain and it has also been referenced in test validation studies of content validity (Guion, 1978 Messick, 1980, 1995; Babbie, 2001) and in studies of training design (Ford & Wroten, 1984, Holton et al., 1997; Holton et al., 2000). The content domain was operationalized by a 17-item task list representing topics taught in a training program. Appendix A lists these 17 training tasks along with 27 other related tasks not taught in the training program. The total 44-item

task list operationalized the job performance domain. The content validity of the training tasks was assessed via a training content questionnaire using a three-point importance and a six-point frequency scale. Thus, the content domain was tested via content validity ratios (CVR) and frequency validity ratios (FVR) and served as dependent measures that were compared to stimulus validity and organizational validity measures.

Independent variables. This study incorporated three independent variables discussed or implied in the literature. These variables were job performance, stimulus, and organizational domains.

Lawshe (1975) defined the job performance domain as an identifiable segment or aspect of the job performance universe about which inferences could be made. For this study the identifiable segment was represented by a 44-item task list, which identified the total possible tasks associated with the installation of a fire alarm system.

The concept of a stimulus domain has been identified by a number of researchers (Hofding, 1892; as cited in Royer, 1979; McGehee & Thayer, 1961; Gagne (1974); Gagne et al., 1992; Baldwin & Ford, 1988; Ford & Weissbein, 1997). The stimulus domain was identified by the same 44-item task list, which represented a total set of stimulus cues by product component.

Stimulus validity was assessed via a questionnaire using two scales to determine 1) task importance and 2) frequency of use in the workplace. Stimulus validity ratios were calculated for each task based on the responses. The stimulus domain was thus operationalized as stimulus validity ratios (SVR) and stimulus-frequency validity ratios (S-FVR) for each of the 44 job tasks.

The organizational domain variable has also been discussed by a number of researchers (McGehee & Thayer, 1961; Kirkpatrick, 1994; Holton 1996; Swanson, 1996, 1998). The organization domain was operationalized by calculating product revenue value (quantity sold for one year x product list price = product revenue value) for each of the product components identified in the 44-item job task list.

Population and Sample Selection

This study used survey data obtained from subject matter experts who were familiar with the application of a fire alarm system within a job performance domain; and, who were also familiar with the content domain of its related training program. In addition, this study used a second set of survey data obtained from fire alarm technicians who were graduates of the fire alarm systems training program. Finally, the study extracted a third set of extant product component sales data from company financial records.

The subject company for this study was a manufacturer of life safety systems. The manufacturer's products, such as fire alarm, access control, and security systems, ranged from simple and easy to install products to highly sophisticated and flexible systems capable of supporting the largest facilities, buildings, and campuses. This company sold its products through an independent distribution network located throughout the global market. In turn, these distributors sold, installed, and serviced these systems for the final end-user - the facility owner. To ensure successful results with its products, the manufacturer required that its distributors complete factory certification courses in order to purchase, install, and service these products. These certification courses were on average five days in duration teaching technicians a variety of job tasks associated with the application of the products. The length of these courses, however, was dictated by the limits of what could be accomplished in a five-day workweek. Therefore, what was taught in class was based on what trainers believed to be essential to the average trainee given the many features and capabilities of the product. In this particular case, the training program was comprised of 17 major training tasks. However, over the years, customers and others had questioned the appropriateness of the training content and its fit with their day-to-day needs. The total set of tasks that could be taught

in the program were 44 tasks, however, given the time restriction, trainers selected 17 tasks to focus on based on a perceived importance and frequency of use in the marketplace.

Therefore, the first step was the identification of the trained tasks, which represented the content domain. Trainers who were responsible for the subject course accomplished this step. In addition, the trainers created a list of the non-trained tasks. Next, this completed task list, published via a training content questionnaire, was administered to twenty-five subject matter experts. These experts were selected from the manufacturer's five sales regions within the United States. Within each region, five distributors were identified based on top sales data for that region. Next, these distributors were asked to nominate one expert to serve on the expert panel. These experts were technicians who were graduates of the subject course and had extensive field experience with the product. These experts were the top technicians within their respective company. These subject matter experts were contacted by e-mail and directed to a secure Internet link to complete an electronic form of the questionnaire. A second e-mail was sent to aid in the data collection.

The sample frame, for the second data collection effort, were technicians who had graduated from the subject course within the past six to twenty-four months. This six-month

requirement had given graduates an opportunity to use the training content back on the job. The twenty-four month requirement limited the survey to graduates who should have by the time of the survey, transferred the training content to the job. These technicians contacted via email were directed to a secure Internet link to complete an electronic form of the stimulus evaluation questionnaire. A second e-mail was sent to aid in the data collection.

Pilot Test of Survey Instrument

When gathering data through a survey instrument there is the possibility of error. Thus, the surest protection against such error is to pretest the questionnaire in full or in part (Babbie, 2001). Furthermore, a pilot test is important to establish the face validity of the instrument and to improve questions, format, and scales (Creswell, 1994)). Babbie, however, stated that it's not usually essential that pretest subjects comprise a representative sample, although it should at least be tested with people to whom the questionnaire is at least relevant (p. 250).

Therefore, a team of trainers who were responsible for the course first completed a task analysis for the job performance, content, stimulus, and organizational domains. A list of tasks were identified and refined into 44 task statements (Appendix

A). The content domain of the training design was represented by 17 of the 44 tasks. The total list of 44 tasks represented the job performance and stimulus domains and each of the 44 items contained a product component, or group of components, representing the organizational domain (Appendix A).

In multiple meetings, trainers reviewed the survey design to ensure accuracy of the content and overall design appeal and completeness. The questionnaire was next piloted with 19 students who were graduates of the subject course and who were attending other training programs at the training center. In addition, six employees of the subject company also completed the survey. These six employees were considered experts on the fire alarm system. All pilot test participants were not included later in the primary survey process in order to serve as an additional sample group to assess reliability based on intergroup correlations.

The raw survey data for the pilot survey were tabulated in Appendix D. Content validity ratios (CVR) (Appendix E) and frequency validity ratios (FVR) (Appendix F) were calculated for each of the survey items. As a result of the CVR calculations a content validity index (CVI) was calculated for the 17 training tasks. The result was a CVI of .39, which exceeded the .37 minimum value needed to be a content valid training design at the $p = .05$ level. As a further test of face validity of the

survey design, the CVR values for the non-training tasks were also averaged to determine the opposing negative CVI. The opposing negative CVI for the non-training tasks was -.38, which exceeded a -.37 minimum value at the p = .05 level; and, thus validated the exclusion of job tasks from the training design. FVR values were also averaged to determine if frequency of use yielded the same level of validity. The Frequency Validity Index (FVI) was .19, which did not exceed the .37 CVR minimum value. However, Lawshe (1975) stated a CVI greater than 0 indicates some level of validity. Further, validity of the frequency scale was supported by the calculation of the opposing negative FVI, which was calculated to be -.86 indicating a clear distinction between the frequency of use in the workplace of the 17 training tasks versus the 27 non-training tasks.

Following the pilot test, trainers reviewed the individual results of each survey item to determine if the responses reflected common assumptions of importance and frequency. As a result, Trainers modified questions 5 and 28 by removing specific product component part numbers from the questions. Trainers perceived the initial responses to these two questions might have been misleading because of the variation of use of specific part numbers. To explain, question 28 referenced the installation of 20, 40, or 90 watt zoned amplifiers. Regardless of the wattage of the amplifier, the skill required to install

the part was the same and thus the need for the product was the same. Therefore, these two questions were modified to reduce possible variation of response based on a specific product part number. Next, the survey was piloted tested once again (Appendix G) with nine different graduates to validate the change. The results were better aligned with common expectations based on the absence of part specific variation. For example, the CVR value for question 5 changed from a CVR = .04 for the first pilot test to a CVR = .55 for the second pilot test. Trainers believed the higher CVR value was better aligned with the use and configuration of the product.

Data Collection and Tabulating

This research study analyzed data from two distinct groups using a custom survey with modified instructions (Appendix B & C) and extant financial data from the subject company. One of the surveys was referred to as the "training content questionnaire" and the second survey as the "stimulus evaluation questionnaire." The extant data consisted of product sales data extracted from company financial data.

The first phase of this study collected data as to the relevance of the content of a subject course to the job performance domain. The items for the survey were based on a 44-item task list considered to represent the job performance

domain. Trainers responsible for the development and teaching of the subject course developed the task list and identified the task statements. An example of one of these task statements was "Install a CAB 5 Lobby Enclosure Cabinet." This task list included all of the tasks taught in the subject course along with other tasks that had been excluded due to administrative constraints or what may have been perceived as non-relevant tasks. Wexley (1984) believed that Lawshe's (1975) original approach failed to identify tasks required on the job and not covered in training, and vice versa.

The survey was administered electronically to a content evaluation panel via a secure Internet web site. These experts rated tasks that were "essential" to the job performance domain as well as the frequency of use of the job tasks. The foundation for this phase of the study was research conducted by Lawshe (1975) who created a process for the validation of course content to include a statistical formula and measurement scale to determine "essential" training tasks as well as research by Baldwin and Ford (1988) who suggested that relevance could be measured by importance and frequency. Further, the expert panel process was a commonly used method to judge the relevance of test content (Lawshe, 1975; Messick, 1995). The data from the surveys were tabulated and conclusions were made about the

content validity of the course and the communality or overlap between the content and job performance domain.

The next phase was the development of a stimulus evaluation questionnaire to determine if opportunities actually existed in the workplace for graduates to use the training and to what extent did they perceive learned tasks to be essential to their job performance domain. Responses were tabulated and measured by using the content validity ratio approach established by Lawshe (1975). The "matching technique" described by Ford and Wroten (1984) was also a foundation for this phase of the study.

The stimulus evaluation questionnaire, containing the same tasks as the training content questionnaire, was administered electronically to a sample group of course graduates via a secure Internet web site. A positive stimulus validity ratio for a survey item (task) should have positively correlated with the content evaluation panel's validity ratios. Likewise, negative stimulus ratios and content validity ratios should have correlated. However, if there was not a correlation this could possibly have indicated two conditions, one was that the expert panel was wrong in its selection of essential and frequently used tasks and the original training design was flawed; or two, the work environment had changed since the original design of the course and there were now training deficiencies or excesses in the training design. Further, a negative condition would

have illustrated the nature of an open systems view where inputs and outputs constantly change and further would have demonstrated the complexity of the ever-changing workplace.

The final aspect of this study was a look at the connection between the content and the organizational domain. Specifically, this study looked at financial data associated with the sale of product components taught in the course. Content validity ratios for each task were compared to the total annual sales for each respective product component or group of components. The higher the revenue value the higher the perceived importance of the product to the organization and thus the more essential it's related training task.

Statistical Treatment

The research questions for this study examined four primary variables: job performance domain, content domain, stimulus domain, and organizational domain. This study sought to establish a relationship between these four variables through several statistical analyses. These tests begin with the calculation of validity ratios to establish the respective validity of the domains. Other statistical tests were performed to correlate the content domain with the stimulus domain; as well as, to correlate the content and stimulus domains with the organizational domain. This study also looked at the

relationship between the independent variables of importance and frequency of use and correlated these two variables for a more comprehensive understanding of content validity.

Data treatment and analysis involved various statistical techniques. The primary statistical treatment was the content validity ratio (CVR) approach proposed by Lawshe (1975). For this study, the CVR analysis established validity ratios for both the content and stimulus domains. Data treatment and analysis also employed SPSS 11.0 for Windows®. SPSS was used for bivariate correlation analysis, an independent-samples t test, and a paired-samples t test for the respective hypotheses. The matching technique was also discussed as a means to identify training excesses and deficiencies (Ford & Wroten, 1984).

For the content validity analysis Lawshe (1975) made two assumptions each of which, according to Lawshe, was consistent with established psychophysical principles:

- Any item, performance on which is perceived to be "essential" by more than half of the panelists, has some degree of content validity.
- The more panelists (Beyond 50%) who perceive the item as "essential," the greater the extent or degree of its content validity (p. 567).

With these assumptions in mind, the following formula for the CVR was used to determine the content and stimulus

validities for each item, thus there were a total of 44 CVR values (Lawshe, 1975; Ford & Wroten, 1984; Cascio, 1998).

$$CVR = \frac{N_E - N_U}{N_T}$$

N_E was the number of panelists (or graduates) indicating essential, N_U was the number of panelists (or graduates) indicating not essential, and N_T was the total number of panelists (or graduates). When fewer than half said essential, the CVR was negative. When half say essential and half do not the CVR was zero. When all said essential the CVR was 1.0 (adjusted to .99); and, when more than half of the respondents and less than all say the task was essential, the CVR was somewhere between zero and .99. Lawshe described how to establish the significance level of the results along with the calculation of a content validity index (CVI), which is simply the mean value of all the CVRs. Hence, the CVI represented the extent to which there was perceived overlap, or communality, between the training content and the job performance domain thus establishing content validity.

Lawshe (1975) discussed the statistical validity of CVR values and indicated that given a set number of panelists the CVR values must have a minimum value in order to satisfy the requirements for a one tailed test ($p = .05$). For example, to satisfy a $p = .05$ value using a one tailed test, a panel must be

composed of at least 14 members to achieve a minimum CVR of .51. The data for this statistical test (Table 3) was contributed by Dr. Lowell Schipper, Bowling Green State University, who did the original computations for the one tailed test (Lawshe, 1975). This study likewise used this table to determine the number of panelists to satisfy a $p = .05$. For example, the content validity study used a panel of 25 individuals requiring that content validity ratios have a minimum value of CVR= .37 to be considered essential. Thus, at least 17 of the 25 panelists would have to indicate that a task was essential for the minimum value of CVR to be met.

Table 2

Minimum Values of CVR, One Tailed Test, p = .05 (Lawshe ,1975)

No. of Panelists	Minimum Value
5	.99
6	.99
7	.99
8	.78
9	.75
10	.62
11	.59
12	.56
13	.54
14	.51
15	.49
20	.42
25	.37
30	.33
35	.31
40	.29

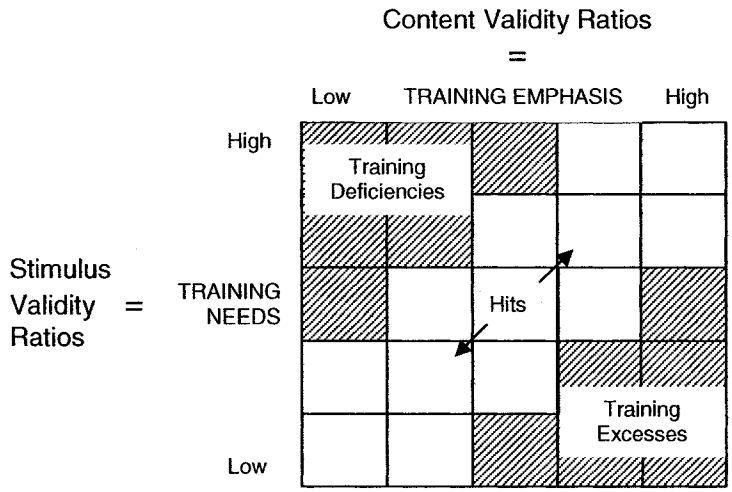
Correlation analysis measures were used to associate the content validity ratios, frequency validity ratios, stimulus validity ratios, frequency-stimulus validity ratios and product sales data. Correlation analysis, or the correlation coefficient (*r*) indicates the strength of the association between any two metric variables (Hair, Anderson, Tatham, & Black, 1998). The correlation between the variables measures from -1.0 to +1.0 to verify both the type and strength of the relationship and the sign of the correlation indicates whether the relationship is directly (+) or inversely (-) associated (Hair et al., 1998). For example, a correlation value of "1" is perfectly correlated. If ratio variables are being associated, one appropriate measure of association is Pearson's product-moment correlation (*r*) (Babbie, 2001). SPSS was used to associate the content and stimulus validity ratios using the software capability to compute a Pearson's product-moment correlation.

A paired-samples t test was used to determine whether the content validity ratio and stimulus validity ratios, as well as frequency validity ratios and stimulus-frequency validity ratios were significantly different from each other. The t test assesses the statistical significance of the difference between two sample means (Hair et al., 1998). A paired-samples t test

procedure compares the means of two variables that represent the same construct group at different times (i.e., before & after an event) or related groups on the same construct (i.e., content validity ratios & stimulus validity ratios). A low significance value for the t test (typically less than 0.05) indicates that there is a significant difference between the two variables. In addition, if the confidence interval for the mean difference does not include zero, this also indicates that the difference is significant. In contrast, if the significance value is high (greater than .05) and the confidence interval for the mean difference contains zero, then it cannot be concluded that there is a significant difference between the means for the two variables.

Additionally, the matching technique described by Ford and Wroten (1984) is itself a correlation process to determine the match between training need and training emphasis (see Figure 12. For this study, the training need was represented by the stimulus validity ratios and the training emphasis was represented by the content validity ratios.

Figure 12. Matching technique applied to content and stimulus validity ratios (Ford & Wroten, 1984)



Thus, descriptive statistics, such as mean, standard deviation, and skewness were used to describe responses. The content validity ratio process was used to test for content and stimulus validity. An independent-samples and paired-sample t test was used to test for statistical significance. Pearson product-moment correlation coefficients were used to test for significance of relationships between independent and dependent variables on the outcomes of the questionnaires.

In order to examine hypothesis one, that there was a relationship between the job performance domain and the content domain of a training program based on an examination of its content validity, the CVR for each task was tested for significance. As illustrated earlier, with a sample of 25 participants, all CVRs that were greater than .37, were

considered significant. In addition, a comparison of training tasks (17 tasks) to non-training tasks (27 tasks) was made. An independent-samples t test compared the set of CVRs for the training tasks to the set of CVRs for the non-training tasks. If the mean, or CVI, of the CVRs for the training tasks was significantly greater than the mean of the CVRs for the non-training tasks, this would indicate that panelists rate training tasks as more essential than non-training tasks. This would validate the training curriculum in terms of the decisions of what to teach and what to exclude based on the input of an expert panel.

In order to examine hypothesis two, that there was a relationship between the job performance domain and the content domain of a training program based on an examination of its frequency validity, the FVR for each task was tested for significance. With a sample of 25 participants, all FVRs that were greater than .37 were considered significant. In addition, a comparison of training tasks (17 tasks) to non-training tasks (27 tasks) was made. An independent-samples t test compared the set of FVRs for the training tasks to the set of FVRs for the non-training tasks. If the mean, or FVI, of the FVRs for training was significantly greater than the mean of the FVRs for the non-training tasks, this would indicate that panelists rated training tasks as more essential based on frequency of use than

non-training tasks. This would provide additional validation for the training curriculum in terms of what to teach and what to exclude based on frequency of use in the job performance domain as viewed by an expert panel.

In order to examine hypothesis three, that there was a relationship between content validity ratios and frequency validity ratios, a bivariate correlation analysis was performed for the 44 CVRs and the 44 FVRs. A positive correlation between these two sets of data would indicate that the tasks that were considered essential were also used more frequently, thus validating the training design.

In order to test hypothesis four, that there was a relationship between the stimulus domain, or transfer opportunities in the workplace, and the job performance domain based on an examination of its stimulus validity, the SVR for each task was tested for significance. With a sample of 25 or more respondents, all SVRs that were greater than .37, were considered significant. In addition, a comparison of training tasks (17 tasks) to non-training tasks (27 tasks) was made. An independent-samples t test compared the set of SVRs for the training tasks to the set of SVRs for the non-training tasks. If the mean, or SVI, of the SVRs for the training tasks was significantly greater than the mean of the SVRs for the non-training tasks, this would indicate that course graduates rate

training tasks as more essential than non-training tasks. This would validate the training curriculum in terms of the decisions of what to teach and what to exclude based on the needs of the marketplace as viewed by course graduates.

To test hypothesis five, that there was a relationship between the stimulus domain, or transfer opportunities in the workplace, and the job performance domain based on an examination of its stimulus-frequency validity, the S-FVR for each task was tested for significance. With a sample of 25 or more respondents, all S-FVRs that were greater than .37, were considered significant. In addition, a comparison of training tasks (17 tasks) to non-training tasks (27 tasks) was made. An independent-samples t test compared the set of S-FVRs for the training tasks to the set of S-FVRs for the non-training tasks. If the mean, or S-FVI, of the S-FVRs for the training tasks was significantly greater than the mean of the S-FVRs for the non-training tasks, this would indicate that course graduates rated training tasks as more essential based on frequency of use than non-training tasks. This would validate the training curriculum in terms of the decisions of what to teach and what to exclude based on the needs of the marketplace as viewed by course graduates.

In order to examine hypothesis six, that there was a relationship between stimulus validity ratios and stimulus-

frequency validity ratios, a bivariate correlation analysis was performed for the 44 SVRs and 44 S-FVRs. A positive correlation between these two sets of data would indicate that the importance and the frequency of each task were positively associated and thus would validate the training design.

To examine hypothesis seven, that there was a relationship between graduates' perception of task importance and an expert panel's perception of task importance, the SVR's and CVR's respectively were calculated for each of the 44 tasks based on the importance ratings, for both the course graduate's questionnaire (the stimulus domain) and the panelist's questionnaire (the content domain). The 44 SVRs were correlated with the 44 CVRs. A significant positive correlation would indicate that both the graduates and panelists agreed on tasks that were important and tasks that were not important. Additionally, a paired-samples t test was used to determine whether the two groups rated the tasks equivalently. The paired-samples t test procedure compared the means of the two variables. If the significance value was high and the confidence interval for the mean difference contained zero, then it could not be concluded that there was a significant difference between the means for the two variables. However, if the significance value was lower than .05, this would indicate that one group rated the tasks as more important than the other

group. So while the bivariate correlation indicated the strength of the relationship between the two groups ratings, the paired-samples t test would indicate whether the two groups rated the tasks as equally important or if one group rated the tasks as more important than the other. As a result, it was possible for there to be a significant positive correlation and for there to be a significant difference in the means. This would indicate that both groups rated the same tasks as more important, but that one group rated the tasks as more important than the other group.

In order to examine hypothesis eight, that there was a relationship between graduates' perception of frequency of use of a job task in the workplace and an expert panel's perception of frequency of use of a job task in the workplace, the S-FVR's and FVR's respectively were calculated for each of the 44 tasks based on the frequency ratings, for both the course graduate's questionnaire (the stimulus domain) and the panelist's questionnaire (the content domain). The 44 FVRs for the content domain were correlated with the 44 S-FVRs for the stimulus domain. A positive correlation would indicate that both the panelists and the graduates of the training program agreed on which tasks should be included in the training program and which tasks should not be included based on frequency of use. Additionally, a paired-samples t test was used to determine

whether the two groups rated the tasks differently. The paired-samples t test procedure compared the means of the two variables. If the significance value was high and the confidence interval for the mean difference contained zero, then it could not be concluded that there was a significant difference between the means for the two variables. However, if the significance value was lower than .05, this would indicate that one group rated the tasks as used more frequently than the other group. So while the bivariate correlation would indicate the strength of the relationship between the two groups ratings of frequency, the paired-samples t test would indicate whether the two groups rated the tasks equally or if one group rated the tasks as being more frequent than the other. Thus, it was possible for there to be a significant positive correlation and for there to be a significant difference in the means. This would therefore indicate that both groups rated the same tasks as more frequent, but that one group rated the tasks as more frequent than the other group.

To examine hypothesis nine, that there was a relationship between the organizational domain and the content domain of a training program, the set of 44 CVRs for the content domain (based on the panelist questionnaire), were correlated with the corresponding revenue value for the respective product component or group of components. A positive correlation would indicate

that tasks that were rated to be essential by the panelists were also associated with greater sales.

To examine hypothesis ten, that there was a correlation between the organizational domain and the stimulus validity of a training program, the set of 44 SVRs for the stimulus domain (based on the graduate questionnaire), were correlated with the corresponding revenue value for the respective product component or group of components. A positive correlation would indicate that tasks that were rated to be essential by the graduates were also associated with greater sales.

Table 3 details each hypothesis, the variables, and the statistical treatment.

Table 3

Hypotheses, Variables, and Statistical Treatments

Hypotheses	Variables	Statistical Treatments
Ha1: There is a relationship between the job performance domain and the content domain of a training program based on an examination of its content validity ratios (CVR).	Dependent variable: Content domain Independent variable: Job Performance domain	1. Descriptive statistics 2. Content validity ratio (CVR) 3. Content validity index (CVI) 4. Independent-samples t test

Hypotheses	Variables	Statistical Treatments
Ha2: There is a relationship between the job performance domain and the content domain of a training program based on an examination of its frequency validity ratios (FVR).	Dependent variable: Content domain Independent variable: Job Performance domain	1. Descriptive statistics 2. Frequency validity ratio (FVR) 3. Frequency validity index (FVI) 4. Independent-samples t test
Ha3: There is a relationship between content validity ratios and frequency validity ratios (FVR)	Independent variable: Content Validity Independent variable: Frequency Validity	1. Bivariate correlation analysis of CVR and FVR values
Ha5: There is a relationship between the job performance domain and the stimulus domain based on an examination of its stimulus-frequency validity ratios (S-FVR).	Independent variable: Stimulus domain Independent variable: Job Performance domain	1. Descriptive statistics 2. Stimulus-frequency validity ratio (S-FVR) 3. Stimulus validity index (S-FVI) 4. Independent-samples t test
Ha7: There is a relationship between graduates' perception of task importance (SVR) and an expert panel's perception of task importance (CVR).	Independent variable: Stimulus domain validity Independent variable: Content domain validity	1. Bivariate correlation analysis of SVR and CRV values 2. Paired-samples t test

Hypotheses	Variables	Statistical Treatments
Ha8: There is a relationship between graduates' perception of frequency of occurrence a job task in the workplace (S-FVR) and an expert panel's perception of frequency of occurrence of a job task in the workplace (FVR).	Independent variable: Stimulus domain validity Independent variable: Content domain validity	1. Bivariate correlation analysis of S-FVR and FRV values 2. Paired-samples t test
Ha9: There is a relationship between the organizational domain, or a business goal/measure within an organization, and the training content domain based on a correlation of content validity ratios and respective product component revenue value.	Independent variable: Content domain validity Independent variable: Organizational domain	1. Correlation analysis of sales data, sales quantity, and content validity ratios (CVR)
Ha10: There is a relationship between the organizational domain, or a business goal/measure within an organization, and the training stimulus domain based on a correlation of stimulus validity ratios and respective product component revenue value.	Independent variable: Content domain validity Independent variable: Organizational domain	1. Correlation analysis of sales data, sales quantity, and stimulus validity ratios (SVR)

Summary

The purpose of this study was to empirically investigate transfer of training and its relationship with the training system. Specifically, this study looked at training content along with its content validity in relation with the job performance domain. This study also examined stimulus situations in the workplace as a task cue and indicator to use learned tasks; and, as a means to establish stimulus validity. Finally, this study looked at the connection between training content and the organizational domain. Specifically, this study examined training content and its relationship with business performance as a goal cue and indicator of transfer; and, as a means to establish the organizational validity of a training program.

To address these issues, this study posed three basic research questions.

1. To what extent is there a relationship between the training content domain and the job performance domain based on an examination of the content validity metrics of importance and frequency?
2. To what extent is there a relationship between the stimulus domain, the training content domain, and the job

performance domain based on an examination and correlation of stimulus and content validity metrics?

3. To what extent is there a relationship between the training content domain, the stimulus domain, and the organizational domain based on correlations of these domains and their respective metrics?

This chapter described the methodology this study used to examine these research questions and to test the series of hypotheses to explain the relationships. The chapter included the instrument rationale as well as evidence to demonstrate the validity and reliability of the research instruments. The hypotheses were restated and all variables were defined. The population, sample selection, pilot test, and data collection methods were discussed. The proposed data analyses techniques were provided. Using these techniques, Chapter IV presents the results of the study.

Chapter IV

Analysis and Presentation of Findings

Introduction

This chapter presents the analysis of this research study along with a presentation of the findings. The data collection results and electronic questionnaire process are described along with descriptive statistics. Results are organized according to each research question and associated hypotheses. Statistical information for each hypothesis is derived from the responses to two questionnaires designed for this research study and extant sales data obtained for this research study.

This study investigated the relationship between the job performance domain and the content domain of a training program. Specifically, this study investigated the process of transfer of training and its relationship with the validation of training content as an antecedent of a transfer condition. Further, this study examined the stimulus domain and its relationship with the job performance and content domains. Specifically, this study explored stimulus situations in the workplace, or the market for training, also a possible antecedent of a transfer condition. Finally, this study examined the connection between the content domain and the organizational domain. Specifically, this study

investigated training content and its relationship with business performance, or for this study, product sales data.

Sample Frames and Descriptive Statistics

This study used survey data from two sample frames, which were a group of 25 subject matter experts and a group of 146 course graduates; and, a third set of financial data obtained from the subject company.

Survey data was obtained from subject matter experts who were familiar with an identified job performance domain; and, who were also familiar with the content domain of its related training program. These subject matter experts were asked to complete a training content questionnaire comprised of 44 job task statements (Appendix B).

A second set of survey data was obtained from graduates of the subject training program. These course graduates were asked to complete a stimulus evaluation questionnaire comprised of the same 44 job task statements (Appendix C).

Finally, the study extracted a third set of extant product sales data from company financial records. This set of data was obtained from the sales department at the subject company (Appendix H).

An e-mail was sent to the twenty-five subject matter experts with a link to the training content questionnaire.

Eleven SME's completed the survey. A second e-mail was sent five days later with ten more SME's responding. The remaining four were contacted by telephone and asked to complete the survey. All four completed the survey. Thus, all twenty-five SME's, or 100 percent, completed the training content questionnaire.

An e-mail was sent to a selected group of course graduates with a link to the stimulus evaluation questionnaire. Graduates were selected based on a graduation date range. This range was from six months to twenty-four months after graduation resulting in a list of 212 graduates. The initial e-mail yielded eighty-four responses to the survey. A second reminder e-mail was sent five days later resulting in forty-three additional graduates completing the survey. A final e-mail was sent indicating the electronic survey process would expire in forty-eight hours. An additional nineteen graduates responded to the questionnaire for a total of 146 responses giving the stimulus evaluation questionnaire an overall response rate of 68.9 percent.

The final set of data was obtained from the subject company's sales staff. This data set was a list of products with respective revenue and quantities sold for the year 2004. The product sales data were then associated with each of the 44 task statements resulting in a total sales value and total sales quantity for each of the 44 task statements (Appendix H).

Descriptive Statistics

The training content questionnaire was administered to twenty-five subject matter experts selected from five respective sales regions within the United States. Table 4 lists the regions, number of experts, and their percentage representation.

Table 4

Descriptive Statistics, Subject Matter Expert Panel, Sales Regions

Region	Frequency	Percent	Valid Percent	Cumulative Percent
North Central	5	20.0	20.0	20.0
North East	5	20.0	20.0	40.0
South Central	5	20.0	20.0	60.0
South East	5	20.0	20.0	80.0
West	5	20.0	20.0	100.0
Total	25	100.0	100.0	

These subject matter experts were graduates of the subject course. Their graduation dates ranged from September 30, 1996 to August 30, 2004 (table 5). The mean graduation date was August 7, 1999. Therefore, the subject matter experts had approximately 5 years and 8 months experience with the product.

Table 5

Descriptive Statistics, Subject Matter Expert Panel, Graduation Dates

	N	Minimum	Maximum	Mean
ClassDate	25	SEP-30-1996	AUG-30-2004	AUG-07-1999
Valid N (listwise)	25			

The stimulus evaluation questionnaire was administered to 212 graduates in five sales regions. Responses were received from 146 of these graduates (table 6). The North Central region had 31 survey returns representing 21.2 percent of the responses. The North East region had 24 survey returns representing 16.4 percent of the responses. The South Central region had the smallest return, 20 responses, representing 13.7 percent of the returned surveys. The South East region had 26 survey returns representing 17.8 percent of the responses. The Western region had the greatest number of survey returns, 26 returns, representing 30.8 percent of the responses.

Table 6

Descriptive Statistics, Course Graduates, Sales Regions

Region	Frequency	Percent	Valid Percent	Cumulative Percent
North Central	31	21.2	21.2	21.2
North East	24	16.4	16.4	37.7
South Central	20	13.7	13.7	51.4
South East	26	17.8	17.8	69.2
West	45	30.8	30.8	100.0
Total	146	100.0	100.0	

The stimulus evaluation questionnaire was competed by 146 course graduates whose graduation dates ranged from six months to twenty-four months (table 7). Their graduation dates ranged from April 7, 2003 to August 30, 2004. The mean graduation date was November 19, 2003. Therefore, the graduates had approximately 1 year and 4 months experience with the product.

Table 7

Descriptive Statistics, Course Graduates, Graduation Dates

	N	Minimum	Maximum	Mean
Class Date	146	APR-07-2003	AUG-30-2004	NOV-19-2003
Valid N (listwise)	146			

Both questionnaires were comprised of 44 task statements. Of the 44 tasks, 17 were taught in the training course and 27

were not a part of the training design but were tasks that a graduate might experience in the field. Based on the raw survey data for the 44 task statements, four ratios were calculated, which included the CVR, FVR, SVR, and S-FVR values (Appendix H). Each task also had a corresponding product sales figure and sales quantity for the year 2004. Table 8 is the descriptive statistics for these metrics.

Table 8

Descriptive Statistics, CVR, FVR, SVR, S-FVR, Sales Data, and Sales Quantity

	N	Minimum	Maximum	Mean	Std. Deviation
		No (tasks not taught in course)			
CVR	27	-.92	.20	-.4456	.30144
FVR	27	-.99	-.12	-.8170	.20568
SVR	27	-.93	.08	-.4530	.30980
S-FVR	27	-.99	.30	-.8637	.25739
2004 Sales	27	$.00	$1,306,907	$113,159	$249,425
2004 Sales Qty	27	0	5,750	740	1,440
Valid N (listwise)	27				
		Yes (tasks taught in course)			
CVR	17	-.28	.99	.5471	.37045
FVR	17	-.76	.99	.3853	.58596
SVR	17	-.29	.96	.4712	.36154
S-FVR	17	-.89	.92	.1641	.61771
2004 Sales	17	$97,541	$10,693,182	$1,428,956	$2,680,214
2004 Sales Qty	17	326	302,351	27,254	77,859
Valid N (listwise)	17				

Hypothesis Tests

Several statistical tests were used to test the research hypotheses presented in Chapter I. These included the content

validity ratio formula designed by Lawshe (1975), an independent-samples t test, a paired-samples t test, and bivariate correlation analysis.

Hypothesis one.

Ho1: There is no relationship between the job performance domain and the content domain of a training program based on an examination of its content validity ratios (CVR).

Ha1: There is a relationship between the job performance domain and the content domain of a training program based on an examination of its content validity ratios (CVR).

In order to examine hypothesis one, the CVR for each task was tested for significance. As illustrated earlier, with a sample of 25 participants, all CVRs that were greater than .37, were considered significant. Additionally, if the average of the CVR's, or the content validity index (CVI), was greater than .37, the overall training design was considered significant. Thirteen out of seventeen of the CVRs for the tasks that were taught in the course were significant, ranging from CVR values of .44 to .99. Four of the seventeen were not significant, these score ranged from -.28 to .28. Among the tasks that were not taught in the course, all twenty-seven were not significant. The CVR values ranged from -.92 to .20. See Appendix H for CVR values for each task.

In addition, a comparison of the CVRs for the training tasks (17 tasks) to non-training tasks (27 tasks) was conducted with an independent-samples t test (table 9 & 10). The CVRs for the training tasks (*M* (CVI)= .55, *SD* = .37) were significantly higher than the CVRs for the non-training tasks (*M* (CVI)= -.45, *SD* = .30), *t* (42) = -9.732, *p* < .001. This indicated that the expert panelists rated training tasks as more essential than non-training tasks. Furthermore, the CVI, or mean, for the CVR values was .55. A CVI of .55 was greater than the minimum requirement of .37, *p =.05* (table 2); and therefore, indicated that the total training design for the subject course was content valid. The null hypothesis, Ho1, was rejected.

Table 9

CVI (mean) for CVR Values

COURSE		N	Minimum	Maximum	CVI (Mean)	SD
No	CVR	27	-.92	.20	-.4456	.30144
	Valid N (listwise)	27				
Yes	CVR	17	-.28	.99	.5471	.37045
	Valid N (listwise)	17				

Table 10

Independent-samples t test for CVR values

		t-test for Equality of Means			
		t	df	Sig. (2-tailed)	Mean Difference
CVR	Equal variances assumed	-9.732	42	.000	-.99261
	Equal variances not assumed	-9.281	29.018	.000	-.99261

Hypothesis two.

Ho2: There is no relationship between the job performance domain and the content domain of a training program based on an examination of its frequency validity ratios (FVR).

Ha2: There is a relationship between the job performance domain and the content domain of a training program based on an examination of its frequency validity ratios (FVR).

In order to examine hypothesis two, the FVR for each task was tested for significance. With a sample of 25 participants, all FVRs that are greater than .37 are considered significant. Additionally, if the average of the FVR's, or the freguency validity index (FVI), was greater than .37, the overall training design was considered significant. Nine out of seventeen of the FVRs for the training tasks were significant, ranging from FVR values of .44 to .99. Eight of the seventeen were not significant, these score ranged from -.76 to .20. Among the

tasks that were not taught in the course, all twenty-seven were not significant. The CVR values ranged from -.99 to -.12. See Appendix H for FVR values for each task.

In addition, a comparison of the FVRs for the training tasks (17 tasks) to the non-training tasks (27 tasks) was conducted with an independent-samples t test (table 11 & 12). Levene's test of equality of variances was significant, F = 7.71, p = .008, therefore the adjusted degrees of freedom were used (table 13). The FVRs for the training tasks (M (FVI)= .39, SD = .59) were significantly higher than the FVRs for the non-training tasks (M (FVI)= -.74, SD = .40), t (25.485) = -7.59, p < .001. This indicated that expert panelists ratedtraining tasks as more essential based on frequency of occurrence than non-training tasks. Furthermore, the frequency validity index (FVI), or mean, for the FVR values was .39. A FVI of .39 was greater than the minimum requirement of .37, p =.05 (table 2); and therefore, indicated that the total training design was valid from a frequency of use perspective. Thus, the null hypothesis, Ho2 was rejected.

Table 11

FVI (means) for FVR Values

COURSE		N	Minimum	Maximum	FVI (Mean)	SD
No	FVR	27	-.99	-.12	-.8170	.20568
	Valid N (listwise)	27				
Yes	FVR	17	-.76	.99	.3853	.58596
	Valid N (listwise)	17				

Table 12

Independent-samples t test for FVR Values

		t-test for Equality of Means			
		t	df	Sig. (2-tailed)	Mean Difference
FVR	Equal variances assumed	-7.594	42	.000	-1.12900
	Equal variances not assumed	-6.979	25.485	.000	-1.12900

Table 13

Levene's Test for Equality of Variances for FVR Values

		Levene's Test for Equality of Variances	
		F	Sig.
FVR	Equal variances assumed	7.705	.008
	Equal variances not assumed		

Hypothesis three.

Ho3: There is no relationship between content validity ratios and frequency validity ratios (FVR).

Ha3: There is a relationship between content validity ratios and frequency validity ratios (FVR).

In order to examine hypothesis three, a bivariate correlation analysis was performed for the 44 CVRs and the 44 FVRs, $r = .879$, $p < .001$ (table 14). This positive correlation indicated that the expert panel perceived tasks that were essential were also used frequently in the workplace. Therefore, the null hypothesis, Ho3, was rejected.

Table 14

Bivariate Correlation Analysis for CVR and FVR Values

		CVR	FVR
CVR	Pearson Correlation	1	.879**
	Sig. (2-tailed)	.	.000
	N	44	44
FVR	Pearson Correlation	.879**	1
	Sig. (2-tailed)	.000	.
	N	44	44

** Correlation is significant at the 0.01 level

Hypothesis four.

Ho4: There is no relationship between the stimulus domain, or transfer opportunities in the workplace, and the job performance domain based on an examination of its stimulus validity ratios (SVR).

Ha4: There is a relationship between the stimulus domain, or transfer opportunities in the workplace, and the job performance domain based on an examination of its stimulus validity ratios (SVR).

In order to test hypothesis four, the SVR for each task was tested for significance. With a sample of 40 or more respondents, all SVRs that are greater than .29, are considered significant. Additionally, if the average of the SVR's, or the stimulus validity index (SVI), was greater than .29, the overall training design was considered significant. Twelve out of seventeen of the SVRs for the training tasks were significant, ranging from SVR values of .34 to .96. Five of the seventeen were not significant, these scores ranged from -.29 to .21. Among the non-training tasks, all twenty-seven were not significant. The SVR values ranged from -.93 to .08. See appendix H for SVR values for each task.

In addition, a comparison of the SVR values for the training tasks (17 tasks) to the non-training tasks (27 tasks) was conducted with an independent-samples t test (table 15 &

16). The SVRs for the training tasks (*M* (SVI)= .47, *SD* = .36) were significantly higher than the SVRs for the non-training tasks (*M* (SVI)= -.45, *SD* = .31), *t* (42) = -9.032, *p* < .001. This indicated that course graduates rated training tasks as more essential than non-training tasks. Furthermore, the stimulus validity index (SVI), or mean, for the SVR values was .47. A SVI of .47 was greater than the minimum requirement of .29, *p =.05,* for 40 or more respondents (Table 2); and therefore, indicated that the total training design was content valid. The null hypothesis, Ho4, was also rejected.

Table 15

SVI (mean) for SVR Values

COURSE		N	Minimum	Maximum	Mean	SD
No	SVR	27	-.93	.08	-.4430	.30980
	Valid N (listwise)	27				
Yes	SVR	17	-.29	.96	.4712	.36154
	Valid N (listwise)	17				

Table 16

Independent-samples t test for SVR Values

		t-test for Equality of Means			
		t	df	Sig. (2-tailed)	Mean Difference
SVR	Equal variances assumed	-9.032	42	.000	-.92414
	Equal variances not assumed	-8.715	30.237	.000	-.92414

Hypothesis five.

Ho5: There is no relationship between the job performance domain and the stimulus domain based on an examination of its stimulus-frequency validity ratios (S-FVR).

Ha5: There is a relationship between the job performance domain and the stimulus domain based on an examination of its stimulus-frequency validity ratios (S-FVR).

To test hypothesis five, the S-FVR for each task was tested for significance. With a sample of 40 or more respondents, all S-FVRs that are greater than .29, are considered significant (table 2). Additionally, if the average of the S-FVR's, or the stimulus-frequency validity index (S-FVI), was greater than .29, the overall training design was considered significant. Eight out of seventeen of the S-FVRs for the training tasks were significant, ranging from S-FVR values of .34 to .92. Nine of the seventeen were not significant, these score ranged from -.89

to .14. Among the non-training tasks, only one was significant, the S-FVR value was .30; this was for "Install a remote booster power supply cabinet." Twenty-six were not significant. The S-FVR values ranged from -.99 to -.60. See appendix H for S-FVR values for each task.

In addition, a comparison of the S-FVR values for the training tasks (17 tasks) to the non-training tasks (27 tasks) was conducted with an independent-samples t-test (table 17 & 18). Levene's test of equality of variances was significant (table 19), $F = 25.56$, $p < .001$, therefore the adjusted degrees of freedom were used. The S-FVRs for the training tasks (M (S-FVI) = .16, SD = .62) were significantly higher than the S-FVRs for the non-training tasks (M (S-FVI)= -.86, SD = .26), t (19.546) = -7.69, $p < .001$. This indicated that course graduates rated training tasks as more essential based on frequency of occurrence than non-training tasks. However, the S-FVI was lower than the .29 criteria for significance based on a response rate of 40 respondents (see table 2). Therefore, the content domain might not be valid from a stimulus-based frequency of use perspective. The null hypothesis, Ho5, could not be rejected, and thus, only partial support could be found for the alternate hypothesis, Ha5.

Table 17

S-FVI (mean) S-FVR Values

COURSE		N	Minimum	Maximum	Mean	SD
No	S-FVR	27	-.99	.30	-.8637	.25739
	Valid N (listwise)	27				
Yes	S-FVR	17	-.89	.92	.1641	.61771
	Valid N (listwise)	17				

Table 18

Independent-samples t test for S-FVR Values

		t-test for Equality of Means			
		t	df	Sig. (2-tailed)	Mean Difference
S-FVR	Equal variances assumed	-7.690	42	.000	-1.02782
	Equal variances not assumed	-6.514	19.546	.000	-1.02782

Table 19

Levene's test for equality of variances for S-FVR values

		Levene's Test for Equality of Variances	
		F	Sig.
S-FVR	Equal variances assumed	25.559	.000
	Equal variances not assumed		

Hypothesis six.

Ho6: There is no relationship between the stimulus validity ratios (SVR) and stimulus-frequency validity ratios (S-FVR).

Ha6: There is a relationship between the stimulus validity ratios (SVR) and stimulus-frequency validity ratios (S-FVR).

In order to examine hypothesis six, a bivariate correlation analysis was conducted with the 44 SVRs and 44 S-FVRs, $r = .85$, $p < .001$. This indicated that the importance and the frequency of use of each task were positively associated and thus validated the training design for the subject course. Thus, the null hypothesis, Ho6, was rejected.

Table 20

Bivariate Correlation Analysis for SVR and S-FVR Values

		SVR	S-FVR
SVR	Pearson Correlation	1	.850**
	Sig. (2-tailed)	.	.000
	N	44	44
S-FVR	Pearson Correlation	.850**	1
	Sig. (2-tailed)	.000	.
	N	44	44

** Correlation is significant at the 0.01 level

Hypothesis seven.

Ho7: There is no relationship between graduates' perception of task importance (SVR) and an expert panel's perception of task importance (CVR).

Ha7: There is a relationship between graduates' perception of task importance (SVR) and an expert panel's perception of task importance (CVR).

To examine hypothesis seven, the SVR's and CVR's were correlated, $r = .996$, $p < .001$ (table 21). This indicated that both the panelists and the graduates of the training program agreed on which tasks were important and which tasks were not important for the training design. The null Hypothesis, Ho7, was also rejected.

Table 21

Bivariate Correlation Analysis for CVR and SVR Values

		CVR	SVR
CVR	Pearson Correlation	1	.966**
	Sig. (2-tailed)	.	.000
	N	44	44
SVR	Pearson Correlation	.966**	1
	Sig. (2-tailed)	.000	.
	N	44	44

** Correlation is significant at the 0.01 level

Additionally, a paired-samples t test was used to determine whether the two groups rated all 44 tasks equivalently (tables 22 to 24). The paired samples t test was not significant, t (43) = 1.469, p = .149 (table 22, 23 and 24). Therefore, the two groups rated the tasks equally (M (CVR)= -.06, SD = .59; M (SVR) = -.10, SD = .56).

Table 22

Paired-samples t test Descriptives for CVR and SVR Values

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	CVR	-.0620	44	.58740	.08855
	SVR	-.0959	44	.56023	.08446

Table 23

Paired-samples t test for CVR and SVR Values

		Paired Differences					
					95% Confidence Interval of the Difference		
		Mean	SD	Std. Error Mean	Lower	Upper	t
Pair 1	CVR-SVR	.03386	.15291	.02305	-.01263	.08035	1.469

Table 24

Paired-samples t test, 2-tailed Significance for CVR and SVR Values

		df	Sig. (2-tailed)
Pair 1	CVR - SVR	43	.149

Hypothesis eight.

Ho8: There is no relationship between graduates' perception of frequency of occurrence a job task in the workplace (S-FVR) and an expert panel's perception of frequency of occurrence of a job task in the workplace (FVR).

Ha8: There is a relationship between graduates' perception of frequency of occurrence a job task in the workplace (S-FVR) and an expert panel's perception of frequency of occurrence of a job task in the workplace (FVR).

In order to examine hypothesis eight, the S-FVR's and FVR's were correlated, $r = .972$, $p < .001$ (table 25). This indicated that both the panelists and the graduates of the training program agreed on which tasks should be included in the training program and which tasks should not be included based on frequency of use in the workplace.

Table 25

Bivariate Correlation Analysis for FVR and S-FVR Values

		FVR	S-FVR
FVR	Pearson Correlation	1	.972**
	Sig. (2-tailed)	.	.000
	N	44	44
S-FVR	Pearson Correlation	.972**	1
	Sig. (2-tailed)	.000	.
	N	44	44

** Correlation is significant at the 0.01 level

Additionally, a paired-samples t test was conducted to determine whether the two groups rated the frequency of using all 44 tasks differently (tables 26 to 28). The paired-samples t test was significant, t (43) = 3.27, p = .002. This indicated that the expert panel (M = -.31, SD = .73) rated the tasks as used more frequently than the course graduates (M = -.47, SD = .66). Therefore, the null hypothesis, Ho8, was rejected.

Table 26

Paired-samples t test Descriptives for FVR and S-FVR Values

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	FVR	-.3075	44	.73105	.11021
	S-FVR	-.4666	44	.66206	.09981

Table 27

Paired-samples t test for FVR and S-FVR Values

		Paired Differences					
					95% Confidence Interval of the Difference		
		Mean	SD	Std. Error Mean	Lower	Upper	t
Pair 1	SVR-S-FVR	.15909	.32260	.04863	.06101	.25717	3.271

Table 28

Paired-samples t test, 2-tailed Significance for FVR and S-FVR Values

		df	Sig. (2-tailed)
Pair 1	FVR - S-FVR	43	.002

Hypothesis nine.

Ho9: There is no relationship between the organizational domain, or a business goal/measure within an organization, and the training content domain based on a correlation of content validity ratios and respective product component revenue value.

Ha9: There is a relationship between the organizational domain, or a business goal/measure within an organization, and the training content domain based on a correlation of content validity ratios and respective product component revenue value.

To examine hypothesis nine, the set of 44 CVRs for the content domain (based on the training content questionnaire), was correlated with the corresponding revenue value, as well as the sales quantities for the respective product component or group of components. The correlation between CVR and the corresponding revenue value was significant, $r = .44$, $p = .003$, as was the correlation between CVR and the corresponding sales quantity, $r = .33$, $p = .029$. This indicated that tasks that were rated to be essential by the panelists were associated with greater sales revenue and more products sold in the marketplace.

Table 29

Bivariate Correlation Analysis for CVR values, Sales, and Sales Quantity

		CVR	2004 Sales Data	2004 Sales Qty
CVR	Pearson Correlation	1	.442**	.329*
	Sig. (2-tailed)	.	.003	.029
	N	44	44	44
2004 Sales Data	Pearson Correlation	.442**	1	.974**
	Sig. (2-tailed)	.003	.	.000
	N	44	44	44
2004 Sales Qty	Pearson Correlation	.329*	.974**	1
	Sig. (2-tailed)	.029	.000	.
	N	44	44	44

* Correlation is significant at the 0.05 level (2-tailed)
** Correlation is significant at the 0.01 level (2-tailed)

Another test of hypothesis nine was the correlation of the set of 44 FVRs with the corresponding sales quantity for the respective product component or group of components (see table 30). The correlation between FVR and the corresponding sales quantity was significant, $r = .40$, $p = .007$. This indicated that tasks rated by the subject matter experts as frequently used in the workplace were associated with more products sold in the marketplace. Thus, the null hypothesis, Ho9, was rejected.

Table 30

Bivariate Correlation Analysis for FVR Values and Sales Quantity

		FVR	2004 Sales Qty
FVR	Pearson Correlation	1	.402**
	Sig. (2-tailed)	.	.007
	N	44	44
2004 Sales Qty	Pearson Correlation	.402**	1
	Sig. (2-tailed)	.007	.
	N	44	44

** Correlation is significant at the 0.01 level (2-tailed)

Hypothesis ten.

Ho10: There is no relationship between the organizational domain, or a business goal/measure within an organization, and the stimulus domain based on a correlation of stimulus validity ratios and its respective product components revenue value.

Ha10: There is a relationship between the organizational domain, or a business goal/measure within an organization, and the stimulus domain based on a correlation of stimulus validity ratios and its respective product components revenue value.

To examine hypothesis ten, the set of 44 SVRs for the stimulus domain (based on the graduate questionnaire), was correlated with the corresponding revenue value and sales quantities for the respective product component or group of components (see table 31). The correlation between SVR and the corresponding revenue value was significant, $r = .49$, $p = .001$, as was the correlation between SVR and the corresponding sales quantity, $r = .37$, $p = .014$. This indicated that tasks that were rated to be essential by the graduates were associated with greater sales and more products sold in the workplace.

Table 31

Bivariate Correlation Analysis for SVR Values, Sales, and Sales Quantity

		SVR	2004 Sales Data	2004 Sales Qty
SVR	Pearson Correlation	1	.490**	.367*
	Sig. (2-tailed)	.	.001	.014
	N	44	44	44
2004 Sales Data	Pearson Correlation	.490**	1	.974**
	Sig. (2-tailed)	.001	.	.000
	N	44	44	44
2004 Sales Qty	Pearson Correlation	.367*	.974**	1
	Sig. (2-tailed)	.014	.000	.
	N	44	44	44

* Correlation is significant at the 0.05 level (2-tailed)
** Correlation is significant at the 0.01 level (2-tailed)

Another test of hypothesis ten was the correlation of the set of 44 S-FVRs with the corresponding sales quantity for the respective product component or group of components (see table 32). The correlation between S-FVR and the corresponding sales quantity was significant, $r = .46$, $p = .003$. This indicated that tasks rated by the graduates as frequently used in the workplace were associated with more products sold in the marketplace. The null hypothesis, Ho10 was rejected.

Table 32

Bivariate Correlation Analysis for S-FVR Values and Sales Quantity

		S-FVR	2004 Sales Qty
S-FVR	Pearson Correlation	1	.445**
	Sig. (2-tailed)	.	.003
	N	44	44
2004 Sales Qty	Pearson Correlation	.445**	1
	Sig. (2-tailed)	.003	.
	N	44	44

** Correlation is significant at the 0.01 level (2-tailed)

Summary

This chapter presented an analysis of this research study along with a presentation of the findings. Study results were reported for three research questions and ten hypotheses. Statistical information for each hypothesis was derived from the responses to two questionnaires designed for this research study and extant sales data obtained for this research study.

Chapter V

Summary and Conclusions

Introduction

This chapter includes a summary of findings, implications for managers, implications for researchers, limitations of the study, recommendations for future research, and conclusions.

The purpose of this study was to empirically investigate transfer of training and its relationship with training content, along with its validation, from a systems theory approach as an antecedent of a transfer condition. Further, this study examined stimulus situations in the workplace, or the market for training, also as an antecedent of a transfer condition. Finally, this study looked at the connection between the content of a corporate training program and the organizational domain.

This study was based on a systems view of the training process (Bushnell, 1990; Moore & Kearsley, 1996; Swanson & Holton, 1997) and that by following the process of input, transformation, and output, a training design would lead to higher levels of transfer and thus serve as an antecedent of transfer. In the literature, key research support for this study was Lawshe (1974), Ford and Wroten (1984), and Baldwin and Ford (1989). Other key research was from the marketing literature that discussed the identification of need, marketing

orientation, and market driven approaches to organizational performance (Kohli & Jaworski, 1990, Kotler, 1991; Jaworski & Kohli, 1993; Jaworski, Kohli, & Sahay, 2000).

Summary of Findings

The findings reported by this study were based on input from two groups of survey respondents who provided their perceptions about the importance and frequency of use of job tasks related to the installation of a building control system. Their input was based on a 44-item task list of which 17 were included in a training course on this system and the other 27 were not but could have been experienced in the performance of workplace duties. Findings were also based on a set of extant financial data, which was the annual sales revenue and sales quantity for products associated with each of the 44 task statements.

Findings summarized in tables 9 through 14 indicated that there was a relationship between the training content domain and the job performance domain based on an examination of the content validity measures of importance and frequency. Additionally, findings reported in tables 15 through 28 showed that there was a relationship between the stimulus domain, the training content domain, and the job performance domain based on an examination and correlation of stimulus and content validity

measures. Finally, study results summarized in tables 29 through 32 indicated that there was a relationship between the training content domain, the stimulus domain, and the organizational domain based on correlations of these domains and their respective measures. Therefore, these findings were consistent with the literature discussed in Chapter II and provided additional support for the content validation of training programs, as well the validation of on-going changes in the workplace that would require the redesign of the training program, and the need to link training content with individual and organizational expectations and performance.

Therefore, the null hypothesis was rejected that there was no relationship between the job performance domain and the content domain of a training program based on an examination of its content validity. It was found that given a training design its validity could be established by applying Lawshe's (1975) content validity process to the tasks taught in the training program. This hypothesis also demonstrated that tasks not taught in the training program were appropriately excluded based on their CVR values. Wexley (1984) believed that Lawshe's original approach failed to identify tasks not taught in training. This study included all tasks associated with this selected job performance domain.

Similar analysis rejected the hypothesis that there was no relationship between the job performance domain and the content domain of a training program based on an examination of its frequency validity ratios (FVR). Baldwin and Ford (1988) stated that the combination of task importance and frequency could provide a baseline for training design. Thus, this study applied the Lawshe (1975) content validity process to frequency of use to further validate the training design. The data showed that the expert panelists rated training tasks as more essential based on frequency of occurrence than non-training tasks. Furthermore, the frequency validity index (FVI), or mean, for the FVR values was .39 greater than the minimum requirement of .37 $p < .05$ (table 2). Thus, support for this hypothesis was statistically significant. However, not all trained tasks were significant, which implied possible training excesses or deficiencies in the training design (Ford & Wroten, 1984). For example, task statements 13 and 15 (see Appendix H), were not significant for frequency and thus would imply a possible training excess. In fact, task statements 13 and 15 were not significant for all four measures (CVR, FVR, SVR, & S-FVR) and thus must clearly be training excesses.

The null hypothesis was rejected for the hypothesis that there was no relationship between content validity ratios and frequency validity ratios (FVR). A bivariate correlation

analysis yielded a correlation of $r = .879$, $p < .001$ (table 14). This strong positive correlation indicated that the expert panel for this study viewed essential tasks as also frequently used in the workplace. This analysis supported the proposition of Baldwin and Ford (1988) that a combination of task importance and frequency could provide a baseline for training design. For example tasks 2, 10, 13, and 15 (see Appendix H) were not significant for both CVR and FVR measures. Thus this combination might imply that these tasks were training excesses.

The null hypothesis was rejected that there was no relationship between the stimulus domain and the job performance domain based on an examination of its stimulus validity ratios (SVR). Rouiller and Goldstein (1993) developed measures of organizational transfer climate, which consisted of situational cues and consequences that either inhibit or help to facilitate transfer. Ford, Quinones, Sego, Sorra (1992) as well looked at 'opportunity to use' a learned task. Jaworski and Kohli (1993) stated that because needs and expectations continually evolve over time, delivering consistently high-quality products and services required ongoing tracking and responsiveness to changing marketplace needs, i.e., being market oriented. Thus, this hypothesis investigated the relationship between the training design and the marketplace and the possible changing requirements of a given job performance domain. The results

were statistically significant indicating that the current training design matches job tasks perceived to be essential by course graduates. However, only 12 of the 17 tasks were statistically significant indicating possible training deficiencies or excesses.

The null hypothesis could not be rejected that there was no relationship between the job performance domain and the stimulus domain based on an examination of its stimulus-frequency validity ratios (S-FVR). Based on content validity requirements, the stimulus-frequency validity index was not significant (S-FVI = .16 < .29, $p < .05$). Additionally only eight out of seventeen S-FVRs for trained tasks were significant. Therefore, the content domain might not be valid from a stimulus-based frequency of use perspective and thus requires further investigation. Therefore, the null hypothesis could not be rejected. However, statistical tests did find support for distinct differences in trained tasks versus non-trained tasks for frequency of use.

The null hypothesis was rejected that there was no relationship between the stimulus validity ratios (SVR) and stimulus-frequency validity ratios (FVR). Again, this hypothesis was based on the Baldwin and Ford (1988) assertion that a combination of task importance and frequency might provide a baseline for training design.

The null hypothesis was rejected that there was no relationship between graduates' perception of task importance (SVR) and an expert panel's perception of task importance (CVR). Ford and Wroten (1984) also looked at intergroup agreement in their study of content validity and concluded that their positive correlation ($r > .80$, $p < .001$) implied that this high level of intergroup agreement supported the quality of their expert judgments. Therefore, this study likewise sought to validate this study's expert judgments, which Lawshe (1975) stated was dependent on the situation and whose judgment falls at or was near the 'observation' end of the validity process. In other words, those who know the job were normally competent to make these judgments. Therefore, for this study the judgments of the expert panel (25 respondents) were similar, and could be assumed to be accurate, in comparison to a much larger group of general respondents (146 respondents).

A similar analysis rejected the null hypothesis that there is no relationship between graduates' perception of frequency of occurrence of a job task in the workplace (S-FVR) and an expert panel's perception of frequency of occurrence of a job task in the workplace (FVR). This hypothesis sought to validate the judgment of the expert panel to ensure that their perceptions of the work environment were accurate and a reliable opinion on which to base training design and redesign.

The null hypothesis was rejected that there was no relationship between the organizational domain, or a business goal/measure within an organization, and the training content domain based on a correlation of content validity ratios and respective product component revenue values. Swanson (1996) stated than training and development logic must be based on economic considerations and that economic requirements were the primary explanation of organizational performance. In fact, researchers have long identified the business outcomes of a training intervention as an important construct of the transfer of training process (McGehee & Thayer, 1961; Kirkpatrick, 1994; Holton 1996; Swanson, 1996, 1998). However, Montesino (2002) suggested that human resources development professionals might be focusing on state-of-the-art delivery methods rather than the critical link between training and the organization. Thus, Swanson (1998) summarized that HRD programs imbedded in a purposeful performance improvement framework, and systematically implemented, would yield very high returns on investment. For this study, the connection between training and the job domain was fairly straightforward given that the training involved a product for sale. This connection might be more difficult to make for other types of training that are more abstract and thus would be based on a construct validity process rather than content validity (Lawshe, 1975).

A similar empirical analysis rejected the null hypothesis that there was no relationship between the organizational domain, or a business goal/measure within an organization, and the stimulus domain based on a correlation of stimulus validity ratios and its respective product components revenue value. Thus, a training design connected with, or driven by (Jaworski, Kohli, & Sahay, 2000), the needs of individuals, work processes, and organizational strategy was more likely to show a return-on-investment (Swanson, 1996, 1998) and would more likely contribute to the competitive advantage of the organization (Porter, 1999). The stimulus for training is thus both a cue to use a learned task (Rouiller & Goldstein, 1993) and a market requirement to satisfy the needs and wants of customers (Kotler, 1991). Therefore, this study has proposed the concept of market oriented training design.

Study Implications

Transfer of training has been researched for many years and still seems to be an illusive phenomenon. Management within today's corporations have somewhat embraced training as a corporate function but disdain its costs; and thus, in times of corporate distress, aggressively reduce these costs and ultimately downsize the training function. If Georgenson (1982) is correct that only ten percent of training is transferred to

the workplace, then management, as well as researchers, must study this problem and find solutions that will ensure that corporate training initiatives are linked with organizational strategy, based on marketplace demands, and consequently lead to an inimitable organizational capability (Barney, 1991, 1995; Barney & Wright, 1998) and a source of sustained competitive advantage (Porter, 1985, 1999).

Implications for management. The primary implication of this study for management is that training within an organization is a system that has inputs, a transformation, and outputs; and, it is a subsystem that is connected with other organizational systems that must produce a profitable output for the organization. Campbell (1971), Moore and Kearsley (1996), Swanson and Holton (1997) all advocated a systems approach to training. Porter (1985) has identified human resources management, and training, as a key support activity in the value chain. The value chain disaggregates a firm into its strategically relevant activities in order to understand the behavior of costs and the existing and potential sources of differentiation (Porter, 1985). Therefore, training can be a differentiator within an organization if its purpose is clearly defined, needs are properly defined, and training is linked with other value generating processes in the organization. However,

McGehee and Thayer (1961) stated over 40 years ago that many training efforts are begun without any reason, continued with no purpose, and end with no results.

Thus, from a systems perspective training begins with a needs assessment. This assessment is an examination of individual capability within the job performance domain, an understanding of the stimulus need for training, and the study of driving factors within the organizational domain. Ford and Wroten (1984) however, stated pressures to develop and implement training programs to address perceived deficiencies in the workforce often prevent a thorough initial analysis of training needs. McGehee and Thayer (1961) stated that the problem is that needs assessment efforts are not typically conducted in a continuing, on-going manner and coordinated and integrated with other organizational functions as a system. Baldwin and Ford (1988) stated that transfer of training research has implicitly assumed the job relevance of training content without attempting to specify the training need. Thus, McClelland (1992) stated that a systems approach to needs assessment helps to integrate the assessment process into the strategic plans of the organization and Seyler (1997) added that ensuring training content is consistent with job requirements can positively influence transfer.

Another concern for management and training professionals is a look at the genuine need for training, or the market for training, rather than the usual passive implementation of a training solution based on a training fad or the convenient availability of a vendor provided solution advocated by potentially biased internal and external forces. Thus, training programs must be customer focused; but, this does not necessarily mean spend more it merely infers the concentration of training and development issues on those skills and capabilities which enhance company responsiveness and market focus (Harris & Piercy, 1997). This study therefore advocates not the training solution but the need for training. As Kotler (1991) pointed out some organizations follow a product orientation where the solution is the driving force and is desired simply because it exists. In contrast, this study suggests to management that training initiatives should be based on a market-oriented view of training, which is the satisfaction of needs and wants. From an organizational perspective, the corporate vision, mission, and strategy define these needs and wants. Likewise, the human resources strategy defines the skill development needs of today and tomorrow so that organizations are properly positioned for future business opportunities.

Implications for researchers. Researchers have proposed models and methods to measure transfer of training (Kirkpatrick, 1978) and others have questioned these models and proposed new models and methods (Baldwin & Ford, 1988; Alliger & Janak, 1989; Holton, 1996; Holton, Bates, & Ruona, 2000). Swanson (1996) believed that this difference amongst researchers about appropriate outcome variables is based on the influence of psychological theory rather than training and development logic based on economic, system, and psychological assumptions. Swanson stated that it has been common to read of change, employee satisfaction, intent to transfer, and learning as dependent variables of HRD. However, Swanson stated that as far back as 1962, Gagne has challenged researchers to stop looking at what happens inside the learner and to start studying the organization. Instead, Swanson stated that researchers must address the dependent variable at three outcome levels: individual, work process, and organization. Baldwin and Ford (1989) also suggested a model that looks at the individual, the training design, and the organization.

Swanson (1996) explained that a basic premise of the training subsystem must be that economic requirements are the primary explanation of organizational performance, system requirements are primary at the process level, and psychological requirements are primary at the individual level. Thus, Swanson

proposed that the dependent variable, the outcome, is the ultimate reason for human resources development and that people who own and run organizations are most concerned about survival, return-on-investment, effectiveness and efficiency of goods and services, quality of goods and services, customer requirements, and customer satisfaction.

Thus, researchers must look not to the psychology of learning but business theories such as corporate strategy, corporate analysis and performance, and marketing and competitive advantage. Well known business theorists include Porter (1985, 1999), Kotler (1991), Barney (1991, 1995), and Kaplan and Norton (1996) just to name a few. Researchers such as Kirkpatrick (1994) and Swanson (1996, 1998) have advocated the link between training, organizational performance, the achievement of business results, and a return-on-investment. In fact, researchers have previously associated the business theory of market orientation with learning organization concepts (Sinkula, 1994; Slater & Narver, 1995; Sinkula, Baker, & Noordewier, 1997). Therefore, researchers should return to the basic process of training and examine transfer of training as a subsystem rather than an isolated phenomenon. Researchers should explore the stimulus for training, its ever-changing nature, and its effect on transfer of training. Researchers should also explore methods to validate the content of a

training program based on business need and better define the stimuli, or cues, that trainees face once they return to the workplace. Finally, researchers should study training as a business activity that is linked with business strategy.

Study Limitations

The results of this study were based on a statistical process established by Lawshe (1975) for the purpose of content validating a training design. It is assumed in this study that this was a viable method for the content validation of a training design. This study was also based on the work of Ford and Wroten (1984) whom further studied content validation and who similarly used the work of Lawshe (1975) to study training design. In support of Lawshe, Casio (1998) further reiterated his work in a textbook discussion of validity and specifically this content validity method.

The results of this study were also based on the input of two groups of people who completed an electronic survey process. It is assumed that both the subject matter experts (25 respondents) and the graduates (146 respondents) of the training program were capable of making judgments (Lawshe, 1975; Messick 1995) about the requirements of the workplace; and, their responses were unbiased and accurate as to their work environment. It is also assumed that there was no sample bias

resulting from those who declined to participate (66 non-respondents) in the survey process. The correlation analysis for the SVR's and CVR's, $r = .996$, $p < .001$ (table 33), should demonstrate that both responding groups agreed as to the task importance of the training design and thus it is assumed that this study has no sample bias. Further, a correlation with the pilot test, pilot test CVR and primary test CVR, $r = .894$, $p < .001$ (table 33) and pilot test CVR and primary test SVR $r = .920$, $p < .001$ (table 33), yielded positive intergroup correlations also indicating survey consistency and thus no sample bias.

Table 33
Bivariate Correlation Analysis of Pilot Test CVR Values and Primary Test CVR and SVR Values

		Pilot CVR	CVR	SVR
Pilot CVR	Pearson Correlation	1	.894**	.920**
	Sig. (2-tailed)	.	.000	.000
	N	44	44	44
CVR	Pearson Correlation	.894**	1	.966**
	Sig. (2-tailed)	.000	.	.000
	N	44	44	44
SVR	Pearson Correlation	.920**	.966**	1
	Sig. (2-tailed)	.000	.000	.
	N	44	44	44

** Correlation is significant at the 0.01 level (2-tailed)

Another limitation of this study was the connection between the 44-task statements and the financial data. In this case, the association was straightforward given that the subject of the training was a technical system with product components that were easily connected with the training. Thus, the training concept of near and far transfer might be applicable to this issue. Royer (1979) defined near transfer as a situation where the transfer event is very similar to the original learning event. In contrast, far transfer is where the transfer stimulus is somewhat different than the original learning event. In this study the connection between the training event and the marketplace were "near" leading to an easy association of the data. For other types of training programs the link between a learning objective, individual performance, and an organizational result might not be so evident and thus result in a "far" situation. However. McGehee and Thayer (1961) defined training as a formal procedure to facilitate employees' learning so that their resultant behavior contributes to the attainment of the company's goals and objectives. Swanson (1996) and Holton (1996) also stated that there must be a connection between learning, individual performance, and organizational results. Therefore, making a connection might be difficult but must be pursued to ensure that training initiatives are indeed worthwhile.

A final limitation of this study was its specific application to a single training design. Others such as Lawshe (1975) and Ford and Wroten (1984) used this content validity process in the study of various training designs and found it to be a viable method for training content validation. Therefore, this study represents an additional use of this process and thus further validates it use as a means to assess the appropriateness of a training design.

Recommendations for Future Studies

This research was based on a systems approach to training and specifically studied the phenomenon of transfer of training. This research explored the validation of course content as an antecedent of a transfer condition and examined the stimulus to transfer learned skills as an antecedent of a transfer opportunity. This study also explored the connection between training and the organizational domain. Therefore, the results of this study combined with existing research suggest several avenues for future research.

A logical extension of this study is to examine market oriented training and the proposition that this would lead to higher levels of transfer because of a positive relationship between organizational need and training implementation. Researchers could also examine performance discrepancies within

the workplace and the notion that these discrepancies can be corrected upon transfer of learned skills, which is a consequence of training, which in turn is a consequence of need. A research study could also be initiated that would further explore the stimulus domain and the assertion that a positive relationship between training, transfer of training, and job performance is contingent on identification of a typology of stimuli for transfer. Thus, given observable, recognizable, and distinguishable situational cues there would be an opportunity for a task response. Based on these research extensions a research question might read: "Is there a causal relationship between needs assessment, training, transfer, and job performance and to what degree does this relationship affect transfer?" Another research question might read: "Is there a causal relationship between the stimulus domain and the transfer domain based on an examination of stimulus cues in the workplace?" Consequently, given a proposed market oriented approach to training, research could be planned to examine these issues in an effort to better understand the inputs of a training system, which manifests itself as an individual need, an organizational need, and a stimulus to transfer.

Another avenue for future research centers on a firm's organizational strategy and training as a subsystem in support of this strategy. This research extension would also explore

training and its output as a possible source of sustained competitive advantage. Thus, a possible hypothesis is that training linked with strategy will lead to higher levels of transfer because of a positive relationship between organizational requirements and training implementation. Another assertion based on Barney's (1995) resource based view of the firm is that training that is valuable, rare, inimitable, and organizationally focused will lead to a better fit with strategy and competitive advantage. Barney (1995) stated that resources could be a basis of sustained competitive advantage when they exhibit the characteristics of VRIO: value, rareness, inimitability, and organizational focus. Therefore, the training subsystem could be researched from this perspective to determine its value, rareness, inimitability, and organizational focus as an antecedent to the core competencies of an organization. As Pearson and Robinson (2003) pointed out a core competence once identified, nurtured, and deployed throughout the firm could become a basis for lasting competitive advantage.

Another assertion is that given an organizational strategy, training that focuses on firm specific rather than general skills would yield higher levels of competitive advantage. Human capital theory distinguishes between general skills, which are skills possessed by an individual that can be transferred across organizations, and firm-specific skills, which only

provide value to a particular firm (Flamholtz & Lacey, 1981). Chakraborty (1997) stated that unless training and development is highly firm-specific then the less secure it is as a competitive advantage. Thus, Barney and Wright (1998) suggested to seek competitive advantage through general skills would be futile. Rather, firms should focus on firm-specific skills by investing in training and development programs to perform work processes and procedures that are specific to the firm (Barney & Wright). Thus, research could be initiated that looks at general versus firm specific training and its impact on usefulness and transfer to the workplace.

A final area to explore is the concept of bundled skills and the hypothesis that training designs that emphasize bundled skills will yield higher levels of competitive advantage. This current study looked at job skills from an individual task validity perspective. In contrast, research could examine the content validity of bundled skills by using Lawshe's (1975) content validity process. To explain, Zuagg and Thorn (2003) stated that a core competency has to do more with bundling of several mutually complementary competencies. Porter (1999) also stated competitive advantage depends not only on individual activities but also on the fit among numerous activities. Thus, Kruger and Hump (1997) as cited in Zuagg and Thorn (2003) stated that various tasks could be performed only by integration and

bundling of skills and procedures. Therefore, the analysis of training needs should focus not only on individual tasks but instead on the collective value and fit of these tasks with the organizational strategy and competence.

Conclusions

Companies are spending billions of dollars a year on training programs in hopes that it will lead to improved performance. However, HRD professionals should resist the impulse to act before the problem is properly defined, a need is identified, connected with strategy, and an appropriate action is formulated that will lead to a competitive advantage and ultimately profitability for the firm. Therefore, management should not implement training programs on the basis of fad, convenience, or novelty unless through an internal analysis there is an organizational need and strategy that requires a clearly defined training response.

This dissertation empirically investigated transfer of training and its relationship with the training system. Specifically, this study examined training content, along with its validation, from a systems theory approach as an antecedent of a transfer condition. Further, this study examined stimulus situations in the workplace, or the market for training, as a task cue and indicator to use learned knowledge and skills, also

as an antecedent of a transfer condition. Finally, this study looked at the connection between the content of a corporate training program and the organizational domain that it presumes to support. Specifically, this study examined training content and its relationship with organizational performance as a goal cue and indicator of a transfer condition.

Using two sets of survey data and extant financial data this study statistically analyzed the various relations between the job performance domain, the training content domain, the stimulus domain, and the organizational domain. Specifically, the findings reported by this study were based on input from two groups of survey respondents (N1=25 & N2=146) who provided their perceptions about the essentiality and frequency of use of job tasks for a technical system employed in the workplace. Their input was based on a 44-item job task list some of which were included in a training design. Findings were also based on extant financial data associated with each job task. Variables and items were statistically tested using a content validity process established by Lawshe (1975) and other statistical methods such as independent-samples t test, paired-samples t test and bivariate correlation analysis.

Nine of the ten null hypotheses were rejected. The one null hypothesis that could not be rejected was an examination of the frequency of use of job tasks in the workplace by graduates

of the subject course. For this hypothesis, the statistical test that compared the trained tasks to non-trained tasks was statistically significant. However, the stimulus-frequency validity index (S-FVR) did not meet the minimum standard. Thus, the null hypothesis could not be completely rejected but there is evidence of partial support for this hypothesis.

These findings represent several implications for corporate management and researchers. For management the primary implication of this study is that training within an organization is a system that has inputs, a transformation, and outputs; and, it is a subsystem that is connected with other organizational systems that must produce a profitable output for the organization. Another implication is that training can also be a differentiator within an organization if its purpose is clearly defined, needs are properly defined, and training is linked with other value generating processes in the organization. This study therefore advocates not the training solution but the need for training. This study suggests that training should be based on a market-oriented view of training, which is the satisfaction of needs and wants. From an organizational perspective, the corporate vision, mission, and strategy define these needs and wants and the human resources strategy defines the skill development needs of today and

tomorrow so that organizations are positioned for future business opportunities.

For researchers, this study suggests that studies of the training system must not simply look at the psychology of learning but business theories such as corporate strategy, corporate analysis and performance, marketing theories, and competitive advantage concepts. Thus, an examination of training from a market orientation perspective could lead to higher levels of transfer due to a positive relationship between organizational need and training implementation. Additional research could also be initiated to explore the stimulus domain and the assertion that a positive relationship between training, transfer of training, and job performance is contingent on identification of a typology of stimuli for transfer. Thus, given observable, recognizable, and distinguishable situational cues there will be opportunity for a task response.

Research could also explore training and its output as a possible source of sustained competitive advantage. Training linked with strategy should lead to higher levels of transfer because of a positive relationship between organizational requirements and training implementation. Another assertion based on Barney's (1995) resource based view of the firm is that training that is valuable, rare, inimitable, and organizationally focused will lead to a better fit with strategy

and competitive advantage. An additional area to explore is that given an organizational strategy, training that focuses on firm specific rather than general skills will yield higher levels of competitive advantage. A final research area to examine is the concept of bundled skills and the hypothesis that training designs that emphasize bundled skills will yield higher levels of competitive advantage.

In closing, training represents a major organizational capability if properly deployed within an organization. It begins with organizational strategy and the determination of associated needs. Training solutions based on need, or the market for training, should experience higher levels of transfer to the workplace due to this connection. This research study extends the research on the training system, and specifically, transfer of training within the workplace.

Appendices

Appendix A

Job Task List

Job Task List

Job Task List	Training Course	Product Component
1. Install a CAB 5 Lobby Enclosure Cabinet	No	3-CAB5, 3-CABR
2. Install a CAB 7/14/21 Lobby Enclosure Cabinet	Yes	3-CAB7B, 3-CAB7D(R), 3-CAB14b, 3-CAB14D(R), 3-CAB21B, 3-CAB21d(R)
3. Install a RCC7/14/21 Remote Closet Enclosure	No	3-RCC7R, 3-RCC14R, 3-RCC21R
4. Install a CHASS7 Chassis Assembly	Yes	3-CHASS7
5. Install a System's Power Supply	Yes	3-PPS/M, 3-BPS/M, 3-PPS/M-230, 3-BPS/M-230, 3-PPS/M230-E, 3-BPS/M230-E, 3-PSMON, 3-BPSMON
6. Install a BTSEN Battery Distribution Unit	No	3-BTSEN
7. Install a Remote Power Supply Cabinet	No	BPS6, BPS6220, BPS10, BPS10220
8. Install and program a CPU1 Central Processor Unit	Yes	3-CPU-1
9. Install and program a RS485A/B Network Communication Card	Yes	3-RS485a, 3-RS485B
10. Install and program a RS232 Communication Card	Yes	3-RS232
11. Install and program a SSDC / SDDC Device Driver Controller Module	Yes	3-SSDC, 3-SDDC
12. Install and program a AADC Addressable Analog Device Controller	No	3-AADC
13. Install and program a IDC8/4 Initiating Device Circuit Module	Yes	3-IDC8/4

14.Install and program a OPS Off Premise Signaling Module	No	3-OPS
15.Install and program a FIB / FIBA Fiber Optics Communications Interface	Yes	3-FIB, 3-FIBA
16.Install and program a MODCOM / MODCOMP Modem Communicator	Yes	3-MODCOM, 3-MODCOMP
17.Install and program a LCD Display Module	Yes	3-LCD
18.Install and program a control display module	Yes	3-LDSM, 3-24R, 3-24Y, 3-34G, 3-12SR, 3-12SY, 3-12SG, 3-12RY, 3-12/2Y, 3-12/RY, 3-12/S1GY, 3-12/S1RY, 3-12/S2Y, 3-6/3S1G2Y, 3-6/3S1GYR
19.Install and program a Graphic Annunciator	No	EV1, EV1B, EV1T, EV2, EV2B, EV2T, EV3, EV3B, EV3T, FSCS-1, FSCS-2, FSCS-3, FSCS-4
20.Install and program a Remote Annunciator	Yes	3-LCDANN, 3-6ANN, 3-10ANN, 3-ANNCPU1, 3-ANNSM, 3-ANNBF, 3-EVDVRA, 3-EVPWRA, 3-EVDRX, RCLM/B, RLCM/B-S, 6ANN/B-S, 10ANN/B, 10ANN/B-S
21.Install and program a 10/100 MB Ethernet Switching Hub	No	NETSW-EIS6, NETSW-EIS6-SM
22.Install and program a NETCOM-1F Ethernet Fiber Optic Network Interface	No	NETCOM-1F
23.Install and program a NETCOM-1S Ethernet Serial Network Interface	No	NETCOM-1S
24.Install and program an ASU /ASUFT Audio Source Unit	Yes	3-ASU/FT, 3-ASU/4, 3-ASU, 3-FTCU, 3-ASUMX/32, 3-CCI
25.Install and program a SAC Security/Access Control Module	No	3-SAC

26.Install and program a KPDISP Keypad/ Display	No	KPDISP
27.Install and program CRC Card Reader Controller	No	CRC, CRCXM, CRCSND
28.Install and program a Zoned Amplifier	Yes	3-ZA20A, 3-ZA20B, 3-ZA40A, 3-ZA40B, 3-ZA90
29.Install and program an ATP Audio Terminal Panel for banked amplification	No	1B3125, 1B3250, ATP, 3-ATPINT, URSM,
30.Install and program a REMICP/A Remote Microphone	No	3-REMICP, 3-REMICA
31.Install a PT-1/S Serial Printer	No	PT-1S, PT1S/220
32.Install a RS-232 Optical Isolator Card	No	IOP3A
33.Install and program a CDR Coder Option Module	No	CDR-3
34.Install a MTM-1 March Time Coder Module	No	MTM-1
35.Install a NSHM1/2 Network Short Haul Modem	No	3-NSHM1, 3-NSHM2
36.Install a GFD Ground Fault Detection Module	No	GFD
37.Install and program a SM8051-1039 Communication Bridge	No	3-SM8051-0139
38.Install and program a device AA30/50 Audio Amplifier	No	SIGA-AA30, SIGA-AA50
39.Install and program a device APS Auxiliary Power Supply	No	SIGA-APS, SIGA-APS-220
40.Install and program a device sounder base	No	SIGA-AB4
41.Install and program a device relay base	No	SIGA-RB, SIGA-RB4
42.Install and program a detector	Yes	SIGA-IPHS, SIGA-IPHSB, SIGA-PHS, SIGA-PS, SIGA-IS, SIGA-HRS, SIGA-HFS

43. Install and program device module	Yes	SIGA-UM, SIGA-MAB, SIGA-CT1, SIGA-CT2, SIGA-MCT2, SIGA-CC1, SIGA-MCC1, SIGA-CC2, SIGA-MCC2, SIGA-CR, SIGA-MCR, SIGA-CRR, SIGA-MCRR, SIGA-RM1, SIGA-MRM1, SIGA-CC1S, SIGA-MCC1S, SIGA-IO, SIGA-MIO, SIGA-WTM, SIGA, IM, SIGA-MM1
44. Install and program a device releasing module	No	SIGA-REL

Appendix B

Course Content Questionnaire

Training Content Questionnaire

Your company has nominated you to participate in a Technical Advisory Panel. As a subject matter expert your opinion about the training program is very valuable and your input will help to ensure that it meets your company's needs.

Specifically, this study seeks to determine if the tasks taught in the training program reflect the needs of the workplace and are essential to the performance of a technician's job given a typical customer specification. Thus, this questionnaire seeks to obtain your opinion about the importance, or essentiality, of these job tasks in relationship to everyday workplace demands; and, the frequency of performance of these job tasks in relationship to the number of installations.

Instructions

Below is a list of job tasks associated with the application of this fire alarm system. Please indicate the level of *importance* and the *frequency* of performance of each job task based on the scale to the right of each job task statement. Please base your opinion of importance on what you believe should be taught in the training program given your workplace experiences. Your participation in this survey is voluntary. Thanks for your time.

Questionnaire

Job Tasks (Please note each task statement refers to all facets related to the installation and programming of the component.)	Importance Rating Scale ① Not Necessary ② Useful, but not Essential ③ Essential	Frequency Rating Scale ① No Installations (0%) ② Occasional Install (20%) ③ Below Average (40%) ④ Above Average (60%) ⑤ Most Installs (80%) ⑥ Every Installation (100%)
1. Install a CAB 5 Lobby Enclosure Cabinet	① ② ③	① ② ③ ④ ⑤ ⑥
2. Install a CAB 7/14/21 Lobby Enclosure Cabinet	① ② ③	① ② ③ ④ ⑤ ⑥
3. Install a RCC7/14/21 Remote Closet Enclosure	① ② ③	① ② ③ ④ ⑤ ⑥
4. Install a CHASS7 Chassis Assembly	① ② ③	① ② ③ ④ ⑤ ⑥
5. Install a Power Supply	① ② ③	① ② ③ ④ ⑤ ⑥
6. Install a BTSEN Battery Distribution Unit	① ② ③	① ② ③ ④ ⑤ ⑥
7. Install a Remote Power Supply Cabinet	① ② ③	① ② ③ ④ ⑤ ⑥

Job Tasks (continued) (Please note each task statement refers to all facets related to the installation and programming of the component.)	Importance Rating Scale ① Not Necessary ② Useful, but not Essential ③ Essential	Frequency Rating Scale ① No Installations (0%) ② Occasional Install (20%) ③ Below Average (40%) ④ Above Average (60%) ⑤ Most Installs (80%) ⑥ Every Installation (100%)
8. Install and program a CPU1 Central Processor Unit	① ② ③	① ② ③ ④ ⑤ ⑥
9. Install and program a RS485A/B Network Communication Card	① ② ③	① ② ③ ④ ⑤ ⑥
10. Install and program a RS232 Communication Card	① ② ③	① ② ③ ④ ⑤ ⑥
11. Install and program a SSDC / SDDC device driver controller module	① ② ③	① ② ③ ④ ⑤ ⑥
12. Install and program an AADC Addressable Analog Device Controller	① ② ③	① ② ③ ④ ⑤ ⑥
13. Install and program a IDC8/4 Initiating Device Circuit Module	① ② ③	① ② ③ ④ ⑤ ⑥
14. Install and program an OPS Off Premise Signaling Module	① ② ③	① ② ③ ④ ⑤ ⑥
15. Install and program a FIB / FIBA Fiber Optics Communications Interface	① ② ③	① ② ③ ④ ⑤ ⑥
16. Install and program a MODCOM / MODCOMP Modem Communicator	① ② ③	① ② ③ ④ ⑤ ⑥
17. Install and program a LCD Display Module	① ② ③	① ② ③ ④ ⑤ ⑥
18. Install and program a control display module	① ② ③	① ② ③ ④ ⑤ ⑥
19. Install and program a graphic annunciator	① ② ③	① ② ③ ④ ⑤ ⑥
20. Install and program a Remote Annunciator	① ② ③	① ② ③ ④ ⑤ ⑥
21. Install and program a 10/100 MB Ethernet Switching Hub	① ② ③	① ② ③ ④ ⑤ ⑥
22. Install and program a NETCOM-1F Ethernet Fiber Optic Network Interface	① ② ③	① ② ③ ④ ⑤ ⑥

Job Tasks (continued) (Please note each task statement refers to all facets related to the installation and programming of the component.)	Importance Rating Scale ① Not Necessary ② Useful, but not Essential ③ Essential	Frequency Rating Scale ① No Installations (0%) ② Occasional Install (20%) ③ Below Average (40%) ④ Above Average (60%) ⑤ Most Installs (80%) ⑥ Every Installation (100%)
23. Install and program a NETCOM-1S Ethernet Serial Network Interface	① ② ③	① ② ③ ④ ⑤ ⑥
24. Install and program an ASU /ASUFT Audio Source Unit	① ② ③	① ② ③ ④ ⑤ ⑥
25. Install and program a SAC Security/Access Control module	① ② ③	① ② ③ ④ ⑤ ⑥
26. Install and program a KPDISP keypad/display	① ② ③	① ② ③ ④ ⑤ ⑥
27. Install and program CRC Card Reader Controller	① ② ③	① ② ③ ④ ⑤ ⑥
28. Install and program a Zoned Amplifier	① ② ③	① ② ③ ④ ⑤ ⑥
29. Install and program an ATP Audio Terminal Panel for banked amplification	① ② ③	① ② ③ ④ ⑤ ⑥
30. Install and program a REMICP/A Remote Microphone	① ② ③	① ② ③ ④ ⑤ ⑥
31. Install a PT-1/S Serial Printer	① ② ③	① ② ③ ④ ⑤ ⑥
32. Install a RS-232 Optical Isolator Card	① ② ③	① ② ③ ④ ⑤ ⑥
33. Install and program a CDR Coder Option Module	① ② ③	① ② ③ ④ ⑤ ⑥
34. Install a MTM-1 March Time Coder Module	① ② ③	① ② ③ ④ ⑤ ⑥
35. Install a NSHM1/2 Network Short Haul Modem	① ② ③	① ② ③ ④ ⑤ ⑥
36. Install a GFD Ground Fault Detection Module	① ② ③	① ② ③ ④ ⑤ ⑥
37. Install and program a SM8051-1039 Communication Bridge	① ② ③	① ② ③ ④ ⑤ ⑥
38. Install and program a device AA30/50 Audio Amplifier	① ② ③	① ② ③ ④ ⑤ ⑥

Job Tasks (continued) (Please note each task statement refers to all facets related to the installation and programming of the component.)	Importance Rating Scale ① Not Necessary ② Useful, but not Essential ③ Essential	Frequency Rating Scale ① No Installations (0%) ② Occasional Install (20%) ③ Below Average (40%) ④ Above Average (60%) ⑤ Most Installs (80%) ⑥ Every Installation (100%)
39. Install and program a device APS Auxiliary Power Supply	① ② ③	① ② ③ ④ ⑤ ⑥
40. Install and program a device sounder base	① ② ③	① ② ③ ④ ⑤ ⑥
41. Install and program a device relay base	① ② ③	① ② ③ ④ ⑤ ⑥
42. Install and program a detector	① ② ③	① ② ③ ④ ⑤ ⑥
43. Install and program a device module	① ② ③	① ② ③ ④ ⑤ ⑥
44. Install and program a device releasing module	① ② ③	① ② ③ ④ ⑤ ⑥

Thanks for your time

Appendix C

Stimulus Evaluation Questionnaire

Stimulus Evaluation Questionnaire

You have been selected to participate in a course design study. As a graduate of this training program your opinion about the course is very valuable and your input will help to ensure that it meets your company's needs.

Specifically, this study seeks to determine if the tasks taught in the training program reflect the needs of the workplace and are essential to the performance of a technician's job given a typical customer specification. Thus, this questionnaire seeks to obtain your opinion about the importance, or essentiality, of these job tasks in relationship to everyday workplace demands; and, the frequency of performance of these job tasks in relationship to the number of installations.

Instructions

Below is a list of job tasks associated with the application of this fire alarm system. Please indicate the level of *importance* and the *frequency* of performance of each job task based on the scale to the right of each job task statement. Please base your opinion of importance on what you believe should be taught in the training program given your workplace experiences. Your participation in this survey is voluntary and your input will be anonymous. Thanks for your time.

Questionnaire

Job Tasks (Please note each task statement refers to all facets related to the installation and programming of the component.)	Importance Rating Scale ① Not Necessary ② Useful, but not Essential ③ Essential	Frequency Rating Scale ① No Installations (0%) ② Occasional Install (20%) ③ Below Average (40%) ④ Above Average (60%) ⑤ Most Installs (80%) ⑥ Every Installation (100%)
1. Install a CAB 5 Lobby Enclosure Cabinet	① ② ③	① ② ③ ④ ⑤ ⑥
2. Install a CAB 7/14/21 Lobby Enclosure Cabinet	① ② ③	① ② ③ ④ ⑤ ⑥
3. Install a RCC7/14/21 Remote Closet Enclosure	① ② ③	① ② ③ ④ ⑤ ⑥
4. Install a CHASS7 Chassis Assembly	① ② ③	① ② ③ ④ ⑤ ⑥
5. Install a Power Supply	① ② ③	① ② ③ ④ ⑤ ⑥
6. Install a BTSEN Battery Distribution Unit	① ② ③	① ② ③ ④ ⑤ ⑥
7. Install a Remote Power Supply Cabinet	① ② ③	① ② ③ ④ ⑤ ⑥

Job Tasks (continued) (Please note each task statement refers to all facets related to the installation and programming of the component.)	Importance Rating Scale ① Not Necessary ② Useful, but not Essential ③ Essential	Frequency Rating Scale ① No Installations (0%) ② Occasional Install (20%) ③ Below Average (40%) ④ Above Average (60%) ⑤ Most Installs (80%) ⑥ Every Installation (100%)
8. Install and program a CPU1 Central Processor Unit	① ② ③	① ② ③ ④ ⑤ ⑥
9. Install and program a RS485A/B Network Communication Card	① ② ③	① ② ③ ④ ⑤ ⑥
10. Install and program a RS232 Communication Card	① ② ③	① ② ③ ④ ⑤ ⑥
11. Install and program a SSDC / SDDC device driver controller module	① ② ③	① ② ③ ④ ⑤ ⑥
12. Install and program a AADC Addressable Analog Device Controller	① ② ③	① ② ③ ④ ⑤ ⑥
13. Install and program a IDC8/4 Initiating Device Circuit Module	① ② ③	① ② ③ ④ ⑤ ⑥
14. Install and program a OPS Off Premise Signaling Module	① ② ③	① ② ③ ④ ⑤ ⑥
15. Install and program a FIB / FIBA Fiber Optics Communications Interface	① ② ③	① ② ③ ④ ⑤ ⑥
16. Install and program a MODCOM / MODCOMP Modem Communicator	① ② ③	① ② ③ ④ ⑤ ⑥
17. Install and program a LCD Display Module	① ② ③	① ② ③ ④ ⑤ ⑥
18. Install and program a control display modules	① ② ③	① ② ③ ④ ⑤ ⑥
19. Install and program a graphic annunciator	① ② ③	① ② ③ ④ ⑤ ⑥
20. Install and program a Remote Annunciator	① ② ③	① ② ③ ④ ⑤ ⑥
21. Install and program a 10/100 MB Ethernet Switching Hub	① ② ③	① ② ③ ④ ⑤ ⑥
22. Install and program a NETCOM-1F Ethernet Fiber Optic Network Interface	① ② ③	① ② ③ ④ ⑤ ⑥

Job Tasks (continued) (Please note each task statement refers to all facets related to the installation and programming of the component.)	Importance Rating Scale ① Not Necessary ② Useful, but not Essential ③ Essential	Frequency Rating Scale ① No Installations (0%) ② Occasional Install (20%) ③ Below Average (40%) ④ Above Average (60%) ⑤ Most Installs (80%) ⑥ Every Installation (100%)
23. Install and program a NETCOM-1S Ethernet Serial Network Interface	① ② ③	① ② ③ ④ ⑤ ⑥
24. Install and program an ASU /ASUFT Audio Source Unit	① ② ③	① ② ③ ④ ⑤ ⑥
25. Install and program a SAC Security/Access Control module	① ② ③	① ② ③ ④ ⑤ ⑥
26. Install and program a KPDISP keypad/display	① ② ③	① ② ③ ④ ⑤ ⑥
27. Install and program CRC Card Reader Controller	① ② ③	① ② ③ ④ ⑤ ⑥
28. Install and program a Zoned Amplifier	① ② ③	① ② ③ ④ ⑤ ⑥
29. Install and program an ATP Audio Terminal Panel for banked amplification	① ② ③	① ② ③ ④ ⑤ ⑥
30. Install and program a REMICP/A Remote Microphone	① ② ③	① ② ③ ④ ⑤ ⑥
31. Install a PT-1/S Serial Printer	① ② ③	① ② ③ ④ ⑤ ⑥
32. Install a RS-232 Optical Isolator Card	① ② ③	① ② ③ ④ ⑤ ⑥
33. Install and program a CDR Coder Option Module	① ② ③	① ② ③ ④ ⑤ ⑥
34. Install a MTM-1 March Time Coder Module	① ② ③	① ② ③ ④ ⑤ ⑥
35. Install a NSHM1/2 Network Short Haul Modem	① ② ③	① ② ③ ④ ⑤ ⑥
36. Install a GFD Ground Fault Detection Module	① ② ③	① ② ③ ④ ⑤ ⑥
37. Install and program a SM8051-1039 Communication Bridge	① ② ③	① ② ③ ④ ⑤ ⑥
38. Install and program a device AA30/50 Audio Amplifier	① ② ③	① ② ③ ④ ⑤ ⑥

Job Tasks (continued) (Please note each task statement refers to all facets related to the installation and programming of the component.)	Importance Rating Scale ① Not Necessary ② Useful, but not Essential ③ Essential	Frequency Rating Scale ① No Installations (0%) ② Occasional Install (20%) ③ Below Average (40%) ④ Above Average (60%) ⑤ Most Installs (80%) ⑥ Every Installation (100%)
39. Install and program a device APS Auxiliary Power Supply	① ② ③	① ② ③ ④ ⑤ ⑥
40. Install and program a device sounder base	① ② ③	① ② ③ ④ ⑤ ⑥
41. Install and program a device relay base	① ② ③	① ② ③ ④ ⑤ ⑥
42. Install and program a Detector	① ② ③	① ② ③ ④ ⑤ ⑥
43. Install and program a device module	① ② ③	① ② ③ ④ ⑤ ⑥
44. Install and program a device releasing module	① ② ③	① ② ③ ④ ⑤ ⑥

Thanks for your time

Appendix D

Pilot Test, Raw Survey Data

Pilot Test, Raw Survey Data

Survey Number	A_Q1A	A_Q1B	A_Q2A	A_Q2B	A_Q3A	A_Q3B	A_Q4A	A_Q4B	A_Q5A	A_Q5B	A_Q6A	A_Q6B
1	3	2	3	5	2	2	3	4	3	4	3	4
2	1	2	2	5	2	2	2	2	2	6		1
3	1	2	2	2	1	1	2	2	2	2	2	1
4	2	4	2	4	2	3	3	6	3	6	2	1
5	2	2	3	6	2	2	1	1	2	5	2	3
6	2	1	3	6	2	1	1	6	1	6	2	2
7	1	2	1	2	1	2	2	2	2	3	1	1
8	1	1	1	1	1	1	3	5	3	5	2	1
9	2	2	2	2	2	2	2	2	2	2	1	1
10	2	1	3	6	3	5	3	6	3	6	3	3
11	2	2	2	6	2	3	2	6	2	6	1	1
12	1	2	2	6	2	3	2	6	2	6	3	4
13	1	1	2	3	2	3	2	3	2	6	1	2
14	1	2	2	5	2	5	2	6	2	6	2	3
15	1	2	1	5	1	2	1	6	2	6	1	1
16	2	2	3	6	1	1	2	5	3	6	1	1
17	2	2	3	6	2	4	2	6	3	6	2	2
18	2	2	3	4	2	2	2	2	3	6	2	4
19	3	5	3	6	3	.	.	.	3	6	1	1
20	2	2	3	4	1	1	2	5	3	5	2	2
21	2	2	3	6	1	1	3	6	3	6	2	1
22	.	.	3	6	2	2	3	6	3	6	2	2
23	1	1	3	2	2	1	1	1	2	1	2	1
24	3	3	2	4	3	6	3	6	3	6	2	3
25	2	4	3	6	2	3	3	6	3	4	1	3

A_Q7A	A_Q7B	A_Q8A	A_Q8B	A_Q9A	A_Q9B	A_Q10A	A_Q10B	A_Q11A	A_Q11B	A_Q12A	A_Q12B
3	5	3	6	3	5	3	5	3	5	3	4
1	4	3	6	3	5	3	5	3	5	2	2
1	.	3	2	1	2	1	2	3	2	1	1
1	6	3	6	3	6	3	4	3	6	3	3
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2	6	3	6	2	3	2	3	3	6	2	2
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3	5	3	6	3	6	3	5	3	6	3	2
3	4	3	6	3	5	3	4	3	5	2	1
3	5	3	6	3	6	3	5	3	6	3	2
2	5	3	6	3	5	3	3	3	6	2	2
2	4	3	6	2	6	2	6	3	6	3	2
1	2	3	6	2	6	1	2	3	6	2	2
1	4	3	6	2	4	2	3	3	6	3	4
1	1	3	6	3	5	3	5	3	5	3	2
2	3	.	.	2	5	2	5	3	6	2	1
3	6	3	6	3	5	3	5	3	6	2	3
1	1	3	6	3	5	3	4	3	6	2	2
2	1	3	6	3	5	3	4	3	6	2	1
3	5	3	6	3	5	2	4	3	5	3	2
3	5	3	6	3	5	2	4	3	6	2	1
3	6	3	6	3	5	3	6	3	6	2	1
2	1	3	2	3	2	1	2	3	2	2	1
3	5	3	6	3	6	3	5	3	6	3	3
1	2	3	6	3	4	3	4	3	5	3	3

A_Q13A	A_Q13B	A_Q14A	A_Q14B	A_Q15A	A_Q15B	A_Q16A	A_Q16B	A_Q17A	A_Q17B	A_Q18A	A_Q18B
3	4	3	4	3	4	3	3	3	6	3	5
2	2	.	.	2	2	3	4	3	6	3	5
2	2	2	2	2	1	2	2	1	2	2	1
2	2	1	1	2	4	3	4	3	6	3	6
3	5	2	2	3	5	3	4	3	6	2	3
2	1	1	1	2	1	2	2	3	6	2	1
1	1	1	1	3	3	3	4	3	5	3	3
3	2	3	2	3	2	3	6	3	6	3	2
2	3	1	1	2	2	3	4	3	6	2	2
3	1	1	1	3	2	3	6	3	6	3	6
2	2	2	3	3	3	3	4	3	6	3	6
3	2	2	1	3	4	3	5	2	6	3	6
1	1	1	2	1	2	3	3	1	6	1	4
3	4	2	3	3	5	3	5	3	5	2	4
3	2	2	1	2	1	3	4	3	6	2	2
2	2	2	1	2	1	3	4	2	2	3	6
3	4	2	1	3	3	3	5	3	6	2	3
2	4	2	2	2	2	3	5	3	6	2	3
1	1	2	1	2	1	.	2	3	6	2	1
3	2	2	2	3	1	3	4	3	6	3	1
3	4	2	1	2	2	2	1	3	6	2	2
3	6	1	1	3	5	2	3	3	6	2	1
2	2	2	1	2	1	3	1	2	2	2	1
3	4	3	3	3	5	3	5	3	6	3	6
2	3	2	2	3	3	3	3	1	6	.	.

A_Q19A	A_Q19B	A_Q20A	A_Q20B	A_Q21A	A_Q21B	A_Q22A	A_Q22B	A_Q23A	A_Q23B	A_Q24A	A_Q24B
3	3	3	4	3	3	3	3	3	3	3	5
3	2	3	3	3	1	3	3	3	1	3	5
2	1	3	2	3	1	3	1	3	1	3	2
2	2	3	6	2	3	2	3	2	3	3	6
2	1	3	5	3	1	3	5	2	2	3	5
1	1	3	5	2	1	2	1	2	1	3	2
1	1	3	4	2	1	3	3	3	3	3	4
3	4	3	6	3	1	3	1	3	2	3	5
2	3	3	5	1	1	1	1	1	1	3	5
3	4	3	5	2	1	2	1	2	1	3	5
3	4	3	5	2	2	2	1	2	1	3	5
2	2	3	5	2	1	3	1	3	4	3	4
2	3	1	4	1	1	2	2	2	2	3	4
2	4	3	4	3	5	3	4	3	4	3	5
2	2	3	4	2	1	2	1	2	1	3	3
2	2	2	4	1	1	1	1	1	1	3	6
3	3	3	5	3	3	3	2	3	2	3	3
2	3	3	5	1	1	1	1	1	1	2	3
1	1	3	5	2	1	2	1	2	1	3	5
3	2	3	4	3	1	3	1	3	1	3	4
2	1	3	3	2	1	2	1	2	1	3	5
1	1	2	4	1	1	1	1	1	1	2	1
2	1	2	1	2	1	2	1	2	1	1	1
3	4	3	6	3	4	3	4	3	5	3	6
2	3	3	4	2	2	2	.	3	3	3	5

A_Q25A	A_Q25B	A_Q26A	A_Q26B	A_Q27A	A_Q27B	A_Q28A	A_Q28B	A_Q29A	A_Q29B	A_Q30A	A_Q30B
3	2	3	2	3	2	3	4	3	4	3	4
3	2	3	2	3	2	3	5	3	2	2	2
3	1	3	1	3	1	3	2	3	1	2	1
3	4	3	4	3	4	3	5	3	4	3	4
3	3	3	3	2	3	3	5	1	1	2	3
2	1	2	1	2	1	2	2	2	1	2	1
1	1	1	1	1	1	3	5	3	3	3	3
2	1	2	1	2	1	3	5	3	2	2	1
2	1	2	1	2	1	3	5	2	1	2	2
2	1	2	1	2	1	3	5	1	1	2	1
2	2	2	1	2	2	3	4	2	2	2	2
3	4	3	4	3	4	3	5	2	2	2	2
1	3	2	1	2	1	1	4	2	3	2	2
3	5	3	4	3	5	2	5	2	4	2	4
3	3	3	2	3	2	2	2	2	1	2	2
2	2	2	1	2	1	3	6	2	5	2	2
2	3	3	3	3	3	3	4	3	3	3	3
2	3	2	3	2	3	2	3	1	1	2	2
2	1	2	1	2	1	3	5	3	2	3	2
3	1	3	1	3	1	3	4	3	1	3	1
2	1	2	1	2	1	3	5	2	1	3	2
2	1	2	1	2	1	2	1	1	1	1	1
2	1	2	1	2	1	2	1	2	1	2	1
3	4	3	4	3	4	3	6	3	4	3	4
3	4	3	4	3	4	3	5	2	3	2	4

A_Q31A	A_Q31B	A_Q32A	A_Q32B	A_Q33A	A_Q33B	A_Q34A	A_Q34B	A_Q35A	A_Q35B	A_Q36A	A_Q36B
3	5	3	3	3	3	3	2	3	4	3	3
2	4			2	1	2	1	3	1	1	1
2	2	1	1	1	1	2	1	2	1	2	1
2	3	2	3	1	1	1	1	1	1	2	1
3	4	1	1	2	2	1	1	1	1	1	1
3	2	2	1	2	1	2	1	2	1	2	1
2	2	2	2	1	1	1	1	2	1	3	3
3	3	2	1	2	1	2	1	2	1	2	1
2	3	2	1	1	1	1	1	1	1	1	1
3	4	2	1	1	1	2	1	2	1	2	1
2	2	2	1	2	2	2	1	2	1	1	.
3	5	1	1	2	2	1	1	3	2	2	1
1	2	1	1	2	3	1	1	1	1	1	1
2	4	2	4	3	4	1	1	3	4	2	4
2	4	1	1	2	2	2	1	2	2	1	2
3	6	1	1	1	1	1	1	1	1	1	1
3	4	2	2	2	2	2	1	2	2	2	1
2	2	1	1	2	2	1	1	1	1	2	2
3	4	3	4	3	4	2	1	2	1	3	1
1	4	1	1	2	1	1	2	1	2	1	2
3	3	2	1	2	1	2	1	2	1	2	1
.	.	1	1	1	1	1	1	1	1	2	2
2	2	2	1	2	1	2	1	2	1	2	1
3	6	3	4	3	3	2	2	2	2	2	1
3	5	3	5	2	3	1	2	2	3	1	2

A_Q37A	A_Q37B	A_Q38A	A_Q38B	A_Q39A	A_Q39B	A_Q40A	A_Q40B	A_Q41A	A_Q41B	A_Q42A	A_Q42B
3	2	3	4	3	3	3	3	3	3	3	4
3	1	2	3	3	3	3	4	2	2	3	5
2	1	3	2	2	2	2	2	1	2	2	3
3	2	3	2	3	2	3	3	3	3	3	6
1	1	1	1	1	1	2	2	3	5	3	6
2	1	2	3	2	2	2	2	2	2	3	6
1	1	3	4	1	2	3	5	3	5	3	5
2	1	2	1	2	1	3	3	3	5	3	6
1	1	3	3	3	3	1	1	3	5	3	6
2	1	2	2	2	2	3	2	3	1	3	6
.	.	2	4	2	4	2	3	2	4	2	6
2	1	3	3	3	3	2	2	2	2	2	6
2	2	2	4	1	2	1	3	1	3	1	6
3	4	2	5	2	4	3	5	2	5	2	5
2	1	2	2	2	4	3	3	3	3	3	5
1	1	1	1	2	4	2	3	2	6	3	6
2	1	3	4	2	5	2	2	3	4	3	6
1	1	2	2	2	2	2	2	2	1	3	6
1	1	3	2	3	5	3	2	2	1	3	6
3	1	2	4	1	4	1	2	1	2	1	5
2	1	2	1	2	1	3	2	3	6	3	6
1	1	1	1	2	1	2	2	2	2	3	6
2	1	2	1	2	1	2	2	2	2	2	6
2	1	3	4	3	4	3	5	3	5	3	6
2	.	2	4	2	4	2	3	2	4	3	5

A_Q43A	A_Q43B	A_Q44A	A_Q44B
3	4	3	3
3	5	3	3
3	2	3	2
3	6	3	3
3	6	3	6
3	6	2	1
3	5	2	2
3	6	3	2
3	6	2	3
3	6	2	1
2	6	2	1
2	6	3	2
1	6	2	2
2	5	3	4
3	6	3	5
3	6	2	3
3	6	2	3
3	6	2	2
3	6	2	2
1	5	3	2
3	6	2	1
3	6	2	1
2	6	2	1
3	6	3	4
3	5	3	4

Appendix E

Survey Pilot Test Results, CVR and CVI Values

Survey Pilot Test Results, CVR and CVI Values

Survey Question	CVR's (Trained Tasks)	CVR's (Non Trained Tasks)
1. Install a CAB 5 Lobby Enclosure Cabinet		-.75
2. Install a CAB 7/14/21 Lobby Enclosure Cabinet	.04	
3. Install a RCC7/14/21 Remote Closet Enclosure		-.76
4. Install a CHASS4/7 Chassis Assembly	-.33	
5. Install a Power Supply	.04	
6. Install a BTSEN Battery Distribution Unit		-.76
7. Install a Remote Power Supply Cabinet		-.20
8. Install and program a CPU1 Central Processor Unit	.99	
9. Install and program a RS485A/B Network Communication Card	.44	
10. Install and program a RS232 Communication Card	.28	
11. Install and program a SSDC / SDDC device driver controller module	.99	
12. Install and program a AADC Addressable Analog Device Controller		-.12
13. Install and program an IDC8/4 Initiating Device Circuit Module	-.04	
14. Install and program an OPS Off Premise Signaling Module		-.75
15. Install and program a FIB / FIBA Fiber Optics Communications Interface	.04	
16. Install and program a MODCOM / MODCOMP Modem Communicator	.67	

17. Install and program a LCD Display Module	.52	
18. Install and program a control display module	.08	
19. Install and program a graphic annunciator		-.36
20. Install and program a remote annunciator	.68	
21. Install and program a 10/100 MB Ethernet Switching Hub		-.28
22. Install and program a NETCOM-1F Ethernet Fiber Optic Network Interface		-.12
23. Install and program a NETCOM-1S Ethernet Serial Network Interface		-.12
24. Install and program an ASU /ASUFT Audio Source Unit	.76	
25. Install and program a SAC Security/Access Control Module		-.12
26. Install and program a KPDISP Keypad/ Display		-.04
27. Install and program CRC Card Reader Controller		-.12
28. Install and program a Zoned Amplifier	.44	
29. Install and program an ATP Audio Terminal Panel for banked amplification		-.20
30. Install and program a REMICP/A Remote Microphone		-.36
31. Install a PT-1/S Serial Printer		0
32. Install a RS-232 Optical Isolator Card		-.67
33. Install and program a CDR-3 Coder Option Module		-.68
34. Install a MTM-1 March Time Coder Module		-.92

35. Install a NSHM1/2 Network Short Haul Modem		-.68
36. Install a GFD Ground Fault Detection Module		-.76
37. Install and program a SM8051-1039 Communication Bridge		-.58
38. Install and program a device AA30/50 Audio Amplifier		-.28
39. Install and program a device APS Auxiliary Power Supply		-.44
40. Install and program a device sounder base		-.12
41. Install and program a device relay base		-.12
42. Install and program a detector	.44	
43. Install and program a device module	.52	
44. Install and program a device releasing module		-.04
Content Validity Index (CVI)	.39	-.38

Appendix F

Survey Pilot Test Results, FVR and FVI values

Survey Pilot Test Results, FVR and FVI values

Survey Question	FVR's (Trained Tasks)	FVR's (Non Trained Tasks)
1. Install a CAB 5 Lobby Enclosure Cabinet		-.92
2. Install a CAB 7/14/21 Lobby Enclosure Cabinet	.20	
3. Install a RCC7/14/21 Remote Closet Enclosure		-.75
4. Install a CHASS4/7 Chassis Assembly	.25	
5. Install a Power Supply	.52	
6. Install a BTSEN Battery Distribution Unit		-.99
7. Install a Remote Power Supply Cabinet		0
8. Install and program a CPU1 Central Processor Unit	.83	
9. Install and program a RS485A/B Network Communication Card	.44	
10. Install and program a RS232 Communication Card	-.12	
11. Install and program a SSDC / SDDC device driver controller module	.84	
12. Install and program an AADC Addressable Analog Device Controller		-.99
13. Install and program an IDC8/4 Initiating Device Circuit Module	-.84	
14. Install and program an OPS Off Premise Signaling Module		-.99
15. Install and program a FIB / FIBA Fiber Optics Communications Interface	-.68	
16. Install and program a MODCOM / MODCOMP Modem Communicator	-.44	

17. Install and program a LCD Display Module	.68	
18. Install and program a control display modules	-.33	
19. Install and program an Envoy Graphic Annunciator		-.99
20. Install and program a Remote Annunciator	-.04	
21. Install and program a 10/100 MB Ethernet Switching Hub		-.92
22. Install and program a NETCOM-1F Ethernet Fiber Optic Network Interface		-.92
23. Install and program a NETCOM-1S Ethernet Serial Network Interface		-.92
24. Install and program a ASU /ASUFT Audio Source Unit	.12	
25. Install and program a SAC Security/Access Control Module		-.92
26. Install and program a KPDISP Keypad/ Display		-.99
27. Install and program CRC Card Reader Controller		-.92
28. Install and program a Zoned Amplifier	.12	
29. Install and program an ATP Audio Terminal Panel for banked amplification		-.92
30. Install and program a REMICP/A Remote Microphone		-.99
31. Install a PT-1/S Serial Printer		-.58
32. Install a RS-232 Optical Isolator Card		-.91
33. Install and program a CDR Coder Option Module		-.99
34. Install a MTM-1 March Time Coder Module		-.99

35. Install a NSHM1/2 Network Short Haul Modem		-.99
36. Install a GFD Ground Fault Detection Module		-.99
37. Install and program a SM8051-1039 Communication Bridge		-.99
38. Install and program a device AA30/50 Audio Amplifier		-.92
39. Install and program a device APS Auxiliary Power Supply		-.84
40. Install and program a device sounder base		-.76
41. Install and program a device relay base		-.36
42. Install and program a detector	.84	
43. Install and program a device module	.84	
44. Install and program a device releasing module		-.84
Frequency Validity Index (FVI)	.19	-.86

Appendix G

Pilot Test 2, Raw Survey Data

Pilot Test 2, Raw Survey Data

Survey Number	A_Q1A	A_Q1B	A_Q2A	A_Q2B	A_Q3A	A_Q3B	A_Q4A	A_Q4B	A_Q5A	A_Q5B	A_Q6A	A_Q6B
1	3	4	3	5	3	4	3	5	2	6	1	4
2	2	2	2	6	2	.	2	3	3	6	1	2
3	3	4	3	4	3	4	3	4	3	4	1	2
4	1	2	1	2	1	2	1	2	2	5	3	5
5	1	2	3	6	1	2	3	6	3	6	1	1
6	2	2	3	6	2	2	2	5	3	6	1	2
7	1	5	1	5	1	5	1	5	3	6	1	1
8	1	2	3	5	2	2	3	5	3	6	3	2
9	1	1	2	2	1	1	3	3	3	6	2	1

A_Q7A	A_Q7B	A_Q8A	A_Q8B	A_Q9A	A_Q9B	A_Q10A	A_Q10B	A_Q11A	A_Q11B	A_Q12A	A_Q12B
2	3	3	6	3	5	1	5	3	6	2	3
2	5	3	6	3	4	3	3	3	6	2	1
1	2	3	6	3	5	3	4	3	6	2	4
2	3	3	6	3	6	3	6	3	6	2	2
2	2	3	6	3	4	3	5	3	6	2	2
3	5	3	6	3	5	3	5	3	6	2	1
1	2	3	6	3	5	3	5	3	6	2	2
3	3	3	6	3	5	2	3	3	6	1	1
2	3	3	6	3	4	3	5	3	6	2	1

A_Q13A	A_Q13B	A_Q14A	A_Q14B	A_Q15A	A_Q15B	A_Q16A	A_Q16B	A_Q17A	A_Q17B	A_Q18A	A_Q18B
2	3	2	2	3	3	3	5	2	6	2	3
3	3	2	1	2	1	3	3	3	6	.	.
2	3	2	1	2	2	3	5	3	6	3	5
2	3	1	1	2	4	3	6	3	6	3	6
2	2	2	1	3	3	3	4	3	6	3	5
2	4	1	1	2	3	3	5	3	6	2	4
2	2	1	1	2	3	2	4	3	6	.	.
1	1	2	1	2	1	2	1	3	5	3	5
2	3	1	1	2	4	2	2	3	5	2	2

A_Q19A	A_Q19B	A_Q20A	A_Q20B	A_Q21A	A_Q21B	A_Q22A	A_Q22B	A_Q23A	A_Q23B	A_Q24A	A_Q24B
1	3	2	4	3	3	3	3	3	3	3	5
2	1	3	3	3	1	3	1	3	1	3	4
3	4	3	5	2	3	2	3	2	3	2	3
2	3	3	6	2	1	2	1	2	3	3	5
2	1	2	5	2	1	2	1	2	1	3	4
2	3	3	5	1	1	1	1	1	1	3	3
1	1	3	5	1	1	2	2	2	2	3	5
1	1	2	3	2	1	2	1	3	1	3	6
1	.	2	3	1	1	1	1	2	2	3	4

A_Q25A	A_Q25B	A_Q26A	A_Q26B	A_Q27A	A_Q27B	A_Q28A	A_Q28B	A_Q29A	A_Q29B	A_Q30A	A_Q30B
3	4	1	2	1	3	1	4	2	2	2	2
3	2	3	2	3	2	3	4	3	4	3	3
2	2	2	2	2	2	3	4	2	2	2	2
3	4	3	4	3	3	3	5	2	3	2	3
2	1	2	2	2	1	2	4	3	2	2	2
2	2	3	2	3	1	3	3	3	2	2	1
3	2	3	2	3	2	2	4	2	5	1	5
2	1	2	1	2	1	3	6	2	2	2	2
1	1	1	1	1	1	2	1	1	1	2	1

A_Q31A	A_Q31B	A_Q32A	A_Q32B	A_Q33A	A_Q33B	A_Q34A	A_Q34B	A_Q35A	A_Q35B	A_Q36A	A_Q36B
2	4	1	2	1	1	1	1	1	1	1	1
3	3	3	3	3	1	3	1	3	1	3	1
3	4	3	5	2	2	1	1	2	2	2	2
2	3	1	1	1	1	1	1	2	2	2	1
3	5	2	5	1	1	1	1	1	1	1	2
3	5	2	2	2	2	2	1	2	1	2	2
2	5	1	1	1	1	1	2	1	1	1	1
1	1	2	1	1	1	1	1	2	1	2	1
2	2	1	1	1	1	1	1	1	1	2	1

A_Q37A	A_Q37B	A_Q38A	A_Q38B	A_Q39A	A_Q39B	A_Q40A	A_Q40B	A_Q41A	A_Q41B	A_Q42A	A_Q42B
2	2	1	5	1	6	1	3	1	3	3	6
3	1	3	2	3	3	3	2	3	3	3	6
2	2	2	3	2	3	2	3	3	5	3	5
1	1	3	4	3	3	3	5	3	5	3	6
1	1	3	5	3	5	3	4	2	2	3	6
2	1	3	5	2	2	2	1	2	1	3	6
1	1	1	1	1	2	1	4	1	4	3	6
2	1	3	6	2	1	2	1	2	3	3	6
1	1	1	1	2	4	2	6	2	6	2	6

A_Q43A	A_Q43B	A_Q44A	A_Q44B
3	6	2	2
3	6	3	3
3	5	2	2
3	6	2	2
3	6	3	3
3	6	3	2
3	6	3	2
3	6	3	4
2	6	2	3

Appendix H

Primary Survey, Ratios and Sales Data

Primary Survey, Ratios and Sales Data

Question	Course	CVR	FVR	SVR	S-FVR	2004 Sales Revenue	2004 Sales Quantity
1	no	-0.92	-0.92	-0.79	-0.95	$29,831.93	232
2	yes	-0.28	0.12	-0.02	0.03	$512,567.65	2,212
3	no	-0.84	-0.76	-0.59	-0.78	$198,433.27	642
4	yes	0.6	0.68	0.19	0.45	$333,209.65	2,251
5	yes	0.68	0.92	0.52	0.66	$1,319,102.62	2,991
6	no	-0.92	-0.84	-0.73	-0.78	$5,526.14	58
7	no	-0.12	-0.12	0.08	0.3	$1,306,907.40	5,750
8	yes	0.99	0.99	0.92	0.82	$800,625.24	1,943
9	yes	0.76	0.68	0.58	0.34	$490,082.49	2,800
10	yes	0.28	0.12	0.34	-0.14	$97,541.67	612
11	yes	0.99	0.99	0.96	0.88	$1,931,422.96	2,676
12	no	-0.28	-0.84	-0.29	-0.93	$87,986.07	105
13	yes	-0.04	-0.68	0	-0.74	$178,471.34	604
14	no	-0.52	-0.99	-0.73	-0.96	$5,735.85	38
15	yes	-0.04	-0.76	-0.29	-0.89	$127,004.21	326
16	yes	0.6	-0.12	0.51	-0.32	$151,202.61	520
17	yes	0.68	0.99	0.55	0.82	$248,976.59	1,812
18	yes	0.52	0.44	0.21	-0.1	$366,077.45	2,554
19	no	-0.36	-0.68	-0.44	-0.92	$174,803.72	1,120
20	yes	0.6	0.2	0.6	0.14	$137,852.73	985
21	no	-0.6	-0.99	-0.67	-0.99	$13,234.00	9
22	no	-0.6	-0.99	-0.63	-0.99	$2,816.00	4
23	no	-0.6	-0.99	-0.56	-0.99	$45,565.85	108
24	yes	0.84	0.12	0.75	-0.45	$408,645.38	431
25	no	-0.28	-0.84	-0.21	-0.99	$42,798.86	140
26	no	-0.2	-0.92	-0.3	-0.97	$81,107.72	264
27	no	-0.2	-0.84	-0.29	-0.99	$144,183.65	1,213
28	yes	0.44	-0.12	0.44	-0.55	$1,375,108.67	3,555
29	no	-0.44	-0.92	-0.41	-0.95	$9,389.81	116
30	no	-0.28	-0.84	-0.33	-0.97	$23,767.74	96
31	no	-0.2	-0.28	0	-0.6	$262,827.19	582
32	no	-0.6	-0.68	-0.77	-0.96	$21,426.29	74
33	no	-0.76	-0.99	-0.77	-0.99	$43,433.50	180
34	no	-0.84	-0.99	-0.93	-0.99	$1,471.81	13
35	no	-0.76	-0.92	-0.81	-0.99	$5,445.90	7
36	no	-0.6	-0.92	-0.79	-0.99	$122.85	1

37	no	-0.67	-0.92	-0.79	-0.99	$0.00	0
38	no	-0.36	-0.76	-0.03	-0.79	$170,877.72	741
39	no	-0.28	-0.68	-0.26	-0.79	$150,182.57	462
40	no	0.04	-0.92	-0.18	-0.93	$125,569.69	4,341
41	no	-0.04	-0.76	-0.04	-0.67	$64,541.73	3,515
42	yes	0.84	0.99	0.86	0.92	$10,693,182.48	302,351
43	yes	0.84	0.99	0.89	0.92	$5,121,192.65	134,696
44	no	0.2	-0.76	0.03	-0.77	$37,331.26	194

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