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## **Supervisory Ratings as a Measure of Training Transfer: Testing the Predictive Validity of the Learning Transfer System Inventory**

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SUPERVISORY RATINGS AS A MEASURE OF TRAINING TRANSFER: TESTING THE  
PREDICTIVE VALIDITY OF THE LEARNING TRANSFER SYSTEM INVENTORY

A Dissertation

Submitted to the Graduate Faculty of the  
Louisiana State University and  
Agricultural and Mechanical College  
in partial fulfillment of the  
requirements for the degree of  
Doctor of Philosophy

in

The School of Human Resource Education and  
Workforce Development

by

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December 2015

*To my papoulakis and mamoulitsa*

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## **ABSTRACT**

The primary purpose of this dissertation was to examine the criterion-related validity of all 16 LTSI General and Specific Scales in relation to training transfer. Using an ex-post facto design the researcher analyzed secondary data that included measures of key transfer system variables, as captured by the LTSI scales, and individual training transfer as indicated by supervisory ratings. The dataset comprised of employees from diverse organizations who had participated in different types of organizational instructor-led classroom training programs.

Confirmatory factor analyses supported the construct validity of the LTSI General and Specific Scales (N = 619). Hierarchical multiple regression analysis measured the unique impact of four sets of variables (i.e., secondary influences, motivation factors, ability/enabling factors, and work environment factors) on training transfer as measured by the difference score between supervisory pre- and post-training ratings indicating the frequency in which trainees utilized the behaviors on-the-job taught in training (N = 202). Results suggested that as a group the LTSI factors explained 10.3 percent of variance in training transfer. Performance outcome expectations emerged as the only significant predictor.

Supplemental analyses controlling for the impact of supervisory pre-training rating scores and using supervisory post-training ratings as the dependent variable identified four significant predictors all stemming from the LTSI General Scales: two factors reflect training-motivation constructs (i.e., performance outcome expectation and transfer effort performance expectations), and the other two reflect work environment factors (i.e., performance coaching and openness to change). LTSI factors explained 10.3% of explained variance in training transfer.

Overall, the results supported the notion that the transfer system as a complex of factors is important in explaining training transfer. However, the modest variance in training transfer

explained by the LTSI factors in this study should be interpreted in light of the study's limitations. Avenues for future research are discussed.

## CHAPTER 1: INTRODUCTION

Training in itself has no intrinsic value. It is not an inherently good or bad thing. Its value lies in the extent to which trainees are able to acquire, apply (transfer) and retain enhanced or new knowledge, skills and attitudes in the workplace. (Griffin, 2012, p. 393)

Organizations constantly seek ways to improve their performance, with investments in employee development and training having a central role in these efforts (Jacobs & Washington, 2003). Training and development interventions have been linked with improved individual, team, and organizational performance, as well as with improvements at the societal level through the development of a more skilled labor force which in turn leads to economic growth (Aguinis & Kraiger, 2009). The prevalence of training is reflected in the magnitude of organizations' training expenditures with organizations in the United States alone spending a total of \$164.2 billion on employee training in 2012 (American Society of Training and Development [ASTD], 2013). Training interventions range from on-the-job training, instructor-led training to online and mobile training, with traditional instructor-led classroom training still being the most prevalent form of employee training accounting on average for 54% of available formal training hours (ASTD, 2013).

However, despite all the money spent, organizations are still unsure about the true yield of their investments in training in regards to the extent that employees perform differently as a result of training (Blume, Ford, Baldwin, & Huang, 2010). In other words, do employees transfer and apply what they learn on the job? And if training is applied on the job, does employee performance change as a result of this? The inability to fully answer these questions can be encapsulated in what has been commonly referred to as the *transfer problem*. The magnitude of the transfer problem is reflected in the estimation that only 10 to 30% of learning is transferring into job performance, leading to a waste of significant resources since investments on training do not translate into improved performance (Broad, 2005; Baldwin & Ford, 1988; Holton &

Baldwin, 2003). More recently, in a survey of 150 organizations, training professionals reported that less than 50 per cent of employees successfully transfer their new knowledge and skills 6 months after training (Saks & Belcourt, 2006).

The limited number of organizations that actually evaluate the effectiveness of their training programs further intensifies the transfer problem. Paradoxically, organizations invest a lot of resources in training, yet they do not place equal importance in evaluating the impact of training on job performance. Evaluation efforts are usually narrowed to trainee reactions and learning and do not focus on assessing the extent to which newly acquired knowledge, skills and attitudes transfer into improved job performance and/or return-on-investment from training (Arthur, Winston, Edens, & Bell, 2003; ASTD, 2009). If organizations utilize training as a way to improve job performance, then transfer is a must (Broad, 2003; Burke & Hutchins, 2008; Naquin & Holton, 2003); and yet, organizations often neglect to ensure that transfer takes place, which is a key part of training effectiveness (Aguinis & Kraiger, 2009; Burrow & Berardinelli, 2003; Mühlemeyer & Clarke, 1997). Limited evaluation efforts can be attributed to many reasons including, lack of time and resources, lack of skilled in-house training professionals, complexity of evaluation approaches and tools (Griffin, 2012), and application of inadequate evaluation methodologies (Holton, 1996, 2005; Wang & Wilcox, 2006).

The increasing concern regarding training transfer has been echoed in the research field of Human Resource Development (HRD) where transfer of training research “is widely recognized as an important arena for research and practice” (Baldwin, Ford, & Blume, 2009, p. 42). One of the most influential pieces of work in the field comes from Baldwin and Ford (1988) who defined positive transfer as the “degree to which trainees effectively apply the knowledge, skills, and attitudes gained in a training context to the job” (p. 63) and concur that for transfer to

have occurred it is necessary to generalize the trained skills to the job context and maintain those skills over a period of time. Baldwin and Ford's (1988) theoretical model of training transfer consisted of: **(a)** training-input factors, **(b)** training outcomes, and **(c)** conditions of transfer, and as a result transfer of training is traditionally seen as a function of trainee characteristics, training design and work environment.

## **Background of the Study**

### **Measuring Transfer Climate**

Baldwin and Ford (1988) identified that research on the work environment factors influencing transfer of training had been limited and that further research was needed in order to operationalize key variables such as climate, supervisory support and opportunity to perform. Indeed, over the last twenty-five years, work environment variables have received increasing attention and researchers and practitioners alike recognize the vital role of organizations in creating a climate that is conducive to training transfer (Broad, 2005; Burke & Hutchins, 2007; Grossman & Salas, 2011). In the transfer literature, work environment factors are often discussed in terms of *transfer climate*. Transfer climate refers to the trainees' perceptions of characteristics in the work environment that either facilitate or inhibit the use of what they have learned in training back to the job (Rouiller & Goldstein, 1993).

The research focus on transfer climate inevitably led to the use of different measures or scales aiming to capture and measure the key work environment variables impacting the transfer of training in organizations, but also revealed the lack of adequate validation standards of the employed measures (Ford & Weissbein, 1997; Holton, Bates, & Ruona et al., 2000). Researchers in the field have advocated for the use of validated instruments to assess the training transfer system in order to help advance the HRD field from a theoretical and practical perspective (Holton et al., 2000; Bates et al., 2007; Tracey & Tews, 2005).

The LTSI, which is the focus of this study, was developed in an attempt to combat the instrumentation problem in transfer research and advance the use of sound measures in assessing transfer system factors (Holton et al., 2000). The LTSI is a self-report, two-part instrument, which measures a system of 16 factors that impact learning transfer in the workplace, and extends beyond the work environment variables to include aspects of trainee characteristics (e.g., performance self-efficacy) and training design (e.g., transfer design). Its most current version consists of 48 items (Bates, Holton, & Hatala, 2012).

### **LTSI Validation Research**

The use of valid instruments is imperative in any type of research, particularly in organizational research, which often relies on the use of self-report measures like surveys and questionnaires (Hinkin, 2005). The lack of sound measures can potentially result in misspecification of models, misinterpretation of findings, and increased measurement error (Holton et al., 2000). Instrument validation is mainly concerned with establishing a construct valid instrument, which essentially “refers to how well a measure actually measures the construct it is intended to measure” (Netemeyer, Bearden, & Sharma, 2003, p. 11). The comprehensive study of construct validity requires corroborating evidence from different sources of validity including content, convergent and discriminant, and predictive validity stemming from diverse samples and studies. Each of these sources of validity not only contributes to the refinement of the instrument, but through the examination of different measures also yields information about the theoretical and empirical relationships between different constructs.

The LTSI is based in extant transfer research (Holton, 1996; Noe, 1986; Rouiller & Goldstein, 1993) and has undoubtedly undergone extensive validation research since its development over 15 years ago, with numerous studies focusing on the improvement of the instrument by testing its validity and reliability across settings (e.g., Bates, Holton, Seyler, &

Carvalho, 2000; Holton, Bates, Bookter, & Yamkovenko, 2007; Hutchins, Nimon, Bates, & Holton, 2013; Ruona, Leimbach, Holton, & Bates, 2002; Yamnill & McLean, 2005). Exploratory (Holton et al., 2000) and confirmatory (Bates et al., 2012) factor analytic techniques have provided support for the 16-factor structure of the instrument and Holton et al. (2007) provided initial evidence supporting the convergent and divergent validity of the LTSI. The results of these studies support the instrument's construct validity.

Up to date the LTSI has been translated into 17 languages (Bates et al., 2012) and construct validation studies across linguistic contexts including Germany (Bates, Kauffeld, & Holton, 2007), Belgium (Devos, Dumay, Bonami, Bates, & Holton, 2007), Portugal (Velada, Caetano, Bates, & Holton, 2009), and Taiwan (Chen, Holton, & Bates, 2005) have generally provided support for the LTSI 16-factor structure. Finally, individual LTSI scales have been extensively incorporated in various HRD studies examining the impact of different variables in the transfer process, providing evidence of predictive validity (e.g., Frash, Antun, Kline, & Almanza, 2010; Velada, Caetano, Michel, Lyons, & Kavanagh, 2007).

### **Predictive Validity of the LTSI**

An important aspect of any type of instrument validation process includes the ability of an instrument to predict a related external outcome (Carmines & Zeller, 1979).

The criterion-related validity studies that have been conducted up to date vary in terms of the number of LTSI scales they examine and the outcome measures they employ. For instance, some of these studies focused on the predictive validation of the LTSI general-training scales (e.g., Bates & Khasawneh, 2005; Hogan, 2005), whereas others only examined the LTSI training-specific scales (e.g., Fitzgerald, 2002). Employed outcome measures include individual-level outcomes like trainees' perceptions of training transfer (Devos et al., 2007), intent to transfer (Hutchins et al., 2013), motivation to transfer (Ruona et al., 2002), and organizational-level



outcomes like organizational innovation (Bates & Khasawneh, 2005), organizational learning (Weldy, 2007), and organizational performance (Bates et al., 2007). Overall, these studies provide some evidence of the predictive ability of the LTSI scales in relation to different transfer outcomes.

However, very few studies have examined the predictive validity of the full LTSI instrument in relation to training transfer. The LTSI measures a set of key elements “in the person, training, and organization that influence transfer of learning to job performance” (Holton, 2005, p. 44) and examining its predictive validity in relation to *all* 16 factors will enable researchers and practitioners to better analyze training transfer as it pertains to a system of influences, and potentially help determine which set of factors is most influential. Examining the predictive validity of the full LTSI not only aligns with the notion that training transfer is influenced by a system of factors (Baldwin & Ford, 1988), but also responds to calls in the literature for a more integrative transfer approach that encompasses all three training input factors (Colquitt, LePine, & Noe, 2000; Scaduto, Lindsay, & Chiaburu, 2008).

Specifically, only four studies have examined the criterion-related validity of the full LTSI instrument in relation to training transfer and/or individual performance as a result of training transfer (Bates et al., 2007; Devos et al., 2007; Hutchins et al., 2013; Scott, 2010) yielding incoherent findings and thus making it hard to assess the predictive ability of the full instrument. The study by Scott (2010) did not identify any significant results in assessing the relationship of the LTSI scales and training transfer, partly due to the small study sample (N = 40) and the restricted range of post-training performance ratings. The study by Hutchins et al. (2013) used a proxy transfer outcome measure (i.e., intent to transfer) and identified motivation to transfer as the only statistically significant predictor, something that could be partially

attributed to the conceptual overlap between motivation to transfer and intent to transfer. The two remaining studies by Bates et al. (2007) and Devos et al. (2007) identified six and seven statistically significant predictors respectively, with one study pointing to the importance of motivational elements (Devos et al., 2007) and the other pointing to the relevance of all three training input factors (i.e., trainee characteristics, training design, work environment).

Furthermore, three out of the four aforementioned studies assessed both predictor variables and transfer measures at the same time and relied on self-report data to measure the outcome variable (Bates et al., 2007; Devos et al., 2007; Hutchins et al., 2013). Transfer research in general has suffered from reporting inflated relationships due to common method variance, resulting from assessing both predictor variables and transfer measures using the same source at the same time (Blume et al., 2010). It is important therefore, to conduct future LTSI criterion-related research that does not solely rely on self-report data and assesses the predictor and outcomes variables at different time intervals.

In sum, the extant literature provides initial evidence of the ability of the LTSI scales to predict training transfer, but the scarce amount of studies testing the full instrument substantiates that this type of research is still in its infancy dictating for additional criterion-related validity research. Additional studies are required to further examine and establish the use of LTSI not only as a diagnostic tool of the training transfer system, but also as a predictive tool that can potentially relate “the nature of the learning transfer system in organizations...to individual performance” (Bates et al., 2007, p. 207). As organizations continue to become more complex, the need for training transfer to be linked to performance improvement will become even more imperative, making it essential for research to provide action-oriented strategies (Broad, 2005; Holton & Baldwin, 2003). Demonstrating the predictive validity of the full LTSI in relation to

training transfer, can help researchers determine which set of factors is more influential in explaining training transfer and enable practitioners to apply targeted interventions in order to enhance training transfer in the workplace and eventually improve job performance.

### **Purpose of the Study**

This study aims to advance the LTSI validation body of research by assessing the ability of the LTSI to predict individual training transfer. Since its development more than fifteen years ago, the LTSI has undergone extensive validation research, which has addressed most of the critical construct validity elements with the exception of the instrument's ability to predict or explain the variance in training transfer. Indeed, few studies have examined the relationship of all 16-factors and training transfer, particularly using outcome measures other than self-reports. This type of research will help determine the use of LTSI not only as a diagnostic tool of the training transfer system, but also as a predictive tool of critical transfer outcomes. The focus of this study hopes to address this deficiency by examining the extent to which the full LTSI instrument can predict training transfer, and unlike the majority of the existing studies in the field, it will measure the predictor and outcome variables at different times and it will *not* rely on self-report data to assess the outcome measure.

### **Research questions**

This study aims to answer the following research questions:

1. What is the relationship between the LTSI scales (General and Specific) and individual training transfer?
2. To what extent, do the LTSI scales explain variance in individual training transfer?

## Independent and dependent variables

In assessing the predictive validity of the LTSI, the scales (General and Specific) of the instrument served as the independent (predictor) variables. Consequently, a total of 16 independent variables were included. Eleven variables refer to specific training scales and include: perceived content validity; transfer design; personal capacity for transfer; opportunity to use; learner readiness; motivation to transfer; positive personal outcomes; negative personal outcomes; peer support; supervisor support, and supervisor sanctions. The remaining five variables refer to general training scales and include: transfer effort-performance expectations; performance-outcomes expectations; performance self-efficacy; resistance-openness to change; and performance coaching.

The dependent (criterion) variable was training transfer as assessed by supervisory ratings.

## Objectives

1. To describe the trainees' perceptions of the transfer system as indicated by the general and specific LTSI scale scores, and grouped by:
  - a. Secondary influences (i.e., trainee characteristics)
  - b. Motivation
  - c. Work environment
  - d. Ability
2. To confirm the factor structure of the LTSI.
3. To examine the relationship between the LTSI scales and training transfer.
4. To examine the extent to which the LTSI scales can explain differences in training transfer as indicated by supervisory ratings.

### **Contributions of the Study**

1. This study contributes to the training transfer literature by examining the relationship between key transfer system variables, as captured by the LTSI scales, and training transfer.
2. This study adds to the overall body of LTSI validation research by further establishing its role as a diagnostic tool of the learning transfer system.
3. This study contributes to the scarce criterion-related validity line of LTSI research by assessing if the LTSI can be used as a predictive measure of training transfer (Holton et al., 2007; 2000; Hutchins et al., 2013). Specifically,
  - a. This study uses an external criterion measure to examine the predictive validity of all 16 LTSI scales (Holton et al., 2007), advancing the extant LTSI predictive-validation line of research which has mainly focused on the examination of certain LTSI scales and/or the use of an internal scale (i.e. motivation to transfer) as a criterion measure.
  - b. This study employs a unique dataset, which includes a non self-report measure of training transfer as indicated by pre- and post-training supervisory ratings. Generally in transfer research, and more specifically in LTSI research, transfer outcomes are commonly measured using self-report data; therefore, using supervisory ratings to measure transfer outcomes, controls for response bias and alleviates common method variance concerns. In addition, having supervisory pre- and post-training ratings to assess individual training transfer is extremely rare. To the author's knowledge, no other LTSI validation study to date has employed this type of transfer measure.
4. This study responds to calls about minimizing the HRD research and practice gap (Hutchins & Burke, 2007) by building upon the extensive transfer and LTSI research and contributing to the solution of the transfer problem that is prominent in the professional realm of the HRD field. The potential practical significance of assessing whether employees' perceptions of the

transfer system can predict training transfer can be invaluable to HRD professionals who can use the LTSI in organizational settings to enhance training evaluation efforts and minimize the transfer problem.

## **CHAPTER 2: REVIEW OF LITERATURE**

This study examines the predictive validity of the LTSI instrument in relation to individual training transfer as assessed by supervisory ratings. The review of literature is divided into four main sections. Section one provides an overview of the training transfer research. Section two describes the development of the LTSI. Section three synthesizes the transfer literature focusing on the relationship between the LTSI factors and key transfer outcomes. Finally, section four reviews the extensive validation research of the LTSI and addresses the need for additional predictive validation research.

### **Overview of Training Transfer Research**

Training transfer (also referred to as transfer of training or learning transfer) has been a century-long debate spurred by Thorndike's (1906) stimulating claim that transfer rarely occurs (as cited in Barnett & Ceci, 2002). Since then researchers have embarked on a research quest to examine whether transfer occurs and to identify influential factors in the training transfer process. This section will therefore describe key transfer frameworks pointing to the multidimensionality of transfer, outline the main areas and advancements of transfer research, and present some of the main challenges involved in attempting to empirically test these frameworks. Identifying these challenges, particularly as they pertain to the valid measurement of transfer system factors, is of great importance to the continuous advancement of HRD practice and research.

### **Frameworks of Training Transfer**

Baldwin and Ford (1988) defined positive transfer as the "degree to which trainees effectively apply the knowledge, skills, and attitudes gained in a training context to the job" (p. 63) and concur that for transfer to have occurred it is necessary to generalize the trained skills to the job context and maintain those skills over a period of time. More recently, as researchers

have noted, dimensions of training transfer have been expanded beyond the notions of generalization and maintenance, to include the notion of adaptability, which highlights the importance of building adaptive expertise in order to effectively cope with novel situations in the workplace (Baldwin, Ford, & Blume, 2009; Ford & Weissbein, 1997).

As a result of Baldwin and Ford's (1988) influential review of the transfer literature, transfer of training is traditionally seen as a function of three factors: trainee characteristics, training design, and work environment. Specifically, Baldwin and Ford's (1988) theoretical model on the training transfer process consisted of: **(a)** training-input factors, **(b)** training outcomes, and **(c)** conditions of transfer. Explicitly,

- (a)** Training-input factors include training design, trainee characteristics and work environment characteristics
- (b)** Training outcomes refer to the amount of original learning acquired during training and the retention of that after the completion of training
- (c)** Conditions of transfer consist of two factors: (1) *generalization* of material learned in training to the job context and (2) *maintenance* of the learned material over a period of time on the job.

Since Baldwin and Ford's (1988) classical study in the field and their model on the transfer process, many other conceptual frameworks have been developed highlighting that the training transfer process is affected by a system of influences (Broad, 2005; Burke & Hutchins, 2008; Holton 1996; Holton & Baldwin, 2003; Noe & Colquitt, 2002; Machin, 2002; Thayer & Teachout, 1995). For example, Broad (2005) and Burke and Hutchins (2008) stress the important role of key stakeholders (trainers, trainees, supervisors) in enhancing transfer and suggest a temporal dimension into the framework by including the stages: before, during, and after



training. Thayer and Teachout's (1995) transfer training model illustrates that the crucial determinants of training transfer are, transfer climate and transfer enhancing strategies during training. Noe and Colquitt's model (2002) identifies that individual and work environment characteristics are critical factors before training (by affecting motivation), during training (by affecting learning), and after training (by influencing transfer and job performance).

Holton's (1996) HRD Evaluation and Measurement framework includes three primary outcomes of training: individual learning, individual performance, and organizational results. These outcomes are influenced by a combination of different factors. Specifically, individual learning is influenced by trainee's reaction to the training climate, trainee's motivation to learn, and prior experiences and ability. Individual performance is affected by the trainee's motivation to transfer, the design of the training program, and the transfer climate. Finally, for organizational results to occur Holton (1996) asserts that training must be linked to the strategic objectives of the organization, have utility or payoff to the organization, and be subject to influences of external environmental factors. A revised HRD Evaluation and Measurement framework (Holton, 2005) included some additional constructs including the Motivation To Improve Work Through Learning (MTIWL) construct, an integration of the motivation to learn and motivation to transfer constructs. Figure 1 shows the revised model.

Holton and Baldwin (2003) focused on a more intervention-oriented approach building on Baldwin and Ford's (1988) transfer process model, by: incorporating a temporal dimension into the framework, focusing on individual and team characteristics and learning outcomes, highlighting organization and learner or team interventions before, during and after training, and making a distinction between the notions of near (trainees apply learning to immediate tasks) and far transfer (trainees generalize learning to new or different tasks). When considering the notions

of near and far transfer, the conditions of transfer as mentioned in Baldwin and Ford's (1988) model can be rearticulated to encompass transfer beyond the job context. Specifically, (1) *generalization* can be redefined as the extent to which the knowledge and skill acquired in a learning setting are applied to different settings, people, and/or situations from those trained and (2) *maintenance* can be redefined as the extent to which changes that result from a learning experience persist over time (Blume et al., 2010, pp. 1067-68).

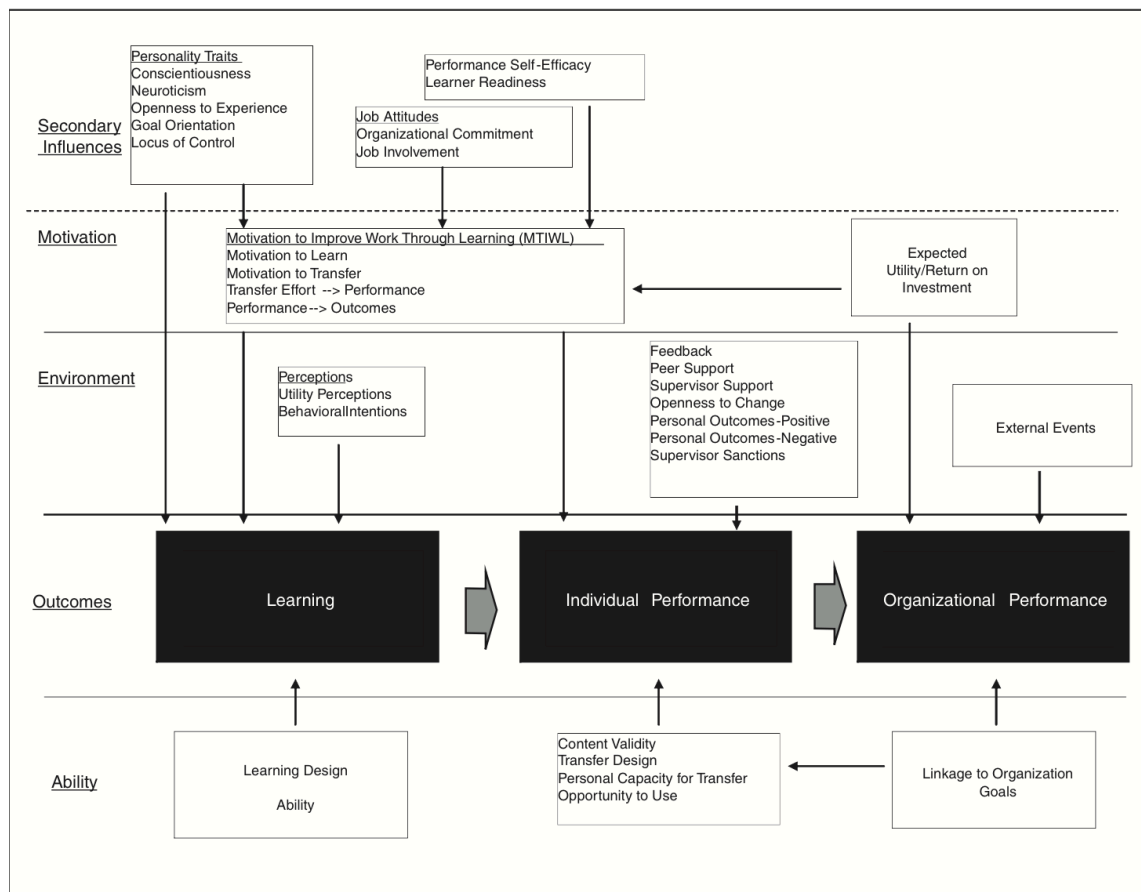


Figure 1. Holton's Revised HRD Evaluation and Research Model. Adapted from "Holton's Evaluation Model: New Evidence and Construct Elaborations," by E. F. Holton III, 2005, *Advances in Developing Human Resources*, 7, p. 51. Copyright 2005 by Sage Publications.

Barnett & Ceci (2002) proposed a taxonomy of far transfer in order to better understand if transfer occurs and if so under what conditions (Baldwin et al., 2009). Specifically, the taxonomy distinguishes transfer studies along the dimensions of content (what is transferred) and

context (where and when is it transferred). Training content focuses on the type of learned skills (e.g., open vs. closed skills), the nature of the performance change to be assessed (e.g., speed, accuracy), and the memory demands of the transfer task. Training context includes six dimensions: knowledge domain, physical context, temporal context, functional context, social context, and modality and considers where and when transfer occurs. For example, temporal context refers to the timing of transfer measurement with near transfer being identified as transfer being measured during the same session or a few days later and far transfer measurements taken weeks, months or even years later (Barnett & Ceci, 2002).

The different transfer frameworks have spurred a good deal of research in the field that attempts to capture the complexity and multidimensionality of training transfer as part of a wider system of influences including trainee characteristics, training design, and work environment. It is not surprising therefore, that training transfer research, especially after Baldwin and Ford's (1988) pivotal work, has expanded beyond the narrow focus of examining just "what happens" in the training environment to include the following research foci: (a) training design factors that influence transfer, (b) factors in the organizational environment that influence an individual's ability and opportunity to transfer, (c) individual differences that affect the nature of transfer, and (d) developing instruments to measure transfer and its antecedent factors in the workplace (Holton & Baldwin, 2003).

### **Transfer Research: Directions and Advancements**

Overall, training transfer research has advanced and progress has been made in regards to all the aforementioned research streams. Consequently, many key factors influencing transfer of training that extend beyond the training program itself haven been identified and examined (Baldwin & Ford, 1988; Baldwin & Holton, 2003). These factors point to the multidimensionality of transfer, and include: (a) training design elements like behavioral

modeling (Taylor, Russ-Eft, & Chan et al., 2005) and error management (Heimbeck, Frese, Sonnentag, & Keith, et al., 2003); (b) aspects of the work environment like supervisory and peer support (Bates et al., 2000; Cromwell & Kolb, 2004), situational cues and consequences (Rouiller & Goldstein, 1993), and opportunity to use (Cromwell & Kolb, 2004; Ford, Quiñones, Sego & Sorra, 1992); (c) individual characteristics like cognitive ability (Colquitt, LePine, & Noe, 2000), and self-efficacy (Chiaburu & Lindsay, 2008), motivation to learn (Colquitt et al., 2000; Noe, 1986), motivation to transfer (Burke & Hutchins, 2007; Gegenfurtner, Veermans, Festner, & Gruber, 2009), and organizational commitment (Fecteau, Dobbins, Russell, Ladd, & Kudisch, 1995; Kontoghiorghes, 2004); and (d) the development of instruments to measure the factors influencing training transfer (Holton et al., 2000; Tracey & Tews, 2005).

From a broader perspective, all these research endeavors collectively contribute to the understanding and improvement of training effectiveness. As Bates et al. (2007) note “training effectiveness research is concerned with understanding the causal factors underlying training outcomes: that is, why did the outcomes from training happen?” (p. 196) One of the most important outcomes of employee training is eventually improved job performance; however, an essential prerequisite of performance change as a result of training is that the skills learned in training are “fully and appropriately transferred to job-related activities” (Aguinis & Kraiger, 2009, p. 465) and retained over a period of time (Baldwin & Holton, 2003). As Bates et al. (2000) emphasize, “training will do little to increase performance...unless what is learned is transferred into on-the-job performance” (p. 19).

### **Measurement of Transfer System Factors**

Consequently, examining and measuring the system of factors influencing transfer has become increasingly important if we are to advance theory and practice in the HRD field.

Unfortunately, out of the aforementioned four streams of research the development of validated instruments is probably the most underutilized area of transfer research.

Using sound measures in assessing transfer system factors is important from a theoretical and practical standpoint. From a practical perspective, a comprehensive and validated instrument will allow practitioners to effectively diagnose potential work context inhibitors to the application of training and enable them to design appropriate interventions (Holton et al., 2000; Tracey & Tews, 2005). From a theoretical standpoint, using validated instruments will help us avoid potential pitfalls including model misspecification, misinterpretation of findings, and measurement error and essentially enable us to advance transfer research (Holton et al., 2000). Finally, using a comprehensive validated instrument to assess transfer system factors will make the generalization of findings across studies a more feasible and straightforward process. As training transfer research advances and attempts to examine multilevel relationships (e.g., the relationship between individual performance and organizational performance, the relationship between individual transfer and team transfer) and to generalize study findings and make inferences about *why* transfer happens the need for validated instruments becomes even more pressing (Holton et al., 2000). In short, the development of validated instruments is a critical need in the area of transfer research. Sound measures are necessary to empirically test different theoretical propositions relating to the training transfer process and essentially advance the field of HRD theory and practice.

### **The Development of the Learning Transfer System Inventory**

The LTSI is the only instrument existing today that is research-based, has undergone some elements of construct validation, and which measures a comprehensive set of factors influencing training transfer in the workplace. This section outlines the conditions that gave rise to the development of the LTSI, followed by a more detailed description of the instrument's

development and refinement process. The section concludes with an overview of the conceptual framework of the LTSI and a description of the 16 LTSI scales.

In the transfer literature, work environment factors are often discussed in terms of *transfer climate*. Transfer climate refers to the trainees' perceptions of characteristics in the work environment that either facilitate or inhibit the use of what they have learned in training back to the job (Rouiller & Goldstein, 1993). For example, Rouiller and Goldstein (1993) conceptualized transfer climate in terms of *situational cues* and *consequences*. Situational cues act as reminders for trainees or provide them with an opportunity to use what they have learned on the job and include goal, social, task, and self-control cues. Consequence cues can impact the further use of trained tasks and include positive, negative or no feedback.

Others (Tracey, Tannenbaum, & Kavanagh, 1995; Tracey & Tews, 2005) conceptualized transfer climate more broadly to allow for the examination of work environment perceptions in relation to training preparation and learning outcomes, as well as training transfer. These researchers saw training climate as a shared-level phenomenon and identified a three-factor model comprising of managerial support, job support, and organizational support. The work by these and other researchers suggest that the notion of transfer climate refers to a broad set of potentially important variables and that, in general, trainees who perceive to be part of a more positive transfer climate (i.e., work environment conducive to training transfer) are more likely to transfer the behaviors learned in training (Blume et al., 2010; Colquitt et al., 2000; Rouiller & Goldstein, 1993; Ruona et al., 2002; Tracey et al., 1995).

Holton and colleagues (Holton, Bates, Seyler, & Carvalho, 1997; Holton et al., 2000) moved beyond the term transfer climate to the notion of the *learning transfer system* by which they mean all factors “in the person, training, and organization that influence transfer of learning

to job performance” (Holton, 2005, p. 44). It is therefore, a broader construct than transfer climate; transfer climate represents only but a subset of the transfer system factors. The LTSI measures a comprehensive set of 16 constructs that are believed to represent the full system of factors that impact learning transfer in the workplace.

### **Measuring Transfer Climate**

Baldwin and Ford (1988) concluded that research on the work environment factors influencing transfer of training had been limited and that further research was needed in order to operationalize key variables including transfer climate, supervisory support and opportunity to perform. Ford and Weissbein (1997) in their updated review and analysis of the transfer literature, identified that since Baldwin and Ford’s (1988) review a total of eight empirical studies were conducted measuring work environment factors influencing transfer and noted that “much effort had been devoted to a greater understanding and measurement of the work environment in which the trainee was supposed to transfer his/her new knowledge and skills” (p. 33).

Further examination of these studies revealed discrepancies in the measurements and scales used, as well as in the validation and scale development processes employed (Bookter, 1999; Holton et al., 2000). Specifically, in seven out of the eight studies, researchers developed new and customized scales for their study making it difficult to generalize results or allow cross-study comparisons (Bookter, 1999; Holton et al., 2000). In addition, only three studies attempted some type of construct or content validation procedures of their measures (e.g., Rouiller & Goldstein, 1993) indicating the “need for more valid measurement instruments in order that researchers may ensure that outcomes derived from studies are as accurate as possible” (Bookter, 1999, p. 27).

Rouiller and Goldstein (1993) in their seminal study on the effect of work environment on training transfer examined the impact of organizational transfer climate on trainees' transfer behaviors learned in a training program. Transfer climate was defined as the trainees' perceptions of characteristics in the work environment that either facilitate or inhibit the use of what they have learned in training back to the job (Rouiller & Goldstein, 1993). The researchers hypothesized that trainees were more likely to transfer their learned behaviors and perform better in the organizational units with more positive transfer climates.

In order to measure transfer climate the researchers developed a transfer climate survey that included two sets of workplace cues: a set of situational cues and a set of consequences to performance of trained tasks. Situational cues acted as reminders for trainees or provided them with an opportunity to use what they have learned on the job and include goal, social, task, and self-control cues. Consequence cues could impact the further use of trained tasks and included positive, negative or no feedback.

Tracey et al. (1995) used the transfer climate survey developed by Rouiller and Goldstein (1993), excluding the self-control scale, in order to examine the impact of transfer climate and continuous-learning culture on learning and training transfer using a sample of supermarket managers. Results indicated that transfer of training climate and continuous learning culture were directly related to post-training behaviors, with social support system factors being of increasing importance to the transfer process (1995). Tracey et al. (1995) conducted a factor analysis of Rouiller and Goldstein's constructs but were unable to validate their hypothesized structure.

### **LTSI Background: Initial Development and Refinement**

At about the same time as Tracey et al. (1995) and in an effort to validate the transfer constructs suggested in Rouiller and Goldstein's (1993) transfer climate survey, Holton and



colleagues conducted a study in the petrochemical industry, with 189 trainees undergoing mandatory training (Holton et al., 1997). The researchers modified the original instrument used by Rouiller and Goldstein (1993) in order to fit the organization in the study, resulting in a sixty-six-item instrument. Specifically, 14 items were deleted and a total of 17 items were added (seven items reflected the “opportunity to perform” construct that was identified by Baldwin and Ford, and ten of them were added to strengthen certain existing scales). Exploratory factor analysis of the expanded instrument resulted in a nine-factor solution that was not consistent with that proposed by Rouiller and Goldstein’s. This led Holton et al. to suggest that employees perceive transfer climate according to organizational cues (e.g., supervisor, peer) and not psychological and self-control cues.

Building on this research, Holton and his associates (2000) developed an expanded version of the earlier instrument. Specifically, additional items and transfer constructs based on the HRD Research and Evaluation Model (Holton, 1996, 2005), were added which resulted in a 112-item instrument that assessed 16 constructs in two distinct domains (general training scales and training specific scales). The general training scales include five constructs that are believed to influence any training program because they include general efficacy beliefs, expectations regarding the outcomes of training transfer and improved job performance, as well as prevailing group norms and feedback mechanisms that can shape employees’ perceptions about training in the organization. These five constructs are: performance self-efficacy, transfer effort-performance expectations, performance-outcomes expectations, openness to change, and performance coaching. The specific-training scales include 11 constructs “representing factors affecting the training program attended” (Holton, 2003, p. 64) and are assumed to vary depending on the training program attended. For instance, a software training program might be

perceived as having high content validity compared to a diversity training program that might not be perceived as relevant to the individual's job requirements. Specifically, the 11 constructs are: learner readiness, perceived content validity, transfer design, personal capacity for transfer, opportunity to use, motivation to transfer, positive personal outcomes, negative personal outcomes, peer support, supervisor support, and supervisor opposition (Holton et al., 2000).

The intent was to move beyond the concept of transfer climate and to develop an instrument that could take a more comprehensive assessment of key factors affecting training transfer. This led the authors to adopt the term *transfer system*, a broader term compared to transfer climate, in an attempt to include all the individual, training, and organizational factors that influence training transfer to job performance and provide a common ground in assessing and measuring factors affecting training transfer across training programs and organizations.

To test this second generation instrument (LTSI version 2) it was administered to a heterogeneous sample of 1,616 trainees representing a variety of organizational settings and training programs. Exploratory factor analysis led to an interpretable sixteen-factor structure with reliable scales and reduced the total of items to 68. A second-order factor analysis was also conducted to determine the most appropriate set of items to retain for each factor (Holton et al., 2000). The analyses resulted in a 68-item instrument measuring 16 factors (LTSI version 3). These 16 factors represent two distinct domains: 11 of the factors refer to a particular training program and five of them refer to general factors since they are expected to affect all training programs. The definitions of these factors grouped according to the training-specific and training-general scales are presented in Table 1.

Table 1: Learning Transfer System Inventory Factors and Scale Definitions.

LTSI Factor	Definition
<i>Specific factors</i>	
Perceived content validity	The extent to which trainees judge training content to reflect job requirements accurately
Transfer design	The degree to which (1) training has been designed and delivered to give trainees the ability to transfer learning to the job
Personal capacity for transfer	The extent to which individuals have the time, energy, and mental space in their work lives to make changes required to transfer learning on the job
Opportunity to use	The extent to which trainees are provided with or obtain resources and tasks on the job enabling them to use training on the job
Learner Readiness	The extent to which individuals are prepared to enter and participate in training
Motivation to transfer	The direction, intensity, and persistence of effort toward utilizing in a work setting skills and knowledge learned
Positive personal outcomes	The degree to which applying training on the job leads to outcomes that are positive for the individual
Negative personal outcomes	The extent to which individuals believe that not applying skills and knowledge learned in training will lead to outcomes that are negative
Peer support	The extent to which peers reinforce and support use of learning on the job
Supervisor support	The extent to which supervisors-managers support and reinforce use of training on the job
Supervisor opposition	The extent to which individuals perceive negative responses from supervisors-managers when applying skills learned in training
<i>General factors</i>	
Openness to change	The extent to which prevailing group norms are perceived by individuals to resist or discourage the use of skills and knowledge acquired in training
Transfer effort – performance expectations	The expectation that effort devoted to transferring learning will lead to changes in job performance
Performance-outcomes expectations	The expectation that changes in job performance will lead to valued outcomes
Performance self-efficacy	An individual's general belief that he is able to change his performance when he wants to

(Table 1 continued)

LTSI Factor	Definition
Performance coaching	Formal and informal indicators from an organization about an individual's job performance

Note. Adapted from "Development of a Generalized Learning Transfer System Inventory," by E. F. Holton, R. A. Bates, and W. E. Ruona, 2000, *Human Resource Development Quarterly*, 11, pp. 344-46. Copyright 2000 by Jossey-Bass.

## **The LTSI Framework, Factors and Research**

### **Conceptual Framework of the LTSI**

The conceptual framework of the LTSI (see Figure 2) is grounded in the extant transfer literature. Specifically, the framework builds on Holton's HRD evaluation research and measurement model (Holton, 1996, 2005), which is based on Noe's (1986) notion that an individual's behavior in training is a function of ability, motivation, and work environment factors. According to the HRD evaluation research and measurement model the primary individual outcomes of HRD interventions are learning and individual performance, which are impacted by a set of primary and secondary influences. Primary influences are in accordance with Noe's (1986) framework and include ability, motivation and work environment factors, whilst secondary influences (e.g., personality characteristics, job attitudes) include elements that affect learning and individual performance primarily through their effect on motivation.

As depicted in the conceptual framework individual performance is directly and indirectly impacted by the sixteen constructs of the LTSI, which are organized around four main categories: (1) secondary influences (e.g., performance self-efficacy), (2) motivation factors (e.g., motivation to transfer), (3) work environment factors (e.g., peer support), and (4) ability factors (e.g., opportunity to use).

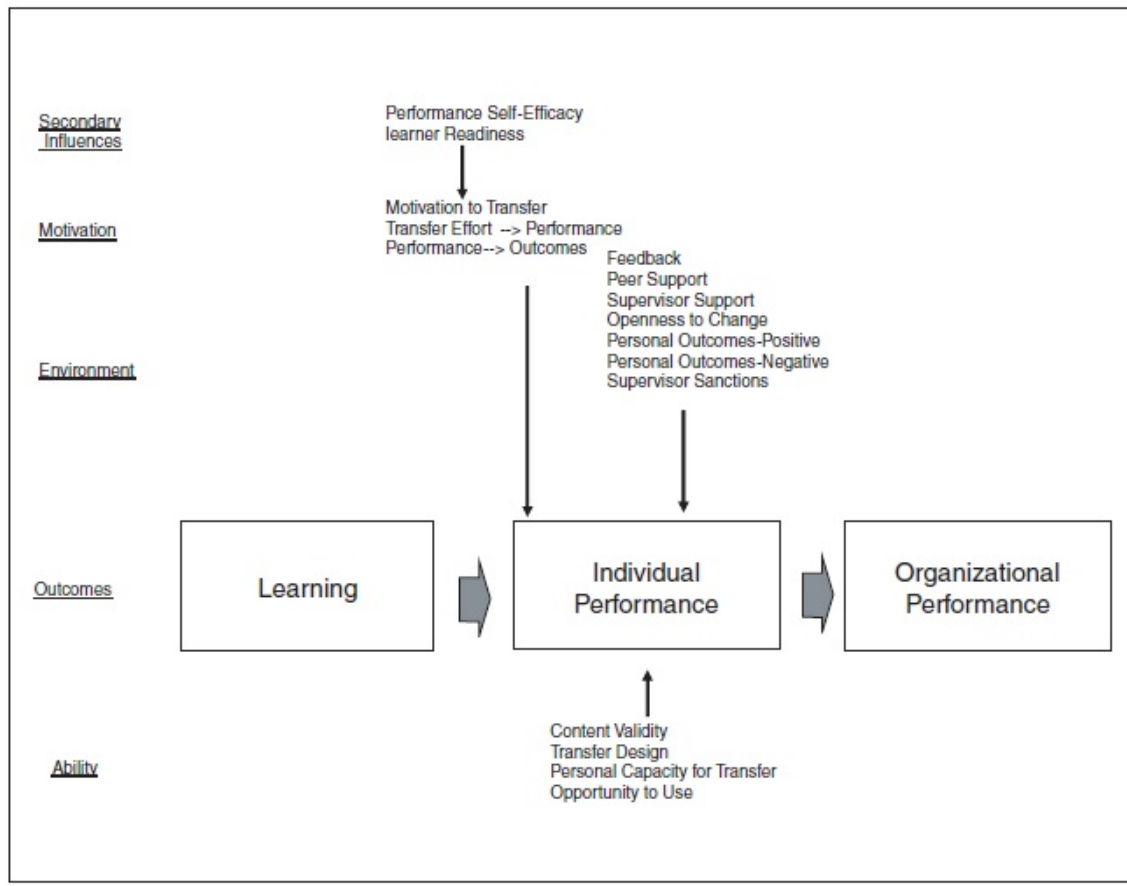


Figure 2. Learning Transfer System Inventory (LTSI) Conceptual Map of Constructs. Adapted from “Holton’s Evaluation Model: New Evidence and Construct Elaborations,” by E. F. Holton III, 2005, *Advances in Developing Human Resources*, 7, p. 48. Copyright 2005 by Sage Publications.

The 16 factors depicted in the conceptual framework of the LTSI provide a diagnostic assessment of the *transfer system*, which extend beyond work environment factors that influence the application of learned skills to the workplace, to also include individual characteristics and motivation and ability factors. The purpose of the LTSI is to assess the transfer system, which is defined as “all factors in the person, training, and organization that influence transfer of learning to job performance” because “transfer can only be completely understood and predicted by examining the entire system of influences” (Holton et al., 2000, pp. 335-36). Specifically, the LTSI is a self-report, two-part instrument, which measures 16 factors likely to facilitate or inhibit

training transfer in the workplace: 11 factors relate to a specific training program, and five factors refer to training in general and can influence any training program in the organization.

In conclusion, the development of the Learning Transfer System (LTSI) addresses the lack of validated scales in the transfer literature and advances transfer research by not only examining and measuring a system of factors that affect transfer in the workplace, but also by adhering to rigorous on-going validation processes that facilitate the investigation of these various transfer variables across different organizational settings and populations.

### **Research Examining LTSI Constructs**

The primary purpose of this section is to expound upon the relationship between the LTSI transfer system variables and key transfer outcomes by reviewing studies across different organizational settings and populations. The review of the relevant HRD literature will be structured according to the groupings of the 16 factors as they appear in the conceptual framework of the LTSI. Specifically, these factors are grouped into: secondary influences, motivation factors, ability factors, and work environment factors (Holton et al., 2000).

#### Secondary Influences

Based on the conceptual model of the LTSI secondary influences are individual characteristics that impact training transfer through their effect on motivation to transfer. The LTSI assesses two such factors, performance self-efficacy and learner readiness (Holton, 2005). For both factors, the assumption is that higher levels of these factors will be associated with increased motivation to transfer training.

#### Performance self-efficacy

The term self-efficacy was first coined by Albert Bandura and is defined as a person's perception of his/her ability to reach a goal. Specifically, efficacy is the "belief in one's capabilities to organize and execute the courses of action required to produce given attainments"

(Bandura, 1997, p. 3). In relation to training transfer, performance self-efficacy reflects an individual's general belief that he/she is able to change his/her performance when desired (Holton et al., 2000) and can be described in terms of the extent to which a trainee "feels confident and self-assured about applying new abilities in their jobs, and can overcome obstacles that hinder the use of new knowledge and skills" (Bates & Holton, 2004, p. 158). As part of the LTSI, performance self-efficacy is identified as a training-general construct.

Overall, research findings support the key role of self-efficacy in the transfer process (Blume et al., 2010; Burke & Hutchins, 2007) and suggest that trainees with higher levels of self-efficacy are more likely to transfer what they have learned on the job (Devos et al., 2007). Recent qualitative (Burke & Hutchins, 2007; Grossman & Salas, 2011; Salas, Tannenbaum, Kraiger, & Smith-Jentsch, 2012) and quantitative (Blume et al., 2010; Colquitt et al., 2000) reviews of the transfer literature consistently support the impact of self-efficacy on transfer. Blume et al. (2010) in their meta-analysis found that pre-training self-efficacy had a moderate relationship with transfer after controlling for same source / same method context bias ( $r = .22$ ,  $p < .05$ ). Similarly, Ford and colleagues in their empirical study examining the impact of differential opportunities to perform training on the job, concluded that trainees with higher levels of self-efficacy tended to not only perform a larger amount of trained tasks on the job, but also to undertake more complex and difficult types of tasks (Ford et al., 1992). Finally, studies employing the LTSI scale of performance self-efficacy also identified significant and positive relationships between self-efficacy and perceived training transfer (Devos et al., 2007; Velada et al., 2007).

Some studies suggest that the relationship between self-efficacy and transfer is mediated by motivation. Bhatti and Kaur (2010) in discussing their conceptual framework of training

transfer posited that transfer motivation mediates the relationship between performance self-efficacy and transfer, and advocated for additional empirical testing. Certain studies have indicated that self-efficacy and transfer is mediated by pre-training motivation (Chiaburu & Marinova, 2005), motivation to learn (Chiaburu & Lindsay, 2008), and motivation to transfer (Gegenfurtner et al., 2009). Studies employing the LTSI scale of performance self-efficacy also identified significant relationships between self-efficacy and motivation to transfer (Baharim, 2008; Ruona et al., 2002) suggesting that performance self-efficacy could be a significant predictor of motivation to transfer. In other words, trainees with higher levels of self-efficacy will likely be more motivated to apply what they have learned on the job.

#### Learner Readiness

Learner readiness refers to the extent to which individuals are prepared to enter and participate in training (Holton et al., 2000). Researchers have also examined conceptually similar constructs to learner readiness. For instance, Fecteau et al. (1995) identified that training attitudes, including training reputation, intrinsic incentives, and compliance impact pre-training motivation, which in turn influences self-reported transfer. The constructs of training reputation and compliance are mostly related to learner readiness; training reputation refers to the expectations that individuals have about the quality of the course and its job relevance, and compliance refers to the status of training as being mandatory versus voluntary. Specifically, training reputation and intrinsic incentives were positively related to pre-training motivation, whilst compliance was negatively correlated, indicating that trainees had higher levels of motivation when training was voluntary (Fecteau et al., 1995).

Furthermore, Baldwin and Magjuka (1991) examined the relationship between employees' pre-training signals and intent to transfer. Results revealed that trainees reported



higher intent to transfer learning when they had received course information prior to the training program, recognized that they would be accountable for their learning to their supervisor, and perceived the program as mandatory. Similarly, Smith-Jentsch et al. (1996) suggested that pre-training experiences influence transfer through their impact on motivation to learn, pointing to the importance of creating a perceived need for training in the minds of participants. Bell and Ford (2007) further highlighted the importance of pre-training experiences and their impact on motivation to learn, by identifying that trainees who perceived skills assessments as being more fair and useful, had higher levels of motivation to learn.

The LTSI operationalizes the learner readiness construct in terms of the degree to which an employee had the opportunity to provide input prior to the training (e.g., through the needs assessment process), was informed about what to expect during the training, and was aware of how the particular training was relevant to his/her job performance (Bates & Holton, 2004). It is therefore, a training-specific construct. In studies employing the LTSI scale of learner readiness, the construct was found to significantly and positively correlate with trainees' perceptions of training transfer (Devos et al., 2007) and it also emerged as a significant predictor of self-reported transfer (Bates et al., 2007; Bhatti, Battour, Sundram, & Othman, 2013).

### Motivation Factors

Motivation has a central role “in the relationship between training antecedents and outcomes” (Chiaburu & Lindsay, 2008, p. 201). Motivation to learn has been identified as a significant predictor of learning (Colquitt et al., 2000; Mathieu, Tannenbaum, & Salas, 1992), and literature also suggests that pre-training motivation to learn is an antecedent of post-training motivation to transfer (Gegenfurtner et al. 2009; Kontoghiorghes, 2002). In relation to transfer, some studies have indicated that individuals who reported higher levels of motivation to attend

and learn from training also had higher levels of perceived transfer (Chiaburu & Marinova, 2005; Fecteau et al., 1995).

The LTSI identifies and assesses three motivational elements that are based on Noe's model (1986) and Vroom's expectancy theory (1964). These include motivation to transfer, transfer effort – performance expectations, and performance-outcomes expectations (Holton et al., 2000). The following section discusses these constructs and the research supporting them.

#### Motivation to Transfer

As an LTSI construct, *motivation to transfer* is a training-specific construct and is defined as “the direction, intensity, and persistence of effort toward utilizing in a work setting skills and knowledge learned” (Holton, et al., 2000, p.344). It is operationalized as the extent to which a trainee “feels better able to perform, plans to use new skills and knowledge, and believes new skills will help him or her to more effectively perform on the job” (Bates & Holton, 2004, p. 158). Research examining this factor has shown it to be a significant predictor of trainees' perceptions of training transfer (Axtell, Maitlis, & Yearta, 1997; Bates et al., 2007; Chiaburu & Lindsay, 2008) and intent to transfer (Hutchins et al., 2013). In a study examining the impact of key variables on individual training transfer at different time intervals, motivation to transfer emerged as a significant predictor of self-rated transfer one month and one year after the completion of training (Axtell et al., 1997). Additionally, certain studies employing the LTSI motivation to transfer scale indicated that motivation to transfer was significantly and positively correlated to trainees' perceptions of transfer (Devos et al., 2007; Fitzgerald, 2002; Yamkovenko & Holton, 2010). The results of a more recent study highlighted the importance of motivation to transfer as a linking mechanism between transfer design and perceived content validity (LTSI

scales) and training transfer as indicated by self- and peer-ratings (Grohmann, Beller, & Kauffeld, 2014).

In sum, the extant literature suggests that motivation to transfer is an instrumental factor in the training transfer process bearing the potential of being an important predictor of individual training transfer.

#### Transfer Effort – Performance Expectations & Performance – Outcomes Expectations

The LTSI assesses two motivation constructs, Transfer Effort – Performance Expectations and Performance-Outcome Expectations that are grounded in Vroom's (1964) expectancy theory. Vroom's model explains motivation in terms of Valence – Instrumentality – Expectancy (VIE). In basic terms, Vroom's model explains the cognitive process of individuals who perceive that: (1) effort will lead to performance (Expectancy), (2) performance will be rewarded (Instrumentality), and (3) the reward will be highly valued (Valence). Vroom's model has been widely cited and empirical studies have examined the relationship of the model with various work-related outcome variables including job performance, effort, preference, and choice (Van Eerde & Thierry, 1996) lending support to its applicability in work settings. Vroom's model is often illustrated in terms of:

$$\text{Motivation} = \text{Expectancy} \times \text{Instrumentality} \times \text{Valence}$$

Researchers in the HRD field have examined the applicability of the VIE approach in relation to training transfer (e.g., Holton et al., 2000; Mathieu et al., 1992; Noe, 1986). As Kontoghiorghes (2004) noted:

Expectancy theory, as applied to training transfer, suggests that employees will be motivated to attend HRD programs and try to learn from them if they believe: (a) their efforts will result in learning the new skills or information presented in the program; (b) attending the program and learning new skills will increase their job performance; and (c) doing so will help them obtain desired out-comes or prevent unwanted outcomes (DeSimone, et al., 2002). (p. 211)

Holton et al. (2000), as part of their LTSI work, defined *transfer effort-performance expectations* as “the expectation that effort devoted to transferring learning will lead to changes in job performance” (p. 345), which is further expanded to include “whether an individual believes that investing effort to utilize new skills has made a difference in the past or will affect future productivity and effectiveness” (Bates & Holton, 2004, p.158). Furthermore, *performance-outcomes expectations*, is defined as “the expectation that changes in job performance will lead to outcomes valued by the individual” (Holton et al., 2000, p. 345) in terms of individual improved performance leading to recognition and reward by the organization. Both constructs reflect the training-general domain of the LTSI.

Results of relevant empirical inquiries lend some initial support to the notion that individuals who expect that effort devoted to training transfer will lead to improved performance, and subsequently valued outcomes, are more likely to transfer newly acquired skills on the job (e.g., Devos et al., 2007). For instance, Mathieu et al. (1992) in a study of 106 university employees participating in a proofreading skills training program, measured training motivation within an instrumentality framework, and concluded that training motivation significantly related to learning (when considering participant’s reactions to training) and subsequent post-training performance on a training related task. Scaduto et al. (2008) in a study based on self-reported data collected from 495 employees who attended professional development training courses, found that outcome expectancy was highly and positively related to transfer ( $r = .58, p < .01$ ), maintenance ( $r = .53, p < .01$ ), and generalization ( $r = .53, p < .01$ ) (Scaduto et al., 2008). Finally, Chiaburu and Lindsay (2008) in a study based on self-reported data collected from 254

employees used structural equation modeling techniques to identify training instrumentality as a significant predictor of motivation to transfer and training transfer.

Empirical studies using the LTSI have identified statistically significant relationships between the constructs of transfer effort-performance expectations and performance-outcomes expectations, and training outcomes (e.g., Bates et al., 2007; Devos et al., 2007). In a study by Ruona et al. (2002) transfer effort- performance expectations and performance-outcome expectations emerged as significant predictors of motivation to transfer, with transfer effort-performance expectations being the strongest predictor out of all the LTSI factors ( $\beta = .254$ ,  $t = 10.01$ ,  $p < .01$ ). Furthermore, in a study examining the relationship of the LTSI with perceived training transfer, transfer effort- performance expectations and performance-outcomes expectations both emerged as statistically significant ( $r = .26$ ,  $p < .01$  and  $r = .23$ ,  $p < .05$  respectively), alongside five additional LTSI factors (Devos et al., 2007). Based on the statistical significance of these two expectancy related constructs, the authors concluded that their study was “the first to explicitly support the relevance of Vroom’s model with regard to transfer” (Devos et al., 2007, p. 195). Finally, LTSI studies focusing on organizational outcomes have supported the positive link between performance-outcome expectations and individual perceptions of organizational performance (Bates et al., 2007), and organizational innovation (Bates & Khasawneh, 2005).

In sum, transfer literature provides some initial support to the notion that individuals who expect that effort devoted to training transfer will lead to improved performance and subsequently valued outcomes, are more likely to transfer newly acquired skills on the job.

#### Ability/Enabling Factors

The LTSI identifies four elements as ability/enabling factors. These factors assess trainees’ ability to use learning on the job in addition to the training characteristics that enable

trainees to transfer the learning. Specifically, two of these factors, content validity and transfer design, are seen as enabling transfer through effective course design. The other two factors, personal capacity for transfer and opportunity to use training, are seen as influencing the probability of transfer through the provision of time, space, and opportunities to apply new learning.

### Content Validity

*Content validity* is defined as “the extent to which individuals judge training content to reflect job requirements accurately” (Holton et al., 2000, p. 345) and it reflects the training-specific domain of the LTSI. From a temporal perspective, trainees form perceptions about content validity during training (Bates et al., 2000, p. 28) based on the degree to which knowledge and skills taught are relevant to job or work performance demands, as well as the degree of similarity between the instructional methods and equipment used in training and the actual work environment of the trainee (Bates & Holton, 2004). Burke and Hutchins (2007), and more recently Grossman and Salas (2011), have identified in their reviews of the transfer literature the importance of similarity between the training environment and the actual workplace of the trainee. Specifically, the researchers concluded that implementing training in an environment that is highly similar to the workplace increases the likelihood that trainees will apply the newly learned skills and competencies (Burke & Hutchins, 2007; Grossman & Salas, 2011).

Studies specifically employing the LTSI to identify the most influential factors in relation to training transfer have provided support for the importance of content validity in the transfer process (e.g., Bates et al., 2000; Yamnill & McLean, 2005). In a study in the petrochemical industry supervisors assessed the transfer performance of 73 trainees participating in a

mandatory computer-based training program. The trainees' perceptions of content validity emerged as a significant predictor of transfer performance (Bates et al., 2000). Similarly, the results of a study involving 569 employees from different private organizations in Germany supported the importance of content validity as a significant predictor of trainees' perceptions of training transfer (Bates et al., 2007). In a more recent study, Grohmann et al. (2014) found direct links between perceived content validity and motivation to transfer, as well as training transfer. However, select LTSI studies failed to identify content validity as a significant predictor of motivation to transfer (Seyler et al., 1998), and intent to transfer (Hutchins et al., 2013).

Studies exploring conceptually comparable constructs to content validity have yielded similar results. For instance, Lim & Morris (2006), in a single-group, time-series-based repeated-measures study involving 81 employees of a Korean corporation, examined the influence of multiple variables (e.g., instructional elements) on perceived learning and training transfer at three different time intervals. Relevant results indicated that job helpfulness of learning content was significantly correlated with the perception of employees that the learning content will be useful for their job ( $r_s = .338$ ,  $p < .10$ ; two tailed). In addition, the multiple regression results revealed that trainees' immediate training needs (need to use the training content within 6 months of training) was the most influential variable that affected their perceived learning and transfer, 3 months after the completion of training. Overall, "the trainees experienced a certain degree of need to transfer learning to their jobs and tasks if training content and job functions were related" (Lim & Morris, 2006, p. 105). Furthermore, in a study involving technical staff from a multinational organization who participated in interpersonal skills training ( $N = 45$ ), Axtell et al. (1997) examined the impact of key variables on transfer performance at different time intervals. Trainees' perceptions of the relevance and usefulness of the course and

motivation to transfer emerged as significant predictors of self-rated transfer on month after the completion of training. Finally, in a qualitative study exploring training transfer influence factors among student workers employed at different dining service units in a US university campus, study participants identified content relevance as one of the most helpful training design characteristics in promoting application of newly learning skills in the workplace (Rodriguez & Gregory, 2005).

All the aforementioned studies highlight the importance of establishing valid training content in order to enhance the application of newly acquired knowledge and skills on the job. Developing valid training content is intertwined with the needs assessment process; ideally, the knowledge and skills covered in training should stem from the results of the needs assessment process, which identifies the specific knowledge, skills, and abilities that employees need to acquire in order to perform their jobs more effectively (Bates et al., 2000).

### Transfer Design

Pertaining to the LTSI, the *transfer design* construct captures the trainees' perceptions of training design elements that facilitate the transfer of trained skills, and as such it is a training-specific scale. Specifically, transfer design is defined as “the extent to which training has been designed to give trainees the ability to transfer learning to job application and the training instructions match the job requirements” (Holton et al., 2000, p. 345). Elements of the training design that can enhance transfer include the use of clear examples, the inclusion of training activities and exercises that clearly demonstrate how the newly taught knowledge and skills should be applied, and the use of methods that are similar to the work environment (Bates & Holton, 2004).



As early as 1962, Gagné was advocating for the importance of incorporating appropriate learning principles in maximizing training effectiveness, suggesting the use of task analysis in identifying what needs to be practiced in training and what not, and in what sequence. More than fifty years later, in their meta-analysis of 397 empirical studies, Arthur and colleagues (Arthur et al., 2003) showed that training effectiveness in organizations varied according to the training method, the trained skill/task and the choice of evaluation criteria. These meta-analytic results further emphasize the importance of selecting effective training methods according to the type of trained skills (e.g., cognitive, psychomotor).

Transfer research has examined the role of various instructional strategies in the transfer process including: self-management strategies (e.g., Frayne & Geringer, 2000), active learning (e.g., Keith, Richter, & Naumann, 2010), error management (e.g., Heimbeck et al., 2003; Keith & Frese, 2008), distributed practice (e.g., Donovan & Radosevich, 1999), and behavioral modeling (Taylor et al., 2005). In addition, studies employing LTSI scales in examining training related outcomes lend credibility to the importance of transfer design in the transfer process (e.g., Devos et al., 2007; Velada et al., 2007). For instance, Devos et al. (2007) conducted a correlational analysis to examine the relationship between all of the LTSI factors and perceived training transfer. The results based on 106 trainees employed in different organizations in Belgium, identified transfer design as one of the seven statistically significant LTSI variables ( $r = .39, p < .001$ ; Devos et al., 2007). Velada et al. (2007) conducted a study assessing the impact of five key variables on perceived training transfer. Hierarchical regression results, based on data from 182 employees of a Portuguese grocery market company who attended distinct training programs, identified transfer design as a significant predictor of transfer ( $\beta = .14, p < .05$ ; Velada et al., 2007). More recently, in a field study of hotel training involving the use of a new software

system, select LTSI scales were used to measure the participants' perceptions of various transfer impact factors and assess their relationship with training transfer (Frash et al., 2010). Transfer was measured 2 months after training via a role-play activity; a lower total transfer score indicated better transfer performance (e.g., score indicates fewer errors in applying the newly learned skills, less time to complete the role-play activity). Multiple regression results, based on data from 66 participants, identified transfer design as the most significant predictor of training transfer ( $B = -4.24$ ,  $p \leq .01$ ; Frash et al., 2010).

As indicated, it is important for organizations to “design their training programs to include such factors that increase the likelihood of transfer” (Velada et al., 2007, p. 284). The aforementioned studies provided some evidence that support the importance of transfer design in the transfer process, and highlight the need to clearly link learning with on-the-job performance in order to enhance the application of newly acquired knowledge and skills after the completion of training (Holton et al., 2000).

#### Personal Capacity for Transfer

Personal capacity for transfer is defined as “the extent to which individuals have the time, energy and mental space in their work lives to make changes required to transfer learning to the job” (Holton et al., 2000, p. 344). Elements affecting personal capacity for transfer include an individual's workload, schedule, personal energy, and stress-level (Bates & Holton, 2004; Russell, 2002). Personal capacity for transfer is a training-specific scale.

Empirical studies employing the LTSI scale of personal capacity for transfer have identified the construct as a significant predictor of individual transfer (Bates et al., 2007; Frash et al., 2010). Specifically, in a study examining the construct validity of the German version of the LTSI, personal capacity for transfer, alongside seven other variables, emerged as significant

predictors of self-reported individual transfer (Bates et al., 2007). Furthermore, in a field-study in the hospitality sector, select LTSI scales were used to assess the impact of trainees' perceptions of the transfer system on actual transfer. Transfer was measured via a role-play activity, whereas lower Transfer-of-Training T-Scores indicated higher levels of transfer. Personal capacity for transfer emerged as a significant predictor of transfer ( $B = -3.40, p \leq .10$ ; Frash et al., 2010). In relation to motivation to transfer, Kirwan and Birchall (2006) examined the impact of select LTSI scales on motivation to transfer and personal capacity for transfer, using a sample of 72 nurse managers employed in the Irish health sector. The researchers identified a strong positive correlation between the two constructs ( $r = .53, p < .01$ ) and ran separate regression equations to further examine the direction of this relationship. The regression equations included the individual factors of performance self-efficacy, learner readiness, personal capacity for transfer, and motivation to transfer. When motivation to transfer acted as the dependent variable the remaining three factors emerged as significant predictors, with personal capacity for transfer exerting the strongest influence ( $\beta = .32, p = .00$ , Kirwan & Birchall, 2006). These results hint to the possibility of personal capacity for transfer to impact transfer indirectly through its influence on motivation to transfer.

Looking at studies that have focused on comparable constructs, Awoniyi and colleagues employed a person-fit environment framework to examine the impact of select variables (including workload pressure) on perceived training transfer (Awoniyi, Griego, & Morgan, 2002). Results from 293 surveys suggested that low workload pressure positively associated with transfer, even though the correlation was weak ( $r = .13, p < .05$ ; Awoniyi et al., 2002). Lack of time has also been found to inhibit the transfer of trained knowledge and skills. For instance, in a longitudinal study measuring perceived training transfer at three different time intervals (1

month, 6 months, 12 months after the completion of training), Cromwell and Kolb (2004) identified lack of time as a barrier to transfer according to the short-answer survey responses of the 63 university employees who participated in the study. Furthermore, in a qualitative study (N=14) set at a UK human service organization, *all* participants identified lack of time and workload pressures as “two major workplace constraints...impeding use of training” (Clarke, 2002, p. 153). Similarly, in a qualitative study (N=18) exploring the factors affecting the transfer of soft skills in a Canadian health services organization, study participants identified time as one of the key factors influencing training utilization (Gilpin-Jackson & Bushe, 2007).

In sum, the literature on the role of personal capacity for transfer is limited and inconclusive. Some studies imply a direct relationship between personal capacity for transfer and training transfer (e.g., Bates et al., 2007), yet most of these studies based their results on small samples (e.g., Clarke, 2002; Gilpin-Jackson & Bushe, 2007) or reported weak relationships (e.g., Awoniyi et al., 2002). Other studies hint towards motivation to transfer as a linking mechanism between personal capacity for transfer and transfer (e.g., Kirwan & Birchall, 2006; Nair, 2007). Thus, future research can help to determine how personal capacity for transfer interacts with other key variables in the transfer process, predominantly motivation to transfer and transfer performance. Nevertheless, while remaining cognizant of the scarce research findings, we expect personal capacity for transfer to play an important role in the transfer process.

#### Opportunity to Use Learning

As part of the LTSI *opportunity to use* is a training-specific construct defined as “the extent to which trainees are provided with or obtain resources and tasks on the job enabling them to use the skills taught in training” (Holton et al., 1997, p. 110). Resources can include the materials, equipment, information or supplies needed to use the newly acquired skills, in addition

to adequate financial and human resources (Bates & Holton, 2004). Qualitative reviews of the transfer literature consistently identify opportunity to use as an important catalyst in the training transfer process (e.g., Burke & Hutchins, 2007; Grossman & Salas, 2011).

One of the first empirical studies to examine the role of opportunity to perform trained skills in the transfer process was conducted by Ford et al. (1992). The researchers examined the opportunities air force trainees obtained to use the technical skills learned in training 4 months after the completion of the program by analyzing 180 matched survey responses from trainees and their supervisors. Opportunity to perform was conceptualized from a multidimensional perspective and examined in terms of: breadth (i.e., number of trained tasks actually performed), activity level (i.e., number of times trainee performs the task), and types of tasks performed (i.e., task complexity and difficulty) (Ford et al., 1992). Results indicated that even though all trainees completed the same training program, not all trainees obtained the same opportunities to perform the learned tasks (Ford et al., 1992) and that opportunity to perform mediated the relationship between work context and training transfer (Ford et al., 1992).

Studies employing the LTSI scale of opportunity to use have yielded supportive evidence. For instance, in a study conducted by Seyler et al. (1998) opportunity to use was identified as having strongest influence on motivation to transfer out of all the environmental factors examined in the study (supervisor support, supervisor opposition, and peer support). Specifically opportunity to use had the strongest correlation with motivation to transfer ( $r = .580$ ,  $p \leq .001$ ) and also emerged as the most significant predictor of motivation to transfer ( $\beta = .379$ ,  $p \leq .001$ ) (Seyler et al., 1998). Additionally, when using the whole instrument to examine the relationship between the LTSI and perceived training transfer, Devos et al. (2007) found a significant correlation between opportunity to use and training transfer ( $r = .25$ ,  $p \leq .01$ ).

However, in certain studies opportunity to use failed to emerge as a significant predictor of transfer (Bates et al., 2007) and motivation to transfer (Ruona et al., 2002). Finally, in a study conducted by Bates et al. (2000) opportunity to use did not emerge as a significant predictor of performance ratings, but its importance was inferred through its strong relationship with content validity, which in turn predicted performance.

Overall, research provides supportive evidence of the importance of opportunity to use learned skills in enhancing the application of those skills on the job (Burke & Hutchins, 2007).

#### Work Environment Factors

Since Baldwin and Ford's (1988) call for studies examining work environment factors that impact the transfer of training "much effort had been devoted to a greater understanding and measurement of the work environment in which the trainee was supposed to transfer his/her new knowledge and skills" (Ford & Weissbein, 1997, p. 33). Indeed, over the last twenty-five years, work environment variables have received increasing attention because researchers and practitioners alike recognize the vital role of a workplace environment that is conducive to training transfer (Broad, 2005; Burke & Hutchins, 2007; Grossman & Salas, 2011).

The LTSI includes seven constructs that specifically refer to work environment factors. These include performance coaching, supervisor support, supervisor opposition, peer support, openness to change, personal outcomes-positive, and personal outcomes-negative (Holton et al., 2000). Out of these seven factors, openness to change and performance coaching reflect the training-general construct domain since prevailing group norms and formal and informal indicators about an individual's job performance can shape overall perceptions about training in an organization. The remaining work environment factors reflect specific-training scales.

## Social Support

As a subset of work environment variables social support factors, has been of increasing interest to researchers in the transfer field. Noe (1986) discussed the importance of social support for transfer as one of the two components of environmental favorability (i.e., work setting environment) that directly impact motivation to learn, motivation to transfer, and transfer. Empirical studies in the transfer literature have examined and identified different sources of social support that potentially impact training transfer, including supervisor support (Baldwin & Ford, 1988; Fecteau et al., 1995; Nijman, Nijhof, Wognum, & Veldkamp, 2006), peer support (Bates et al., 2000; Fecteau et al., 1995; Holton et al., 2007; Seyler et al., 1998), supervisor opposition (Bates et al., 2000), top management support (Fecteau et al., 1995), and subordinate support (Fecteau et al., 1995). In a recent meta-analysis, Blume et al. (2010) reported moderate relationships between social support factors (i.e., supervisor and peer support) and transfer. Overall, supervisor and peer support have received the most attention, and “each variable has been found to contribute a unique influence on training transfer across several studies” (Burke & Hutchins, 2007, p. 281).

### Social Support Measured by the LTSI

The LTSI encompasses five social support factors: supervisor support, peer support, supervisor opposition, performance coaching, and openness to change. The following sections addresses each of these work environment elements.

*Supervisor support* refers to the extent to which supervisors/managers support and reinforce the use of learning on-the-job (Holton et al., 1997). The LTSI operationalizes this construct with reference to supervisory/managerial efforts directed at providing trainees with opportunities to apply new skills and knowledge, working with trainees to set realistic transfer

goals, and providing feedback to support the application of newly learned skills (Holton et al., 1997). Research studies have yielded mixed results regarding the role of supervisory support in the transfer process. Most studies provide support to the intuitive notion that supervisory support is positively associated with transfer (e.g., Bates et al., 2000; Blume et al., 2010; Cromwell & Kolb, 2004; Fitzgerald, 2002; Seyler et al., 1998), whilst other studies have found a non-significant relationship between supervisory support and transfer (e.g., Bates et al., 2007; Chiaburu & Marinova, 2005; Homklin, Takahashi, & Techakanont, 2014; van der Klink, Gielen, & Nauta, 2001). Finally, some studies have yielded counterintuitive results showing a negative association between supervisor support and transfer (e.g., Fecteau et al., 1995; Nijman et al., 2006). A recent quantitative review of the transfer research identified a moderate relationship between supervisor support and transfer after controlling for same source / same method context bias ( $r = .31, p < .05$ ; Blume et al., 2010); however, the reported correlation was based on a small number of studies.

Studies examining the relationship between supervisor support and motivation have also yielded mixed results (e.g., Chiaburu & Marinova, 2005; Fecteau et al., 1995). For instance, Fecteau et al. (1995) identified a significant positive impact of supervisory support on pre-training motivation, whilst Chiaburu and Marinova (2005) concluded that supervisor support did not significantly impact pre-training motivation. Studies using the supervisor support measure in the LTSI have also yielded perplexing results. Seyler et al. (1998) identified a significant correlation between supervisor support and motivation to transfer ( $r = .397, p \leq .001$  one-tailed), yet supervisor support failed to emerge as a significant predictor of motivation to transfer, whereas in the Ruona et al. (2002) study supervisor support emerged as a significant predictor of motivation to transfer, alongside nine other LTSI factors. Some have suggested the mixed



results with regard to supervisor support could be moderated by other factors. For example, supervisor support scale might be a critical leverage point in a government agency (where a culture of hierarchical management is well established) but not as critical in a team-based organization because supervisors have less influence in a team-based culture (where change resistance or peer support would likely be far more critical) (Bates, 2003).

Despite the mixed results of the aforementioned empirical inquiries, qualitative reviews in the field consistently identify supervisor support as an important factor in the transfer process that researchers should continue to empirically examine (Burke & Hutchins, 2007; Grossman & Salas, 2011), and practitioners should take into account when implementing HRD interventions (Salas et al., 2012). The current study hopes to add to this body of research and further clarify the role of supervisor support.

*Peer support* refers to the extent to which peers reinforce and support use of learning on-the-job (Holton et al., 1997). Examples of peer support include demonstrating appreciation for the use of new skills, displaying patience with difficulties associated with applying new skills, and encouraging the use of or expect the application of new skills (Holton et al., 1997). In general, peer support studies have provided evidence that peer support positively impacts motivation to transfer as well as training transfer (Bates et al., 2000, 2007; Cromwell & Kolb, 2004; Fecteau et al., 1995; Myers, 2009; Ruona et al., 2002; Seyler et al., 1998). For example, Martin (2010) concluded that trainees who were part of a supportive peer group exhibited higher levels of transfer performance compared to trainees who experienced low levels of peer support. Furthermore, peer support was found to mitigate a negative workplace climate; trainees with low peer support in an unfavorable climate had lower levels of transfer performance compared to trainees with high peer support in an unfavorable climate (Martin, 2010). Homklin and

colleagues (Homklin et al., 2014) found that coworker support, in a Thai setting, had a significant positive relationship with trainees' perceptions of transfer, as well as a moderating positive effect on the relationship between learning and transfer.

*Supervisor opposition* is defined as the extent to which individuals perceive negative responses from managers when applying skills learned in training (Holton et al., 2000). This kind of opposition is often seen in negative or discouraging responses from supervisors/managers when trainees attempt to apply skills learned in training (e.g., "Do it my way or the highway"), criticism of the skills learned in training, and the absence of assistance in providing or finding opportunities to apply the newly acquired skills, or the use of techniques different from those taught in training (Holton et al., 1997; 2000). In other words, supervisor opposition encapsulates the resistance of supervisors/managers to the effective application of newly acquired skills and can be viewed as the negative side of supervisor support (Russ-Eft, 2002). In a typology of elements affecting workplace learning and transfer, Russ-Eft (2002) identified supervisor opposition as a situational element potentially inhibiting the transfer of newly acquired skills through "supervisors' indifference to trainees' use of trained skills, negative feedback or no feedback, and active opposition to the use of skills" (p.49).

Empirical studies employing LTSI scales have yielded support to the importance of supervisor opposition in the transfer process (e.g., Seyler et al., 1998). Supervisor opposition, in a study involving employees in the petrochemical industry, was significantly and negatively correlated with motivation to transfer and also emerged as a significant predictor of motivation to transfer (Seyler et al., 1998). A study by Bates and his colleagues (2000) found supervisor opposition to be negatively correlated with motivation to transfer, in addition to being a significant predictor of transfer performance. However, the positive association with transfer

performance was puzzling and authors attributed this outcome to measurement error and/or specific work culture dynamics that enabled trainees to perform procedures correctly despite their supervisors' opposition (Bates et al., 2000).

*Performance coaching* is a training-general construct that refers to the formal and informal indicators and feedback from an organization about an individual's job performance (Holton et al., 2000). It is described as "the extent to which an individual receives constructive input, assistance, and feedback from people in his or her work environment (peers, employees, colleagues, managers, and so on) when applying new abilities or attempting to improve work performance" (Bates & Holton, 2004, p. 158). As a training-general construct it reflects an individual's broad experience in the organization of receiving coaching for performance improvement.

Performance coaching can have multiple sources. Importance of feedback mechanisms from peers and supervisors in the transfer process was examined as a feature of positive transfer climate in a study conducted by Rouiller and Goldstein (1993). Results identified that trainees who were part of a more positive transfer climate were more likely to transfer the behaviors learned in training (Rouiller & Goldstein, 1993). In addition, results of a quasi-experimental study examining the impact of self-coaching and upward feedback (i.e., feedback from subordinates) as post-training on-the-job supplements aiming to enhance trainees' performance regarding the interpersonal skills learned in training, identified that receiving either supplement had a favorable impact on post-training performance of trainees compared to the classroom training alone condition (control group) (Tews & Tracey, 2008). In terms of training transfer, the results of this study are important since they capture the favorable impact of subordinates'

feedback on post-training performance, whilst most studies focus on supervisory or peer feedback.

Studies employing the LTSI scale of performance coaching provide some supporting evidence about its positive impact on training transfer. For example, in a Portuguese setting, Velada et al. (2007) used a post-test design methodology to examine the relationship between some key transfer system factors including performance coaching and perceived training transfer three months after the completion of training (N = 182). Correlational analysis results identified a strong positive relationship between performance coaching and training transfer ( $r = .50$ ,  $p \leq .0001$ ), whilst hierarchical regression analysis further validated the importance of post-training feedback, because performance coaching emerged as a significant predictor of transfer alongside transfer design, performance self-efficacy, and training retention ( $\beta = .42$ ,  $p \leq .0001$ ; Velada et al., 2007). Furthermore, a study examining the relationship between organizational learning culture, learning transfer climate, and trainees' perceptions of organizational innovation concluded that the learning transfer climate as measured by the LTSI general scales were a significant predictor of innovation, suggesting the importance of formal and informal indicators from an organization about an individual's job performance (Bates & Khasawneh, 2005).

*Openness to change* (or resistance to change) is a training-general construct defined as “the extent to which prevailing group norms are perceived by individuals to resist or discourage the use of skills and knowledge acquired in training” (Holton et al., 2000, p. 346). Empirical studies have identified the importance of perceived openness to change in the transfer process. For instance, perceived openness to change emerged as significant predictor of motivation to transfer (Ruona et al. (2002). Bates et al. (2000) identified openness to change as a significant

predictor of transfer performance and concluded, “that group-level resistance to change may in some instances be a crucial factor in learning transfer” (p. 33).

In their in-depth case analysis of a leadership development program in a Canadian setting, Gilpin-Jackson and Bushe (2007) conducted post-training interviews with 21 of the managers who had participated in the training. Analysis of the interviews revealed that one of the most significant barriers to applying the newly acquired skills was related to the existing norms of the employees. When managers perceived that employees in their workplace would be more open and encouraging to the application of the new skills, then they were more willing to try using these skills (Gilpin-Jackson & Bushe, 2007).

At the individual level, openness to experience is a conceptually similar construct to resistance/openness to change. Burke and Hutchins (2007) in their review of the transfer literature state that openness to experience has a moderate relationship with transfer; however, they cautioned that additional research is needed to clarify and strengthen these findings. Herold and his associates (Herold, Davis, Fedor, & Parsons, 2002) in a study focusing on a two-phase aviation training program examined three out of the Big Five personality factors in relation to training success, including Openness to Experience. Results suggested that Openness to Experience was positively related to learning, and training success, in the second phase of the training program (Herold et al., 2002).

At the organizational level, openness to change is embedded within the notion of a continuous learning culture. Learning organizations must be open to change and encourage a “workplace culture that fosters learning and action for performance improvement” (Weldy, 2009, p. 60). Studies have provided initial support to the proposition that a continuous learning culture is positively associated with individual perceptions of the transfer system (Bates & Holton, 2004;

Tracey et al., 1995; Weldy, 2007). Researchers have advocated for additional empirical research in this area and some have suggested employing instruments like the LTSI in order to further examine the overlap between the learning organization and training transfer (e.g., Kim & Callahan, 2013; Weldy, 2009). Openness to change has also being linked to organizational innovation (Bates & Khasawneh, 2005) and organizational performance (Bates et al., 2007).

In sum, the extant literature prompts to the importance of social support factors in the transfer process, with empirical studies providing evidence of the importance of peer support supervisor support, supervisor opposition, performance coaching, and openness to change.

#### Reward Systems and Training Transfer

One of the most overlooked elements of a supportive work environment for training transfer has been the presence/absence of reward systems that encourage the application of new learning. The LTSI attempted to capture this element through the definition and operationalization of two reward constructs: positive and negative personal outcomes. Both constructs reflect the training-specific domain of the LTSI. *Positive personal outcomes* are defined as “the degree to which applying training on the job leads to outcomes that are positive for the individual” (Holon et al., 1997, p.110) and can refer to a range of positive outcomes including, salary increases, career development opportunities, additional respect, increased productivity and work effectiveness (Holton et al., 1997), higher performance evaluations (Facteau et al., 1995), and verbal praise (Xiao, 1996).

Empirical studies examining the criterion-related validity of the LTSI identified positive personal outcomes as a significant predictor of training outcomes (Bates et al., 2007; Ruona et al., 2002). Specifically, positive personal outcomes emerged as a significant predictor of perceived training transfer in a study conducted in the German private sector (Bates et al., 2007),

and as a significant predictor of motivation to transfer in a US study employing a diverse group of trainees (Ruona et al., 2002). Fecteau et al. (1995) identified intrinsic incentives, like growth opportunities, as a positive personal outcome that influenced pre-training motivation. Similarly, Clarke (2002) in a qualitative study conducted in a UK human services organization, identified that the low degree of perceived positive personal outcomes was one of the main factors inhibiting the transfer of newly acquired skills on the job. Holton et al. (2000) suggested there is likely a correlation between positive personal outcomes and supervisor support since “support serves as a reward to employees by signaling to them that their learning applications efforts are viewed positively” (p.355).

*Negative personal outcomes* refer to “the extent to which individuals believe that if they do not apply new skills and knowledge learned in training that it will lead to outcomes that are negative” (Holton et al., 1997, p.111). These negative outcomes can include being overlooked for raises or promotions, being reprimanded when not using newly learned skills, being reassigned to undesirable jobs, or experience resentment from peers (Holton et al., 1997, 2000). Outside of a study by Ruona et al. (2002), that identified perceived negative personal outcomes as a significant predictor of motivation to transfer there is limited research examining the impact of perceived negative personal outcomes on transfer.

### **Summary of LTSI Transfer Research**

This section examined the 16 factors assessed by the LTSI and the research addressing and supporting those factors. From the empirical studies examined, it is apparent that the LTSI factors (and conceptually similar constructs) are important in the training transfer process and they directly or indirectly impact training transfer. It is also evident that certain transfer system factors have been more thoroughly examined (e.g., self-efficacy, supervisory support) compared

to others (e.g., personal capacity for transfer). In addition, evidence suggests the central role of motivation to transfer in the transfer process. However, the review of the transfer system factors also reaffirmed the complexity and multidimensionality of training transfer and the need for additional research to clarify the interrelationships and mediating mechanisms that impact the application of knowledge, skills, and attitudes taught in training to the workplace.

Finally, the review of the relevant literature also identified the extensive use of the LTSI scales in various studies, which is an encouraging sign not only for the study of transfer system factors in general, but also for the construct validity of the instrument. The review of the literature also points to the fact that LTSI factors are most often studied in isolation and not as a comprehensive set of 16 factors, highlighting the paucity of research examining the relationship between the entire system of influences and transfer.

### **Construct Validity: The LTSI Status**

The ultimate goal of the instrument development process is to establish a construct valid instrument (Netemeyer et al., 2003). This section will argue that despite evidence for the construct validity of the LTSI one area that needs to be further addressed is predictive validity. In doing so this section will, (1) convey the importance of instrument validation and outline the key elements of construct validity, (2) summarize how research on the LTSI fulfills these elements, and (3) address the need for additional predictive validation research with the LTSI.

### **Importance of Instrument Validation**

Research in the social and organizational sciences often involves the examination of highly abstract and unobserved concepts (Carmines & Zeller, 1979) like transfer climate, organizational commitment, and job satisfaction. These theoretical concepts are referred to as *constructs*. A construct (sometimes referred to as a latent construct) is defined as a “postulated



attribute of people, assumed to be reflected in test performance” (Cronbach & Meehl, 1955, p. 283) or as “an unobservable theoretical variable which is constructed to describe a phenomenon...operationalized by a surrogate set of measures, called indicators or manifest variables” (Brahma, 2009, pp. 60-61). Consequently, particularly from a quantitative research methodology standpoint, examining the relationships between constructs dictates the need for empirical measurement of these constructs (e.g., via multiple items or indicators), which usually requires the development and administration of an instrument (e.g., self-report questionnaire).

Measurement has been defined as the “systematic assignment of numbers on variables to represent characteristics of persons, objects, or events” (Vandenberg & Lance, 2000, p. 4). Measurement in the social sciences often deals with the examination of latent constructs and “focuses on the crucial relationship between the empirically grounded indicator(s) - that is, the observable response – and the underlying unobservable concept(s)” (Carmines & Zeller, 1979, p. 10). The examination of this crucial relationship makes it imperative to establish a set of criteria that will allow researchers to determine the quality of empirical measurements and subsequently empirical results (Carmines & Zeller, 1979). However, even though valid and reliable instruments are a prerequisite of credible organizational research, the psychometric properties of the employed measures are often problematic or understudied (Brahma, 2009; Hinkin, 1995, 2005). This becomes particularly disturbing when one considers that instruments in the form of questionnaires are one of the most prevalent data collection methods used to study organizational phenomena (Hinkin, 1995, 2005). Using quality measures to conduct field research is intertwined with producing quality research findings and drawing valid conclusions about the topic of interest, otherwise we run the risk of perpetuating unfounded and misleading theoretical and empirical arguments (Carmines & Zeller, 1979; MacKenzie, Podsakoff, & Podsakoff, 2011).

## Construct Validity

The ultimate goal of the instrument development (and refinement) process is to establish a construct valid instrument (Netemeyer et al., 2003). Construct validity “refers to how well a measure actually measures the construct it is intended to measure” (Netemeyer et al., 2003, p. 11) and it should “be viewed broadly as referring to the degree to which inferences legitimately can be made from measures used in a study to the theoretical constructs on which those operationalizations are based” (Netemeyer et al., 2003, p. 71). Establishing a measure as construct valid envelops a set of steps and procedures, contributing evidence from different types of validity (Netemeyer et al., 2003), and “ideally...a pattern of consistent findings involving different researchers using different theoretical structures across a number of different studies” (Carmines & Zeller, 1979, p. 24). The process of establishing a construct valid instrument can also be facilitated by advanced statistical techniques including exploratory factor analysis, confirmatory factor analysis, and structural equation modeling. These statistical techniques enable researchers to gain additional insight of the scales under development (e.g., relationship of indicators to constructs, loading of items) and provide corroborating evidence of different types of validity like convergent and discriminant validity (Netemeyer et al., 2003).

The main sources of construct validity include content validity, convergent and discriminant validity, criterion-related validity, and nomological validity. The following sections will examine the research addressing the construct validity of the LTSI and argue that most of the critical construct validity elements have been addressed in the research with the exception of the instrument’s ability to predict or explain the variance in training transfer.

## **LTSI: Evidence of Construct Validity**

As already noted the LTSI has undergone extensive validation research since its development over fifteen years ago. This section will summarize how research on the LTSI fulfills these key elements of construct validity.

### Content Validity

Briefly defined, *content validity* is established at the initial stages of scale development and refers to the extent to which items of an instrument adequately represent the domain of interest (Hinkin, 2005). It usually involves the generation of a comprehensive “item pool” and the selection of items often from a group of expert judges (Hinkin, 2005; Netemeyer et al., 2003). The content validity of the LTSI has been assessed using experts to generate and sort relevant items based on transfer research, in addition to employing factor analytic procedures that grouped items into scales (Holton et al., 2000).

### Convergent and Discriminant Validity

*Convergent validity* refers to “the extent to which the scales correlate with other measures designed to assess similar constructs” and discriminant validity refers to the extent to “which they [the scales] do not correlate with dissimilar measures” (Hinkin, 2005, p. 174). Holton et al. (2007) provided some initial evidence supporting the convergent and discriminant validity of the instrument. The researchers, based on Bookter’s work (1999) identified 28 suitable comparison measures for 14 LTSI scales (for two of the LTSI scales appropriate comparative measures could not be identified). Comparison measures included items from instruments such as the Work Environment Instrument and the Job Descriptive Index (JDI). For example, the JDI scale of Opportunity for Promotion was used as a comparison measure to the LTSI factors of Personal-Outcomes Positive (Holton et al., 2007). In total, 42 scales were included in the study, which yielded 322 items that were distributed into two surveys (Holton et al., 2007).

Holton et al. (2007) administered the LTSI and comparative appropriate measures to the LTSI scales to a sample of 237 trainees, part of a large quasi-public organization located in Midwestern United States (Holton et al., 2007). Correlation analyses results (Pearson and point biserial) indicated that 26 out of the 28 matched correlations fell in the negligible or low range correlation categories (ranging from .00 to .49). Two scales, from the LTSI general-training scales (performance-outcome expectations and resistance to change) resulted in moderate correlations with two scales from the Work-Related Expectancies instrument (performance reward expectancy and group process scale).

Results generally supported the convergent and divergent validity of the LTSI.

#### Validity Across Linguistic Contexts

A series of studies have been conducted to examine the construct validity of the LTSI in different linguistic settings. Bates et al. (2012) reported that up that the LTSI has been translated into 17 languages and many of the translated versions have been used in validation studies in various countries including Germany (Bates et al., 2007), Belgium (Devos et al., 2007), Portugal (Velada et al., 2009), and Taiwan (Chen, Holton, & Bates, 2005). Most of these studies used exploratory factor analysis (EFA) and have generally provided support for the 16-factor structure of LTSI.

A recent study by Bates et al. (2012) provided strong support for the factorial structure of the LTSI by employing for the first time a confirmatory factor analysis (CFA) and testing the hypothesized model using a large and diverse sample. The researchers added 21 items to the earliest version of the LTSI resulting in an 89-item instrument which was administered to a large and diverse sample of 5990 participants representing a variety of industries, settings and training programs (Bates et al., 2012). An added strength of the study was that a total of 17 countries

were represented using 14 different language versions of the LTSI. Exploratory factor analysis (EFA) was used in order to test the structure of the LTSI and assess the number and nature of constructs needed, whilst confirmatory factors analysis (CFA) was used to cross-validate the factorial structure of the LTSI resulting from the EFA (Bates et al., 2012).

The EFA results further validated the 16-factor structure of the LTSI along with the structures of the training-specific and training-general domains (11 and five underlying constructs respectively). In addition, CFA results indicated that the hypothesized models were an acceptable fit to the data and provided support for the distinctive nature of the LTSI underlying scales (Bates et al., 2012). The findings of this study resulted in a much shorter version of the LTSI (version 4) with a total of 48 items, without compromising its psychometric soundness. Up to date, this is the latest version of the LTSI.

### Nomological Validity

*Nomological validity* refers to the aspect of construct validity that examines the extent to which a measure “lawfully” operates within a “nomological network” (Cronbach & Meehl, 1955; Netemeyer et al., 2003). A nomological network defines how a focal construct relates to other constructs including antecedents, correlates, or consequences (MacKenzie et al., 2011). Evidence of nomological validity includes the examination of “the theoretical relationships between different constructs and the empirical relationships between measures of those constructs” (Netemeyer et al., 2003, p. 82).

Even though a clear nomological network of the *learning transfer system* does not exist (Holton et al., 2000) some studies have provided insight into the theoretical relationship of the learning transfer system and other related constructs. For instance, researchers have conceptualized the relationship between the learning transfer system (LTSI) and the learning

organization based on the various similarities of both constructs in terms of the emphasis placed on learning and taking action in order to improve individual and organizational performance (Kim & Callahan, 2013; Weldy, 2007, 2009). Initial empirical testing between measures of these constructs identified positive correlations between learning transfer system factors and learning organization dimensions (Weldy, 2007). In addition, studies employing select LTSI scales have identified the impact of these variables in predicting individual performance outcomes (Bates et al., 2000) and organizational outcomes (e.g., organizational innovation) (Bates & Khasawneh, 2005).

In sum, the comprehensive study of construct validity requires corroborating evidence from different sources of validity ideally stemming from diverse samples and studies. The LTSI has certainly undergone extensive construct validation research, however, as the next section will point out, the predictive validity of the instrument has not yet been fully established.

### **LTSI: Criterion-related Validity**

#### Definition

Criterion-related validity refers to “the extent to which one measure estimates or predicts the values of another measure or quality” (Salkind, 2007, p. 200). The temporal relation between the predictor(s) and its criterion distinguishes the different types of criterion-related validity (Netemeyer et al., 2003). Therefore, criterion validity consists of three types: concurrent validity, predictive validity, and post-dictive (Salkind, 2007). To examine concurrent validity the data for the measures (e.g., LTSI scales) and the criterion (e.g., intent to transfer at the end of training) are collected at the same time (Carmines & Zeller, 1979; Salkind, 2007). In the case of predictive validity, the criterion measure exists in the future (e.g., application of learned skills on the job) and data are collected some time after the data on the predictor variables (Carmines & Zeller, 1979; Salkind, 2007). Finally, providing evidence of post-dictive validity requires that the

outcome variable is measured prior to the independent variable” (Netemeyer et al., 2003; Salkind, 2007).

In criterion-related studies researchers often employ statistical techniques like correlation analysis, regression analyses, or structural equation modeling to examine the relationship between the measuring instrument and an external measure (Hinkin, 2005). To avoid faulty conclusions, it is important to assess the reliability and validity of the criterion measure (Carmines & Zeller, 1979; Netemeyer et al., 2003; Salkind, 2007). The selection of the criterion measure should have a theoretical basis (Carmines & Zeller, 1979; Hinkin, 2005). Criterion-related studies essentially assess the relationship of the construct(s) of interest with other theoretically relevant constructs (or observables) and can therefore yield findings with implications for nomological validity (Barhna, 2009; Netemeyer et al., 2003). Furthermore, criterion-related studies can also be of high practical significance if valid findings point to the ability of an instrument to estimate “some important form of behavior that is external to the measuring instrument itself” (Nunnally, 1978, p. 87). For instance, if the LTSI can be used to estimate individual training transfer, HRD professionals can design appropriate interventions to maximize the application of learned skills on the job.

#### Overview of LTSI Criterion-Related Validity Research

Nearly every LTSI validation study concludes by recommending that future research should focus on demonstrating the criterion related validity of the LTSI (Bates et al., 2007, 2012; Holton et al. 1997, 2000, 2007). Indeed, many studies have demonstrated the predictive validity of select LTSI scales in relation to different outcomes including individual performance (Bates et al., 2000), motivation to transfer Seyler et al., 1998), and perceived training transfer (Velada et al., 2007).

However, the extant literature revealed only ten criterion-related studies focusing on the predictive validity of the LTSI-general-training scales and/or LTSI-specific-training scales. Table 2 outlines the main aspects of each study as they appear in chronological order, from the earliest (i.e., Fitzgerald, 2002) to the most recent (i.e., Hutchins et al., 2013). These studies vary in terms of the LTSI scales they examined, the criterion measures they employed, the temporal relation between the predictors and its criterion, and the statistical analysis techniques they used. For instance, some researchers examined the criterion related validity of the LTSI general training scales (e.g., Bates & Khasawneh, 2005), whilst others used only the LTSI training-specific scales (e.g., Fitzgerald, 2002). Furthermore, some researchers employed trainees' perceptions of transfer as an outcome measure (e.g., Bates et al., 2007) versus other researchers who used supervisory performance ratings (e.g., Hogan, 2005). Finally, most researchers used multiple regression analysis techniques to assess the criterion-related validity of the LTSI, whilst the rest conducted correlational analysis.

In general, the studies outlined in Table 2 provide some evidence of the criterion-related validity of the LTSI in relation to different training outcomes, including individual-level outcomes like trainees' perceptions of training transfer (Devos et al., 2007), intent to transfer (Hutchins et al., 2013), motivation to transfer (Ruona et al., 2002), and organizational-level outcomes like organizational innovation (Bates & Khasawneh, 2005), organizational learning (Weldy, 2007), and organizational performance (Bates et al., 2007).

#### Criterion Related-Validity of the Full Instrument

A closer examination of the studies illustrated in Table 2 reveals that *only* four studies examined the full LTSI instrument (Bates et al., 2007; Devos et al., 2007; Hutchins et al., 2013; Scott, 2010) making it imperative to further examine “the extent to which the LTSI is an



effective predictor of transfer outcomes” (Hutchins et al., 2013, p. 253). Examining the instrument in relation to *all* 16 factors will enable researchers and practitioners to better analyze training transfer as it pertains to a system of influences, and potentially help them determine which set of factors is most influential. Therefore, examining the criterion-related validity of the full LTSI with relevant outcomes (e.g., training transfer) responds to calls in the literature for a more integrative transfer approach that encompasses all three training input factors (Colquitt et al., 2000; Scaduto, Lindsay, & Chiaburu, 2008).

In terms of criterion measure only one study (Scott, 2010) collected data on the predictors and outcome variables at different times and from different sources. This study used a small sample of trainees in a federal law enforcement academy in the United States (N= 40) to assess the relationship between the LTSI summated scales (i.e., ability, motivation, work environment) and individual training transfer (as measured by supervisory post-training performance ratings). Pearson correlations did not yield any statistically significant results between the LTSI scales and training transfer. The non-significant results are not surprising considering the small study sample, the restricted range of post-training performance ratings, and the use of summated scales (Scott, 2010).

The remaining three studies used larger samples and self-report outcome measures. The most recent study by Hutchins et al. (2013) used a proxy transfer outcome, intent to transfer, as the outcome variable in a study of 235 law enforcement officers employed in the South-Central part of the US. Multiple regression results identified motivation to transfer as the only statistically significant predictor, something that could be partially attributed to the conceptual overlap between motivation to transfer and intent to transfer.

Table 2: Criterion-Related Validity Studies: LTSI General and/or Specific Scales.

Study	Sample	Criterion Measure		LTSI Factors	Statistical Analysis Technique	Results
		How	When			
Fitzgerald (2002)*	33 state employees in mental health sector	Trainees' perceptions of Levels of Use (training transfer)	Four months after the completion of training	LTSI specific-training scales	Pearson correlations	Supervisor support, motivation to transfer, and transfer design modestly correlated to training transfer.
Ruona et al. (2002)	1,616 employees from a variety of organizations & training programs	Motivation to transfer	At the end of training <i>and</i> at the same time as the other 15 LTSI factors	LTSI 15-factors (motivation to transfer was employed as a criterion-measure)	Multiple Regression	Fourteen of the LTSI factors (personal capacity for transfer had to be dropped) explained 40.5% of the variance in motivation to transfer.
Bates & Khasawneh (2005)	450 employees from 28 different organizations in Jordan	Trainees' perceptions of organizational innovation	At varying time lengths after training <i>and</i> at the same time as the LTSI	(Arabic) LTSI general-training scales	Hierarchical Multiple Regression	The LTSI general-training scales are a significant predictor of organizational innovation.
Hogan (2005)*	89 manufacturing employees in Midwest US	Employee job performance based on supervisor performance ratings	Prior to the completion of the LTSI	LTSI general-training scales	Logistic Regression	None of the LTSI general-training scales predicted employee job performance.

(Table 2 continued)

Study	Sample	Criterion Measure		LTSI Factors	Statistical Analysis Technique	Results
		How	When			
Bates et al. (2007)	569 employees from 17 different private organizations in Germany	(1) Trainees' perceptions of improved job performance as a result of training transfer (2) Trainees' perceptions of organizational performance	At varying time lengths after training <i>and</i> at the same time as the LTSI data	(German) LTSI-16 factors (general and specific training scales)	Stepwise Multiple Regression	(1) Six significant predictors (motivation to transfer, personal outcomes positive, personal capacity for transfer, content validity, peer support, learner readiness) explained 43% of the variance in individual transfer. (2) Five significant predictors (perf. outcome expectations, openness to change, transfer effort expectations, perf. outcomes negative, and performance outcomes positive) explained 20% of the variance in perceptions of organizational performance.
Devos et al. (2007)	106 employees across six organizations (public & private) in Belgium	Trainees' perceptions of training transfer	One to three months after the completion of training <i>and</i> at the same time as the LTSI data	(French) LTSI-16 factors (general and specific training scales)	Pearson correlations	Seven factors were statistically significant: learner readiness, transfer design, transfer-perf. expectations, perf.-outcomes expectations, motivation to transfer, performance self-efficacy, and opportunity to use.

(Table 2 continued)

Study	Sample	Criterion Measure How	Measure When	LTSI Factors	Statistical Analysis Technique	Results
Weldy* (2007)	143 employees & managers in US retail & manufacturing organizations	Trainees' perceptions of organizational learning	At varying time lengths not related to training	LTSI 16-factors	Canonical Correlations	Fourteen of the LTSI factors had positive relationships with organizational learning dimensions, and two (manager sanctions and performance outcomes-negative) had negative relationships.
Baharim (2008)*	291 government employees in Malaysia	Motivation to transfer	At the end of training	LTSI 15-factors (motivation to transfer was employed as a criterion-measure)	Multiple Regression	In five separate analyses secondary influences, expected utility, transfer climate, enabling, and ability scales explained varying percentages of variance in motivation to transfer, ranging from 20% to 47%.
Scott (2010)*	40 collateral duty instructors for a federal law enforcement academy in the US	Training transfer based on supervisor post-training performance ratings	After the completion of training	LTSI – 16 factors (ability, motivation, and work environment scales)	Pearson correlations	None of the LTSI scales (ability, motivation, work environment) had statistically significant correlations with training transfer.

(Table 2 continued)

Study	Sample	Criterion Measure How	Measure When	LTSI factors	Statistical Analysis Technique	Results
Hutchins et al. (2013)	235 law- enforcement officers in South-Central US	Trainees' perception of intent to transfer	At the end of training <i>and</i> at the same time as the LTSI	LTSI-16 factors (general and specific training scales)	Multiple Regression	Fifteen LTSI factors (personal capacity for transfer had to be dropped) explained 41.3% of the variance in intent to transfer. Motivation to transfer was the only statistically significant predictor.

Note. Number of subjects refers to the final number of subjects whose data were usable and included in the statistical analysis. \* denotes unpublished dissertations. Table compiled by the author.

The studies by Devos et al. (2007) and Bates et al. (2007) used larger samples ( $N = 106$  and  $N = 569$  respectively) involving employees from the public and private sector in Belgium (Devos et al., 2007) and the private sector in Germany (Bates et al., 2007). Both studies relied on self-report data to measure the outcome variables. Devos et al. (2007) assessed individual perceptions of training transfer by using correlational analysis. Results identified seven statistically significant LTSI factors emphasizing the importance of motivational elements including motivation to transfer, transfer performance expectations, and performance outcome expectations. On the other hand, Bates et al. (2007) assessed trainees' perceptions of improved job performance as a result of training transfer. The researchers used stepwise multiple regression analysis to identify which LTSI variables maximize the variance explained in the outcome variable and identified six significant predictors all stemming from the LTSI specific training scales and representing aspects of all three training inputs: the trainee, the training design, and the work environment (Bates et al., 2007).

As with training transfer research in general, the research examining the LTSI and training transfer measures has largely used self-report measures collected at one point in time. Although important in adding to the LTSI research, the short-term, single source, self-report nature of the outcome measures can be problematic (Baldwin & Ford, 1988; Blume et al., 2010). Indeed, measuring training transfer can be proven quite challenging for HRD researchers and practitioners. As Bates et al. (2000) mention, “a shortcoming of many workplace learning transfer studies has been their nearly singular use of self-reports as outcome measures” (p. 25). Consequently, a lot of studies examining training transfer rely on self-reports as a transfer measure (e.g., Chiaburu & Lindsay, 2008; Chiaburu & Marinova, 2005; Velada et al., 2007). However, subjective measures and particularly self-reports can be problematic and prone to bias including high social desirability (Podsakoff, MacKenzie, & Podsakoff, 2003). In terms of self-assessing training transfer trainees might rate themselves higher in order to impress their supervisors by indicating an advanced level of knowledge and skill acquisition (Chiaburu, Sawyer, & Thoroughgood, 2010). Self-reports of training transfer were shown to be less accurate and more prone to overgeneralization (i.e., reporting transfer in areas not covered in training) for trainees high on conscientiousness, agreeableness, and emotional stability compared to supervisors’ ratings that provided more accurate estimates of training transfer (Chiaburu et al., 2010). Furthermore, in a study estimating training performance findings showed a weak agreement between self-ratings and ratings by others (i.e., training staff and peers) in addition to less accurate self-ratings of below-average performers (Carless & Roberts-Thompson, 2001).

Relying on self-report measures intensifies the criterion problem in transfer research, a limitation concerning the *how* and *when* to measure training transfer (Ford & Weissbein, 1997) which translates into overreliance on self-report measures and the assessment of transfer

outcomes right after the completion of training. It is important to note however, that a number of studies have addressed the criterion problem. For instance, more studies have incorporated objective measures of transfer (e.g., Frayne & Geringer, 2000) or used subjective ratings other than self-reports, including supervisory ratings (e.g., Bates et al., 2000), peer ratings (e.g., Richman-Hirsh, 2001), and ratings from subordinates (e.g., Tews & Tracey, 2008). Furthermore, in an attempt to address the dynamic nature of training transfer, a number of researchers have measured transfer at different time intervals, for instance, 3, 6, and even 12 months after training completion (e.g., Cromwell & Kolb, 2004; Frayne & Geringer, 2000). However, the criterion problem in training transfer research is still prevalent and researchers are encouraged to use multiple-sources in measuring transfer (Blume et al., 2010; Burke & Hutchins, 2007).

It is important therefore, in employing training transfer as an outcome measure to address these aforementioned issues and if possible rely on sources other than self-report to measure transfer preferably at an appropriate time interval after the completion of training.

In conclusion, very few studies have examined the relationship of all 16-factors and training transfer, particularly using outcome measures other than self-reports. This type of research will help determine the use of LTSI not only as a diagnostic tool of the training transfer system, but also as a predictive tool of critical transfer outcomes. The focus of this study hopes to address this deficiency by examining the extent to which the full LTSI instrument can predict training transfer, and unlike the majority of the existing studies in the field, it will measure the predictor and outcome variables at different times and it will *not* rely on self-report data to assess the outcome measure.

### **CHAPTER 3: RESEARCH METHOD**

This chapter outlines the procedures that were used to examine the research questions of this study including the study design, the sample, the variable measures, and the data analysis procedures.

#### **Study Design**

This study employed a secondary data analysis research design. Specifically, the database was obtained from a private company based in Louisiana and specializing in training transfer solutions. Once the database was obtained the researcher processed the database to determine the final sample size according to the variables of interest and described the sample in terms of the trainees' perceptions of the transfer system. Second, the factor structure of the LTSI was tested using confirmatory factor analysis (CFA). Separate CFA models were performed reflecting the two distinct construct domains of the LTSI: training-specific and training-general. Third, the relationship between the LTSI scales and training transfer was examined using bivariate correlational analysis. Finally, the ability of the LTSI to account for variance in training transfer was investigated using hierarchical multiple regression analysis. Prior to conducting the aforementioned statistical analyses the researcher screened the data to determine any issues related to data input, missing data, and statistical assumptions.

#### **The Sample**

The sample for this study was comprised of employees from diverse organizations who had participated in different types of organizational instructor-led classroom training programs between 2010-2014. The majority of the trainees came from private sector organizations. These organizations were using a training transfer management product offered by a private company, and therefore reflect a segment of the company's clientele. The company has a global network of partners and offers training transfer services to organizations worldwide. The main product of the



company is an online training transfer management tool, which allows organizations to conduct a transfer system diagnosis and implement actions aiming to increase the transfer rate of their training programs (e.g., setting behavioral objectives, implementing action plans, evaluating transfer). A fundamental feature of this online tool includes the ability to conduct a transfer diagnosis, which requires the administration of the LTST to trainees after the completion of training. The generated data due to the use of the online training tool by the client organizations formed the basis of the database employed in this study.

Access to the data was contingent upon *all* identifiers being stripped from the database. To ensure anonymity of the participants no demographics about the trainees were recorded in the database (e.g., age, gender, number of years employed in the organization). Furthermore, information access limitations also meant that additional information about the training programs (e.g., open vs. closed skills, length of training, mandatory vs. voluntary training) or the participating organizations (e.g., type of industry, size of organization) were not provided.

Required sample size is discussed in the Data Analysis Procedures section in relation to the corresponding statistical techniques of confirmatory factors analysis (Objective 2) and multiple regression analysis (Objective 4).

### **Variable Measures**

Data for the independent and dependent variables in this study were provided from an existing database of a private company offering training transfer services.

#### **Dependent Variable – Training Transfer**

The dependent variable in this study is Training Transfer. Training transfer was operationalized as the frequency in which trainees utilize the behaviors on-the-job taught in training.

Supervisors rated trainees' on-the-job behaviors *before* and *after* training. The rated behaviors were consistent with the behavioral objectives of the corresponding training program in an effort to identify those job behaviors that were the focus of the training intervention. In the case of employee training, behavioral objectives differ from learning objectives in that they reflect statements describing behaviors that employees are expected to exhibit on-the-job, whereas learning objectives refer mostly to the objectives that must be achieved during the training. Sample behavioral objectives included "Makes effective presentations and communicates well in front of a group", "Identifies and tracks personal performance metrics", "Demonstrates positive body language and voice tone", and "Delegates assignments as a way to develop associates" (see Appendix A for a more extensive sample of behavioral objectives).

The rating process included the following steps: (1) the learning objectives were "translated" into behavioral objectives and uploaded to the online training transfer management tool, (2) supervisors received a system generated email within two weeks *prior* to the beginning of training containing a web link to access the online rating tool, (3) supervisors accessed the online system and entered their pre-training ratings, (4) supervisors received a system generated email *no fewer* than 30 days *after* the completion of training, and (5) supervisors accessed the online system and entered their post-training ratings. Resource constraints prevented us from establishing the *exact* timing of these pre- and post-ratings.

For the purpose of this study training transfer was measured by the difference score between the supervisory pre- and post-training ratings. The pre- and post-rating made by supervisors used the same behavioral objectives and the same Likert-type scales. Specifically,

supervisors were asked to rate the percentage of time employees performed the behaviors taught in training as part of their job using the following five-point Likert-type response format:

1. In your observations, how often does (trainee's name) accurately perform the following behaviors when they are needed as a part of his/her job?

- 1 – Rarely, less than 10% of the time
- 2 – Infrequently, about 30% of the time
- 3 – Sometimes, about 50% of the time
- 4 – Frequently, about 70% of the time
- 5 – Nearly always, more than 90% of the time

In computing the overall training transfer score for each trainee, the researcher averaged the behavioral objectives' pre-training rating scores (range of values 1-5) for each case (i.e., trainee). This resulted in an overall *pre-training rating score* per case. The same process was followed in calculating the overall *post-training rating score* per case. The algebraic difference between the matched rating scores (i.e., the difference between the overall pre-training rating score and the overall post-training rating score on a given case) yielded the overall training transfer score per trainee. Negative values indicated a decrease in the frequency in which trainees utilized the behaviors on-the-job taught in training, and positive values indicated an increase in the frequency in which trainees utilized the behaviors on-the-job taught in training. A value of zero indicated that there is no change in the frequency in which trainees utilized the behaviors on-the-job taught in training.

#### Use of Difference Scores

The use of difference scores (or change scores) is often discouraged because of their potential for pretest effect, response-shift bias (Lam & Bengo, 2003), unreliability (Edwards,

1994), and difficulty in interpretation (Fleeson, 2007). However, some researchers argue that difference scores are not “inherently” unreliable, and that the reliability as well as validity of these measures is not solely a matter of statistical attributes; in other words, “a function of two test scores is not unreliable just because that function is a difference” (Williams & Zimmerman, 1996, p. 67). Furthermore, some researchers have advocated that the use of difference scores is contingent upon the context of the study and the researcher’s judgment (Allison, 1990; Dalecki & Willits, 1991). Transfer studies in the field when feasible have used difference scores as a transfer measure (e.g., Martin, 2010) and researchers have advocated for the use of pre and post-training measurements to assess training transfer (Homklin et al., 2014). Finally, the use of difference scores to assess training transfer is in accordance with common training evaluation practices. Specifically, one of the most popular training evaluation approaches used by HRD practitioners is Kirkpatrick’s four-level framework (Kirkpatrick, 1998). Level 3 of the evaluation framework, often labeled as “behavior”, measures transfer of training on the job. Kirkpatrick (1998) advocates comparing the participant’s behavior before and after the training program to assess whether “any change has taken place in relation to the knowledge, skills and/or attitudes that the training program taught” (p. 51).

Therefore, the use of difference scores within the context of this study is of value, particularly as it pertains to attempting to assess the impact of LTSI factors on training transfer. Consequently, taking into consideration the lack of the researcher’s control due to the ex-post facto nature of the study combined with the paucity of pre- and post-training measures in transfer research, and the common practices of HRD practitioners for measuring training transfer, the use of difference scores to assess training transfer is seen as an advantage.

## **Independent Variables – Transfer System Factors**

All the transfer system variables examined in this study were measured by the LTSI. The LTSI is a self-report instrument “designed to assess individual perceptions of catalysts and barriers to the transfer of learning from work-related training” (Bates et al., 2012, p. 550).

Specifically, sixteen independent variables were examined in this study corresponding to the transfer system factors as measured by the LTSI Specific and General scales (see Table 1 for scale definitions). Below are the sixteen LTSI scales that acted as the independent variables of this study grouped along four dimensions: secondary influences, motivation factors, work environment factors, and ability factors. General scales are indicated by (G).

### *Secondary factors:*

1. Performance self-efficacy (G)
2. Learner readiness

### *Motivation factors:*

1. Motivation to transfer
2. Transfer effort/ Performance expectations (G)
3. Performance/ Outcomes expectations (G)

### *Work environment factors:*

1. Performance coaching (G)
2. Peer support
3. Supervisor support
4. Openness to change (G)
5. Personal outcomes – positive

6. Personal outcomes – negative
7. Supervisor opposition

*Ability factors:*

1. Content validity
2. Transfer design
3. Personal capacity for transfer
4. Opportunity to use learning

The database used for this study included trainees' responses to a modified 51-item version of the LTSI. Trainees completed the LTSI using the online system after the completion of training. This modified version of the LTSI is embedded in the 68-item version (LTSI, version 3) and was produced as a result of a confirmatory factor analysis in an attempt to reduce the number of items and make the instrument more accessible for organizational use (E. F. Holton, personal communication, April 15, 2015). To review the complete version of the LTSI used in this study, see Appendix B.

The LTSI utilizes Likert-type scales with all items having the following response anchors: 1 = Strongly disagree; 2 = Disagree; 3 = Neither agree nor disagree; 4 = Agree; 5 = Strongly agree. Respondents are asked to rate the items and indicate the extent to which they agree or disagree with a series of statements. The LTSI is divided into two sections: (1) the first section of the instrument includes 34 items reflecting 11 constructs referring to the specific training program completed by the trainee, and (2) the second section of the instrument includes 17 items reflecting five constructs referring to training in general in the trainee's organization.

## **Data Analysis Procedures**

This section is organized according to the objectives of the study. Unless otherwise noted, all statistical analyses were conducted using the statistical software package SPSS.

### **Initial Data Analysis Procedures**

Prior to conducting any statistical analyses the researcher screened the data. This initial screening focused on data input and coding and missing data. The researcher also examined all the individual variables for statistical assumptions related to linearity, normality, and homoscedasticity using appropriate graphical and statistical methods.

#### **Objective 1**

The *first objective* of this study was to describe the trainees' perceptions of the transfer system as indicated by the general and specific LTSI scale scores, and presented according to the mean value. After generating the corresponding scale scores for the 16 LTSI constructs the sample was described using measures of central tendency and variability. Hence, the mean and standard deviation of each independent variable (i.e., LTSI scale) was computed and reported.

#### **Objective 2**

The *second objective* of this study was to confirm the factor structure of the LTSI using CFA. The LTSI has undergone extensive exploratory factor analyses (EFA) and more recently Bates et al. (2012) conducted CFA analyses that confirmed the factorial structure of the LTSI. However, as Hair et al. (2010) point out "even after CFA results are obtained...evidence of model stability and generalizability can only come from performing the analysis on additional samples and contexts" (p. 703). Thus, the factorial structure of the LTSI was reexamined using the sample of the current study. In addition to providing evidence of generalizability, the CFA analyses also provided evidence of construct validity of the instrument by assessing "the extent

to which a set of measured items actually reflects the theoretical latent construct those items are designed to measure” (Hair et al., 2010, p. 708). Finally, conducting the CFA analyses revealed some problematic items, which were taken into consideration when examining the predictive validity of the LTSI.

In the current study, two separate CFA analyses were conducted reflecting the two construct domains of the LTSI (general and specific). Specifically, the CFA 1 analysis (i.e., analysis pertaining to the general factors) used the responses to the 17 items comprising the five LTSI-general-training scales. The CFA 2 analysis (i.e., analysis pertaining to the specific-training factors) used the responses to the 34 items comprising the 11 LTSI-specific-training scales. The CFA analyses were performed using the statistical software AMOS.

The overall model fit of the hypothesized factorial structure (also referred to as a measurement model) was assessed using “goodness of fit” (GOF) indices. Most GOF indices “assess the degree to which the observed covariances in the data equate to the covariances implied by the data” (Netemeyer et al., 2003, p. 151). This study used three GOF indices to assess how well the estimated covariance matrix fits the observed covariance matrix: (1) the model chi-square ( $\chi^2$ ) value and associated degrees of freedom, (2) the root mean square error of approximation (RMSEA), and (3) the comparative fit index (CFI) (Hair et al., 2010). Good model fit was suggested when: (1) the value of  $\chi^2$  was non-significant; due to the sensitivity of  $\chi^2$  to sample size often non-significance is not achieved, therefore, a lower significant value in combination with acceptable levels of the other GOF indicated good fit, (2) RMSEA values were below .07 with CFI values of .92 or higher for the LTSI General Scales model, and (3) RMSEA values were below .07 with CFI values of .90 or higher for the LTSI Specific Scales model (Hair



et al., 2010). These threshold values are based on the model complexity (i.e., number of observed variables) and sample size criteria outlined by Hair et al. (2010, p. 672).

In addition, evidence of construct validity was assessed based on the following criteria provided by Hair et al. (2010):

- Path estimates (or factor loadings) linking constructs to items should be .5 or higher.
- Average variance extracted (AVE) is a summary indicator of convergence and should be .5 or higher.
- Reliability coefficients including coefficient alpha and composite reliability (CR) should be .7 or higher (reliability between .6 and .7 may still be acceptable).

#### Sample Size and CFA

In order to conduct the CFA analyses, different rules of thumb have been outlined in the literature about the appropriate sample size (Netemeyer et al., 2003). Some researchers have recommended that overall a sample size of 200 should be adequate and cautioned against the use of larger samples (over 400) because even the most trivial differences are detected that could lead poor fit of the model. Hair et al. (2010) recommended different minimum sample sizes contingent upon model complexity and other measurement model characteristics like model identification and communality values. Specifically, for the analyses conducted in this study examining the five LTSI-training-general constructs (CFA 1) and the 11 LTSI-training-specific constructs (CFA 2) the following guidelines are relevant:

- A minimum sample size of 150 has been recommended for a model containing seven or *fewer* constructs, modest communalities (.5), and no underidentified constructs (i.e., CFA 1).

- A minimum sample size of 500 has been recommended for a model containing *more* than seven constructs, some with lower communalities (i.e., CFA 2).

In this study, the data to conduct the CFA analyses stemmed from the completion of the LTSI by trainees. Therefore, data regarding training transfer based on supervisory ratings were not relevant for this analysis. The database included 623 cases with data on the LTSI scales; which was adequate for both CFA analyses (general-scales model and specific-scales model) according to the guidelines provided by Hair et al. (2010).

### **Objective 3**

The *third objective* of this study was to examine the relationship between the LTSI scales and employees' training transfer. For this analysis, the study used the difference scores of training transfer and the LTSI scales scores. LTSI scale scores were computed as the mean of the items comprising each of the instrument's factors. Because all the variables in the study are measured at the interval level of measurement the Pearson product-moment correlation coefficient  $r$  was used to measure the relationship between the variables. Pearson  $r$  can range from -1.0 to +1.0 and is an index of the linear relationship between two variables (Hinkle, Wiersma, & Jurs, 2003). After computing the correlation coefficient, the strength of the relationship was interpreted according to Cohen's (1992) guidelines (less than .10 trivial; .10 to .30 small to medium; .31 to .50 medium to large; and .50 or higher large to very large).

### **Objective 4**

The *fourth objective* of this study examined the extent to which the LTSI scales explained the variance in training transfer using multiple regression. Multiple regression (MR) analysis is a popular technique in organizational research and it allows the researcher "to examine the

relationship between a single dependent variable [criterion] and a set of independent variables [predictors]” (Hair et al., 2010, p. 169).

A hierarchical method of variable entry was used (also referred to as sequential; Tabachnick & Fidell, 2007). Hierarchical MR allows the researcher to determine the unique proportion of variance explained in the dependent variable (e.g., training transfer) by each independent variable or set of independent variables (e.g., work environment factors). In hierarchical multiple regression, the order of entry of variables is assigned by the researcher and is based on a theoretical, conceptual or logical rationale (Bates, 2005; Tabachnick & Fidell, 2007). Independent variables can be entered one at a time or in blocks (Tabachnick & Fidell, 2007). In this study, the order of entry was based on the conceptual framework of the LTSI (Figure 1). The independent variables were entered in four blocks adhering to the groupings of the conceptual framework of the LTSI (i.e., secondary influences, motivation factors, ability factors, and work environment factors; Holton et al., 2000). Based on the conceptual framework secondary influences are individual characteristics that impact training transfer through their effect on motivation to transfer. Therefore, secondary influences were entered in Step 1 followed by motivation factors entered in Step 2. Ability factors were entered in Step 3 followed by work environment factors in Step 4. This allowed determination of how much variance the work environment factors (i.e., transfer climate) accounted for over and above the other variables.

#### Diagnostic Analysis

In conducting regression analysis, the data must meet certain statistical assumptions. These assumptions relate both to the individual variables (independent and dependent) and to the overall relationship (i.e., variate) (Hair et al., 2010). Individual variables were already examined

as part of the initial data screening process. However, *after* the regression model was estimated, it was important to test for assumptions of the *variate* and its relationship with the dependent variable (Hair et al., 2010). Combination of graphical and statistical methods were used to test the variate against four basic statistical assumptions: linearity, normality, constant variance of the error terms (homoscedasticity), and independence of the error terms (Hair et al., 2010). In terms of graphical methods, plots of residuals (i.e., “the difference between the observed and predicted values for the dependent variable”; Hair et al., 2010, p. 183), and particularly studentized and/or standardized residuals, are often used in examining violations to the aforementioned assumptions. Based on the guidelines of Hair et al. (2010), the following steps were implemented in assessing violations to the four basic statistical assumptions:

- Linearity between the dependent and independent variables was assessed by examining the residual plots against a null plot; a consistent curvilinear pattern indicated a nonlinear relationship of the combined effect. Partial regression plots were used to indicate a nonlinear relationship between a specific independent variable and a dependent variable. A curvilinear pattern indicated nonlinearity.
- Constant variance of the error term (i.e., homoscedasticity) were examined using residual plots against the predicted values of the dependent variable, whereas a consistent pattern (e.g., triangle-shaped or diamond-shaped pattern) indicated violation of the assumption (i.e., heteroscedasticity).
- Normality of the independent variables was assessed using a histogram of residuals and assessing its approximation to the normal distribution; comparing the normal

probability plot of standardized residuals to the normal distribution; and examining the standardized residuals scatterplot.

- Independence of the error terms refers to the independence of each predicted value, “which means that the predicted value is not related to any other prediction; that is, they are not sequenced by any variable” (Hair et al., 2010, p. 185). In this study, the researcher assumed independent random samples, which is an assumption for the use of all inferential statistics, and also examined the Durbin-Watson statistic.

Depending on the extent and severity of the violations, corrective actions were considered particularly in terms of transformations of the data to increase the accuracy of the regression results.

In addition to testing against the assumptions described above, a diagnostic analysis of two additional issues, influential observations, and multicollinearity, were conducted. Both these issues can impact the interpretation of results and impair the predictive ability of the regression model. Specifically, influential observations “refer to a broad category of data points that includes outliers [i.e., observations with large residual values], leverage points [i.e., observations that exhibit distinct independent variable values], and other data points that have a disproportionate impact on estimates in a regression analysis” (Bates, Holton, & Burnett, 1999, p. 344). Based on Bates et al. (1999) four diagnostic statistics were computed to identify potential individual influential observations: (1) centered leverage value, (2) studentized deleted residual, (3) DFBETA, and (4) Cook’s distance. Observations were considered as potential influential observations if they: (1) exhibited centered leverage values greater than  $(\text{two times the number of predictors} + 1) / (\text{sample size})$ , (2) yielded statistical significant values when

calculating studentized deleted residuals, (3) had DFBETA values greater than  $\pm 2$ , and (4) had Cook's distance values greater than one or greater than  $4/(\text{sample size} - \text{number of predictors} - 1)$ . Based on the diagnostic results for individual influential observations appropriate corrective actions were taken (e.g., case deletion of select observations).

Multicollinearity occurs “when any single independent variable is highly correlated with a set of other independent variables” (Hair et al., 2010, p. 156). The presence of substantial intercorrelations among predictors essentially “creates ‘shared’ variance between variables” (Hair et al., 2010, p. 201) which limits the overall predictive ability of the regression model and obfuscates the interpretation of the relative impact of each predictor. To identify any issues of multicollinearity the measures of Variance Inflation Factor (VIF) and Tolerance were examined where values over 10 and values smaller than .10 respectively, indicated a large degree of multicollinearity. Following the recommendations of Bates et al. (1999) and Hair et al. (2010) multicollinearity was examined using the condition index, which represents the collinearity of combinations of predictor variables and the regression coefficient variance-decomposition matrix, which describes the proportion of variance for each regression coefficient (and its associated independent variable) attributable to each condition index. This process involved identifying all condition indices exceeding the threshold value of 30. Then, for all condition indices exceeding the threshold, the variables with a substantial proportion (.90 or above) of the variance for two or more coefficients were identified. Variables that met these two conditions were considered to exhibit multicollinearity (Bates et al., 1999; Hair et al., 2010).

### Assessing Model Fit and Interpreting Regression Coefficients

The coefficient of determination ( $R^2$ ) was used to assess overall model fit. This coefficient determines the percentage of variation explained by our predictors and takes values between 0 and 1. The closer the value to 1, the better our model can explain and predict the criterion. The statistical significance of  $R^2$  will be assessed using an  $F$  statistic. The  $R^2$  and  $F$  statistic were calculated after each entry step in the hierarchical regression analysis (Bates, 2005). In addition, adjusted  $R^2$  was calculated and reported. The adjusted  $R^2$  reduces the  $R^2$  because it takes into account the sample size and the number of independent variables.

Individual regression coefficients were examined for the significant models. Regression coefficients are “numerical values that estimate the amount of change in the dependent variable for each unit change in the independent variable” (Bates, 2005, p. 121), and therefore provide important information about the impact of each independent variable on the dependent variable. To assess the relative importance of the independent variables standardized coefficients (Beta Coefficients) were used, because they provide a “scale free” measure of impact and allow for direct comparison between coefficients.

### Sample Size and MR Analysis

For multiple regression analysis Hair et al. (2010) recommended a *minimum* 5:1 ratio of observations to independent variables (and a desired sample size of 15 to 20 observations per independent variable) in order to ensure generalizability of results. Considering that the number of independent variables is 16 (i.e., number of the LTSI scales) the 5:1 ratio requires a sample size of 80 observations, whilst the 15:1 ratio requires a sample size of at least 240 observations.

Sample size must also be considered in terms of anticipated statistical power (Hair et al., 2010). Statistical power is an extension of the Type II error (or beta,  $\beta$ ). The Type II error is the

probability of not rejecting the null hypothesis when it is actually false. Power ( $1 - \beta$ ) is the probability of correctly rejecting the null hypothesis when it should be rejected. Hence, in multiple regression it “refers to the probability of detecting as statistically significant a specific level of  $R^2$  or a regression coefficient at a specific significance level for a specific sample size” (Hair et al., 2010, p. 174). For a desired power of .80 with 10 to 20 independent variables and a significance level of .05 a sample size of 250 will detect fairly small  $R^2$  values, 6% to 8% (Hair et al., 2010, p. 174). In sum, a sample size of approximately 250 observations is desired to ensure both the generalizability of results and anticipated statistical power of .80. The database used in the current study included 215 cases that had completed the LTSI and had a matched supervisory pre- and post-rating score (i.e., 13.5:1 ratio).

#### **Louisiana State University Institutional Review Board Approval**

The current study received an exemption approval from the Institutional Review Board (IRB) at Louisiana State University (see Appendix C).



## CHAPTER 4: RESULTS AND FINDINGS

This chapter reports the findings of the data analytic procedures outlined in Chapter 3 based on the four objectives of the study. First, the results of the initial data screening process are presented, followed by the analysis results of each of the four objectives. The second part of this chapter presents supplemental analyses aimed at gaining a better understanding of the use of difference scores as a measure of training transfer.

### Initial Data Analysis

Of the 756 trainees included in the dataset 623 had completed the LTSI, 532 had a supervisory pre-rating score, 381 had a supervisory post-rating score, 258 had a matched supervisory pre- and post-rating score, and 215 had completed the LTSI and had a matched supervisory pre- and post-rating score. The objectives were analyzed according to two sample subsets: the first subset included the cases with LTSI responses *and* supervisory pre- and post-training ratings which was used to assess Objectives 1, 3, and 4 (N = 215); the second subset included the cases with LTSI responses and was used to confirm the factor structure of the LTSI as part of Objective 2 (N = 623). Initial examination of the dataset revealed four cases with identical responses to all 51 LTSI items. These four cases were deleted from the data set and excluded from further analysis modifying the sample size to 212 trainees with LTSI responses and supervisory pre- and post-training ratings, and to 619 trainees who had completed the LTSI.

Data diagnostic procedures focused on the sample with ratings on both the independent and dependent variables (N = 212). An independent samples t-test was performed that did not identify any significant differences in the dependent variable (i.e., difference between pre- and post-training supervisory rating scores) and the trainees who completed the LTSI versus the ones who did not (see Table 3).

Table 3: Independent Samples t-test result for LTSI Completers versus Non-completers.

Supervisory Rating	Group						95% CI for Mean Difference		
	LTSI Completers			LTSI Non- completers					
	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>			
PPDif	.61	.68	212	.43	.93	43	-0.05, 0.43	1.56	253

Note: PPDif – difference score between pre- and post-training supervisory ratings.

Examination of the independent variables revealed that all data points fell within the valid range of responses (1 to 5) and that all trainees had responded to all 51 items. An examination of the ratings of the training objectives, which were used to calculate the pre- and post-training supervisory average rating score, revealed a total of three cases with invalid data points. Specifically, these three cases included objectives that had a rating score of 0 whereas the valid range of responses was 1 to 5. Even though the missing data were below 10% for each case, the researcher decided to delete these cases because ratings of the training objectives were part of the calculation of the dependent variable. Hair et al. (2010) suggest deleting cases with missing data for the dependent variable to avoid any artificial increase in relationship with independent variables. The deletion of these cases reduced the sample size to 209 participants.

#### Normality and Outliers

To detect univariate outliers Z-score values were examined using a threshold standard value of 4, which is appropriate for a sample size over 200 (Hair et al., 2010). Multivariate outliers were identified using Mahalanobis  $D^2$  statistic based on a p-value of .001. Based on the results a total of seven unique cases were identified as outliers, three univariate outliers and seven multivariate outliers (see Table 4). The decision to remove the outliers was considered in conjunction with improving the normality of some of the variables by examining the skewness and kurtosis values.

Table 4: Univariate and Multivariate Outlier Detection Results.

<u>Univariate Outliers</u> Cases with Standardized Absolute Z-values > 4		<u>Multivariate Outliers</u> Cases with value of D <sup>2</sup> (p < .001)	
Variable	Case	Case	Mahalanobis D <sup>2</sup>
PPDif	No cases	CS0004	55.54
MT	CW0019	LD0018	50.13
TD	PL0016	CW0019	47.75
SOp	CS0004	CS0022	43.59
PSE, LR, TEPE, POE, CV, OU, PCap, POP, PON, PrSup, SSUp, OCh, PCoa	No cases	CS0029	41.64
		DL0002	39.25

Note: PPDif – difference score between pre- and post-training supervisory ratings. MT – motivation to transfer. TD – transfer design. SOp – supervisor opposition. PSE – performance self-efficacy. LR – learner readiness. TEPE – transfer effort/performance expectations. POE – performance outcome expectations. CV – content validity. OU – opportunity to use. PCap – personal capacity. POP – personal outcomes positive. PON – personal outcomes negative. PrSup – peer support. SSUp – supervisor support. OCh – openness to change. PCoa – performance coaching.

Normality was assessed by examining the skewness and kurtosis values, prior to and after the removal of outliers, compared to z-values greater than +2.58 and less than -2.58 at a .01 error level (see Table 5). Normal probability plots were also examined. Minor deviations from normality were detected on the distributions of several of the independent variables. The more pronounced deviations from normality stemmed from the independent variables of motivation to transfer, transfer design, and supervisor opposition. After the removal of the outliers, the skewness and kurtosis values on the variables of motivation to transfer and supervisor opposition, even though indicative of a less severe deviation, remained at a statistically

significant level of nonnormality. However, removal of the outliers alleviated nonnormality issues for the variables of opportunity to use and transfer design and improved the statistical descriptors. Therefore, all seven outliers were removed reducing the sample size to 202 participants ( $N = 202$ ).

Attempted transformations for the two most severely nonnormal independent variables of motivation to transfer and supervisor opposition improved the distribution for motivation to transfer when squared. Specifically, the skewness and kurtosis z-values for the transformed motivation to transfer variable were -1.27 and -0.18 respectively. In the case of supervisor opposition none of the transformations (e.g., log transformation, inverse) could improve normality. In addition, the dependent variable (i.e., PPDif) also exhibited severe nonnormality issues and attempted transformations did not really improve the distribution. A square root transformation improved the skewness (z-value = -0.81) of the distribution but amplified the kurtosis (z-value = 4.66). According to Hair et al. (2010), violation of the normality assumption is most severe in small samples whilst its impact diminishes in samples over 200; therefore, it was decided to proceed with the analysis.

#### Heteroscedasticity, Linearity, and Independence of Error Terms

Heteroscedasticity and linearity were examined by looking at the scatterplots of each of the independent variables with the dependent variable. No serious violations of these assumptions were detected. The assumptions of normality, heteroscedasticity, linearity, and independence of error terms were also assessed for the variate as part of the data diagnostics in Objective 4.

Table 5: Univariate Assessment of Normality.

Variable	Outliers Included (N = 209)				Outliers Removed (N = 202)			
	Skew	Skew z-value	Kurtosis	Kurtosis z-value	Skew	Skew z-value	Kurtosis	Kurtosis z-value
PPDif	0.89	5.28	0.95	2.85	0.86	5.04	0.84	2.47
CV	-0.42	-2.48	-0.03	-0.09	-0.31	-1.84	-0.21	-0.62
LR	0.03	0.17	-0.44	-1.32	0.05	0.28	-0.50	-1.46
MT	-1.20	-7.12	3.77	11.27	-0.74	-4.31	1.34	3.94
OCh	-0.56	-3.31	-0.02	-0.04	-0.55	-3.23	-0.02	-0.05
OU	-0.46	-2.71	1.01	3.03	-0.42	-2.45	0.92	2.71
PrSup	-0.38	-2.27	0.64	1.90	-0.15	-0.86	0.05	0.14
PCoa	-0.10	-0.60	-0.18	-0.55	0.05	0.29	-0.26	-0.75
POE	-0.33	-1.96	0.51	1.51	-0.03	-0.15	-0.47	-1.38
PSE	0.27	1.60	1.12	3.35	0.46	2.70	0.83	2.45
Pcap	-0.37	-2.19	-0.23	-0.68	-0.28	-1.65	-0.38	-1.10
PON	0.37	2.22	0.16	0.47	0.37	2.17	0.22	0.65
POP	-0.40	-2.37	0.07	0.19	-0.27	-1.58	-0.25	-0.72
SOp	1.38	8.18	3.83	11.44	0.69	4.03	-0.52	-1.54
SSup	-0.41	-2.44	-0.09	-0.27	-0.33	-1.95	-0.14	-0.40
TD	-0.92	-5.47	1.78	5.33	-0.34	-2.00	-0.06	-0.18
TEPE	-0.02	-0.14	0.34	1.02	0.00	0.03	0.38	1.12

Note: PPDif – difference score between pre- and post-training supervisory ratings. MT – motivation to transfer. TD – transfer design. SOp – supervisor opposition. PSE – performance self-efficacy. LR – learner readiness. TEPE – transfer effort/performance expectations. POE – performance outcome expectations. CV – content validity. OU – opportunity to use. PCap – personal capacity. POP – personal outcomes positive. PON – personal outcomes negative. PrSup – peer support. SSup – supervisor support. OCh – openness to change. PCoa – performance coaching.

## **Objective 1**

The first objective describes the trainees' perceptions of the transfer system as indicated by the general and specific LTSI scale scores. The analysis was based on the subset of trainees who had supervisory pre- and post-training ratings and had completed the LTSI (N = 202). These trainees came from a variety of training programs (i.e., forty-four different training programs) conducted by different organizations for different purposes. The 16 LTSI summated scales were computed based on the mean score of the corresponding items. The use of these scales was supported by evidence from the two confirmatory factor analyses performed as part of Objective 2. The scales of openness to change and personal capacity for transfer were recoded to simplify interpretation. Specifically, prior to recoding, responses of agree and strongly agree on the items consisting the openness to change scale suggested that individuals perceive group resistance when attempting to apply skills and knowledge acquired in training. Similarly, prior to recoding, responses of agree and strongly agree on the items consisting the personal capacity for transfer scale suggested that individuals had limited capacity to apply what they have learned in training due to lack of time and/or energy. By recoding the scales the researcher was able to interpret higher score values (i.e., agree and strongly agree) in accordance with the name of the corresponding scale.

The results in Table 6 suggest that in general, across the organizations from which data was collected, the pattern that emerged is that items associated with training-related motivation (i.e., motivation to transfer, transfer effort performance expectations, performance self-efficacy) and the ability factors of personal capacity and transfer design were rated moderately high with mean values ranging from 4.06 to 4.21. Hence, participants overall felt confident in their ability to apply newly learned skills on-the-job, believed that applying these newly learned skills would lead to improved performance, and were motivated to utilize learning in their work. In addition,

the moderately high mean value of the personal capacity scale indicates that overall participants had the time, energy, and mental space in their work lives to make changes required to apply

Table 6: Descriptive Statistics based on the LTSI Responses of the Trainees.

LTSI Scales	Mean	Std. Deviation	Minimum	Maximum	Cronbach's alpha
Motivation to Transfer	4.21	0.56	2.00	5.00	.83
Personal Capacity <sup>a</sup>	4.19	0.59	2.67	5.00	.76
Transfer Design	4.16	0.59	2.33	5.00	.81
Transfer Effort					
Performance Expectations	4.13	0.48	2.50	5.00	.82
Performance Self-Efficacy	4.06	0.43	3.00	5.00	.81
Personal Outcomes Positive	3.98	0.67	2.00	5.00	.86
Openness to Change <sup>a</sup>	3.89	0.76	1.67	5.00	.78
Opportunity to Use	3.79	0.54	1.75	5.00	.70
Peer Support	3.73	0.67	2.00	5.00	.81
Performance Outcome Expectations	3.70	0.68	2.33	5.00	.78
Content Validity	3.34	0.69	1.33	5.00	.82
Supervisor Support	3.17	0.85	1.00	5.00	.85
Learner Readiness	3.03	0.84	1.00	5.00	.85
Performance Coaching	3.00	0.77	1.00	5.00	.89
Personal Outcomes Negative	2.03	0.70	1.00	4.67	.81
Supervisor Opposition	1.50	0.56	1.00	3.00	.86

Note. N = 202.

<sup>a</sup> Recoded scales.

newly learned skills on-the-job. Finally, based on the mean value of the transfer design scale participants believed that the training program was delivered in ways that clearly demonstrated, through the use of relevant activities and examples, how to apply the newly learned skills.

Moderate values were reported for the scales of personal outcomes positive, openness to change, opportunity to use, peer support, and performance outcome expectations with mean values ranging from 3.70 to 3.98. This suggests that overall participants expected to be positively rewarded when applying newly learned skills on-the-job and to receive valued outcomes as a result of improved job performance. In addition, peer support and openness to change mean values suggest that prevailing group norms tended to encourage the use of skills and knowledge acquired in training, and that peers to some extent supported training transfer.

Performance coaching, learner readiness, supervisor support, and content validity emerged as borderline factors with mean values between 3.00 and 3.34 indicating that participants' responses ranged in the "Neither agree nor disagree" response scale value. The mean value of content validity ( $M = 3.34$ ,  $SD = .69$ ) suggests that overall across the organizations from which data was collected participants did not perceive the training to be strongly related to their job requirements. Furthermore, trainees were not particularly prepared to enter and participate in the training program nor did they necessarily have the opportunity to provide input prior to the training (i.e., learner readiness). Finally, the mean values of the supervisor support and performance coaching scales suggest that there is not a strong level of social support in the work environment; as a result, participants did not expect to receive constructive input, assistance or feedback from people in their work environment when applying newly trained skills.



Personal outcomes negative and supervisor opposition had the lowest mean values, indicating that most participants' responses ranged in the "Disagree" response scale value. The low mean values on personal outcomes negative suggests that trainees did not expect to experience negative outcomes (e.g., reprimands) when not applying newly acquired skills pointing to the lack of a strong reward system in the respective organizations. In terms of supervisor opposition, the low mean value suggests that supervisors did not actively oppose to the application of newly trained skills and did not provide negative responses or feedback to trainees when successfully applying what they have learned in training.

In terms of the dependent variable (i.e., difference score between the pre- and post-training supervisory ratings), about 12.5 percent of the participants (i.e., 25 cases) had a negative score indicating a decrease in the frequency in which they utilized behaviors on-the-job taught in training. The majority of the participants, specifically 171 participants accounting for 84.5 percent of the sample, had a positive score indicating an increase in the frequency in which they utilized behaviors taught on the job, and only six participants accounting for 3 percent of the sample, had a value of zero (i.e., no change in the frequency in which they utilized the taught behaviors on-the-job). A paired t-test was performed to compare the means of the supervisory pre-ratings scores to the supervisory post-rating scores. Results indicated that there was a significant difference between the supervisory pre- and post-training rating scores ( $t(201) = -12.56, p < .001$ ) pointing to higher supervisory post-training rating scores ( $M = 4.15, SD = .55$ ) compared to supervisory pre-training rating scores ( $M = 3.54, SD = .75$ ). This suggests that overall trainees indicated an increase in the frequency in which they utilized the behaviors on-the-job taught in training.

## Objective 2

Confirmatory factor analysis (CFA) using AMOS was performed to test the factor structure of the LTSI, provide evidence of the instrument's construct validity, and identify potential problematic items. The results of the two separate CFA analyses reflecting the two construct domains of the LTSI (general and specific) follow. The sample size for this analysis included the number of cases with LTSI responses ( $N = 619$ ). Examination of the data revealed that all LTSI responses fell within the valid range of responses (1 to 5) and that all trainees had responded to all 51 items.

### CFA 1 Analysis: LTSI General Scales

The measurement model consisted of five latent variables (LTSI General Scales) with their indicators and error terms (see Figure 3). Specifically, Performance Self-Efficacy (PSE) with four indicators; Transfer Effort-Performance Expectations (TEPE) with four indicators; Performance Outcome Expectations (POE) with three indicators; Performance Coaching (PCoa) with three indicators; and Openness to Change (OCh) with three indicators. Goodness of fit indices suggested good overall model fit. The  $\chi^2$  value although significant ( $\chi^2 = 261.462$ ,  $df = 109$ ) indicated a good model fit in combination with the RMSEA = .048 and CFI = .969 values. RMSEA fell between .040 and .055 with 90% confidence.

According to the criteria specified by Hair et al. (2010), results provided evidence of construct validity for the LTSI General Scales with all factor loadings being over .5 and loading on the appropriate factors. Factor loadings ranged from .60 to .88 with only four out of the 17 path estimates falling below a .7 ideal threshold. Average variance extracted (AVE) values were all above the .5 threshold, indicating adequate convergent validity. Composite reliability and Cronbach's alpha values were all above the .7 threshold. Refer to Table 7 for the basic statistics of the confirmatory analysis.

Examination of the standardized residuals did not reveal any problematic values over 4.0. In terms of discriminant validity, examination of all AVE values showed that they were larger than the corresponding squared interconstruct correlation estimates, suggesting that there are no problems with discriminant validity for the LTSI General Scales CFA model. Finally, all interconstruct correlations were positive and significant, with the exception of the correlation between Openness to Change and Performance Coaching, which was positive, but not significant ( $t = 1.99$ ;  $p = .046$ ). These positive and significant interconstruct correlations can be viewed as an indication of nomological validity.

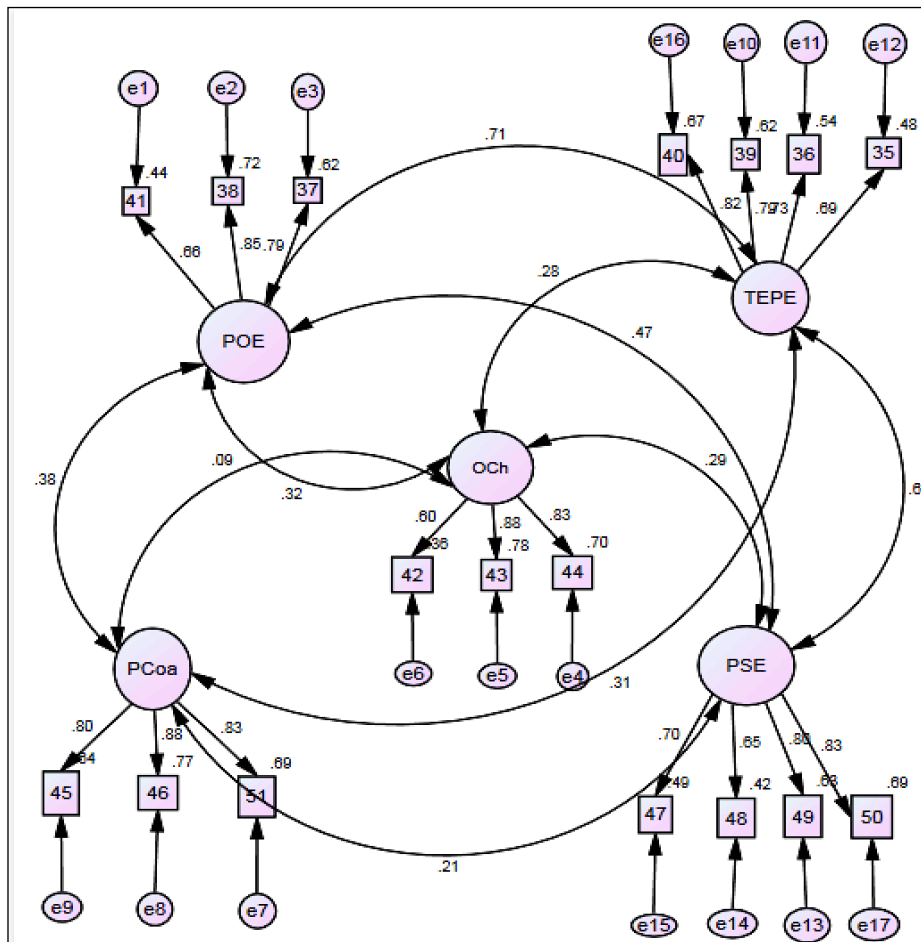


Figure 3. Measurement Model of the LTSI General Scales

Based on a threshold of 10, modification indices (MI) pointed to the Transfer Effort Performance Expectations construct with the highest MI values being associated with items 35 (my job performance improves when I use new things that I have learned) and 36 (the harder I work at learning, the better I do my job) and their associated error terms (i.e., e11 and e12). This suggests that adding a covariance estimate parameter between these error terms could lead to possible improvements in chi-square. Misspecified error covariances imply a systematic form of measurement error that can be attributed to different factors including high degree of overlap in item content (Byrne, 2010). Furthermore, MI values indicated the cross loading of item 41 (my job is ideal for some who likes to get rewarded when they do something really good) on the Performance Coaching construct, even though it was postulated on the Performance Outcome Expectations construct.

Table 7: Basic Statistics of Confirmatory Factor Analysis 1 for the LTSI General Scales.

LTSI General Scales	Number of Items	Factor <sup>a</sup> Loadings	Cronbach's alpha	CR	AVE
Performance Self-Efficacy	4	.80, .65, .70, .83	.83	.83	.56
Transfer Effort/ Performance Expectations	4	.79, .73, .69, .82	.84	.84	.58
Performance Outcome Expectations	3	.66, .85, .79	.80	.81	.59
Openness to Change	3	.83, .88, .60	.81	.82	.61
Performance Coaching	3	.83, .88, .80	.87	.88	.70

Note. N = 619. CR – composite reliability. AVE – average variance extracted.

<sup>a</sup> Factor loadings are standardized.

The results of the comprehensive examination of the measurement model did not warrant any model respecifications. The researcher concluded that, overall, the LTSI General Scales 5 factor model presented in Figure 3 had an adequate fit based on the sample of this study.

### CFA 2 Analysis: LTSI Specific Scales

The CFA 2 measurement model consisted of 11 latent variables (LTSI Specific Scales) with their indicators and error terms (see Figure 4).

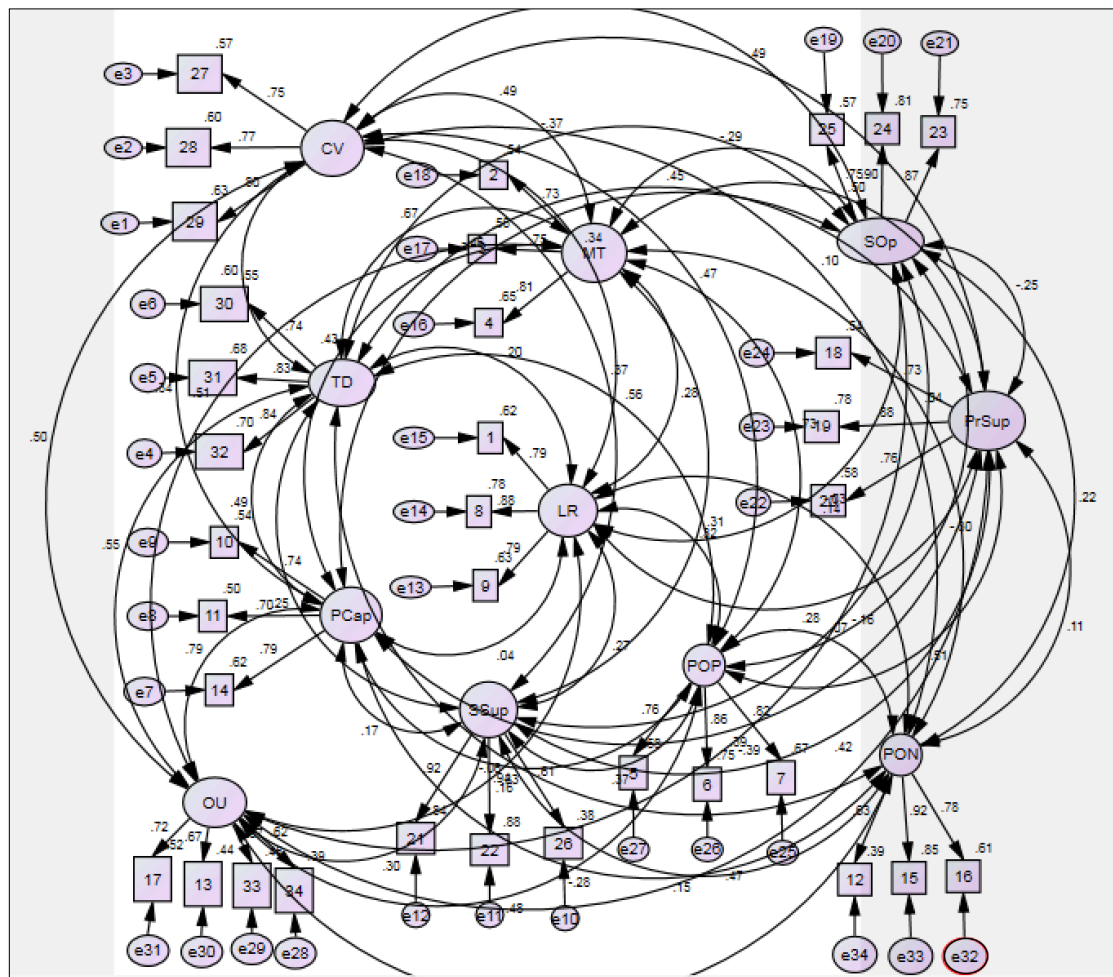


Figure 4. Measurement Model of the LTSI Specific Scales

All 11 LTISI Specific Scales, but one, had three indicators: Content Validity (CV); Transfer Design (TD); Personal Capacity (PCap); Motivation to Transfer (MT); Learner Readiness (LR); Supervisor Support (SSup); Supervisor Opposition (SOp); Peer Support (PrS); Personal Outcomes Positive (POP); and Personal Outcomes Negative (PON). Opportunity to Use (OU) had four indicators. The results indicated good fit of the model with the data. The  $\chi^2$  value although significant ( $\chi^2 = 1253.49$ ,  $df = 472$ ) indicated a good model fit in combination with the RMSEA = .052 and CFI = .929 values. RMSEA fell between .048 and .055 with 90% confidence.

According to the criteria specified by Hair et al. (2010), results provided evidence of construct validity for the LTISI Specific Scales with all factor loadings being over .5 and loading on the appropriate factors. Factor loadings ranged from .61 to .94 with only five out of the 34 path estimates falling below a .7 ideal threshold. Composite reliability and Cronbach's alpha values were all above the .7 threshold. Average variance extracted (AVE) values were above the .5 threshold for all factors, except Opportunity to Use which had an AVE value of .43, indicating that ten out of the 11 LTISI scales demonstrated adequate convergent validity. Refer to Table 8 for the basic statistics of the confirmatory analysis.

The low AVE value for Opportunity to Use suggests that there is more error remaining in the items (i.e., items 13, 17, 33, and 34) relative to the variance explained by the construct; this was also reflected in the high standardized residual value of 4.71 between items 33 and 34, which is over the 4.0 threshold. In addition, examination of the modification indices (MI) indicated that the highest values were associated with items 33 (there are enough human resources available to allow me to use skills acquired in training) and 34 (our current staffing level is adequate for me to use this training) of the Opportunity to Use scale, and their

corresponding error terms (i.e., e28 and e29). MI values also indicated the cross loading of item 33 on Transfer Design and Motivation to Transfer. Overall, these issues suggested that items 33 and 34 were not adequately explaining the Opportunity to Use construct and should perhaps be reviewed in future construct validation studies.

Table 8: Basic Statistics of Confirmatory Factor Analysis 2 for the LTSI Specific Scales.

LTSI Specific Scales	Number of Items	Factor Loadings <sup>a</sup>	Cronbach's alpha	CR	AVE
Motivation to Transfer	3	.81, .75, .73	.80	.81	.58
Learner Readiness	3	.79, .70, .74	.86	.79	.55
Content Validity	3	.80, .77, .76	.82	.82	.60
Transfer Design	3	.84, .83, .74	.84	.85	.65
Personal Capacity	3	.79, .70, .74	.79	.79	.55
Opportunity to Use	4	.62, .67, .67, .67	.77	.75	.43
Personal Outcomes Positive	3	.82, .86, .76	.85	.85	.66
Personal Outcomes Negative	3	.78, .92, .63	.81	.83	.62
Peer Support	3	.76, .88, .73	.83	.83	.63
Supervisor Support	3	.61, .94, .92	.85	.87	.70
Supervisor Opposition	3	.75, .90, .87	.87	.88	.71

Note. N = 619. CR – composite reliability. AVE – average variance extracted.

<sup>a</sup> Factor loadings are standardized.

Further examination of the MI values identified cross loadings of item 16 (if I do not utilize my training I will be cautioned about it) on eight different constructs including Personal Outcomes Positive, Peer Support, and Motivation to Transfer, even though it was postulated on the Personal Outcomes Negative construct. Examination of the standardized residuals pointed to a problematic value of 5.45 between items 16 and 20.

In terms of discriminant validity, examination of all AVE values showed that they were larger than the corresponding squared interconstruct correlation estimates for nine out of the 11 LTSI Specific Scales. Personal Capacity and Opportunity to Use had smaller AVE values (.55 and .43 respectively) compared to the corresponding squared interconstruct correlation estimate of .62 suggesting issues with discriminant validity for the two scales. This further supports the need for revising the Opportunity to Use scale.

Examination of the interconstruct correlations provided some indication of nomological validity for the LTSI Specific Scales. As Hair et al. (2010) point out, the direction and significance of the correlations between the constructs in the measurement model can provide an indication of nomological validity (Hair et al., 2010). The LTSI Specific Scales measurement model revealed that out of the fifty-five correlations, forty-four were significant and in the anticipated direction (e.g., motivation to transfer was positively correlated with transfer design; supervisor support was positively correlated with personal capacity; supervisor opposition was negatively correlated with opportunity to use).

Taking into consideration that the tested measurement model had adequate model fit and that overall results validated the factor structure of the LTSI Specific Scales and provided evidence of construct validity, the researcher concluded that the hypothesized model as presented in Figure 4 adequately described the sample of this study.

### **Objective 3**

Table 9 presents the Pearson product-moment correlation coefficient  $r$  between the LTSI scales and an employee's training transfer score as measured by the difference score between supervisory pre- and post-training ratings (i.e., PPDif). Results indicated that only two out of the 16 LTSI factors were significantly correlated with training transfer. Specifically, content validity



( $r = .140$ ,  $p < .05$ ) and opportunity to use ( $r = .144$ ,  $p < .05$ ) exhibited a small positive correlation with training transfer (Cohen, 1988). The intercorrelations of the LTSI factors were also computed (refer to Appendix D; Table 10).

Table 9: Pearson Correlation Coefficients for Relationships between the LTSI Scales and Training Transfer.

LTSI Variables	Training Transfer (PPDif)
	<i>r</i>
Opportunity to Use	.144*
Content Validity	.140*
Personal Capacity	.12
Performance Self-Efficacy	.09
Transfer Design	.08
Motivation to Transfer	.07
Transfer Effort Performance Expectations	.05
Performance Coaching	.03
Peer Support	.02
Supervisor Support	.01
Openness to Change	-.01
Personal Outcomes Positive	-.03
Supervisor Opposition	-.03
Personal Outcomes Negative	-.04
Learner Readiness	-.05
Performance Outcome Expectations	-.10

Note. N = 202. PPDif – difference score between supervisory pre- and post-training ratings.

\*  $p < .05$ , two-tailed.

#### Objective 4

Using hierarchical multiple regression (MR) the researcher examined the unique proportion of variance explained in the dependent variable (i.e., training transfer as measured by

the difference score between supervisory pre- and post-training ratings) by each set of independent variables (i.e., LTSI factors). The LTSI factors were entered in the hierarchical regression model in four blocks adhering to the groupings of the conceptual framework of the LTSI (see Figure 5): secondary influences (Step 1); motivation factors (Step 2); ability factors (Step 3); and work environment factors (Step 4).

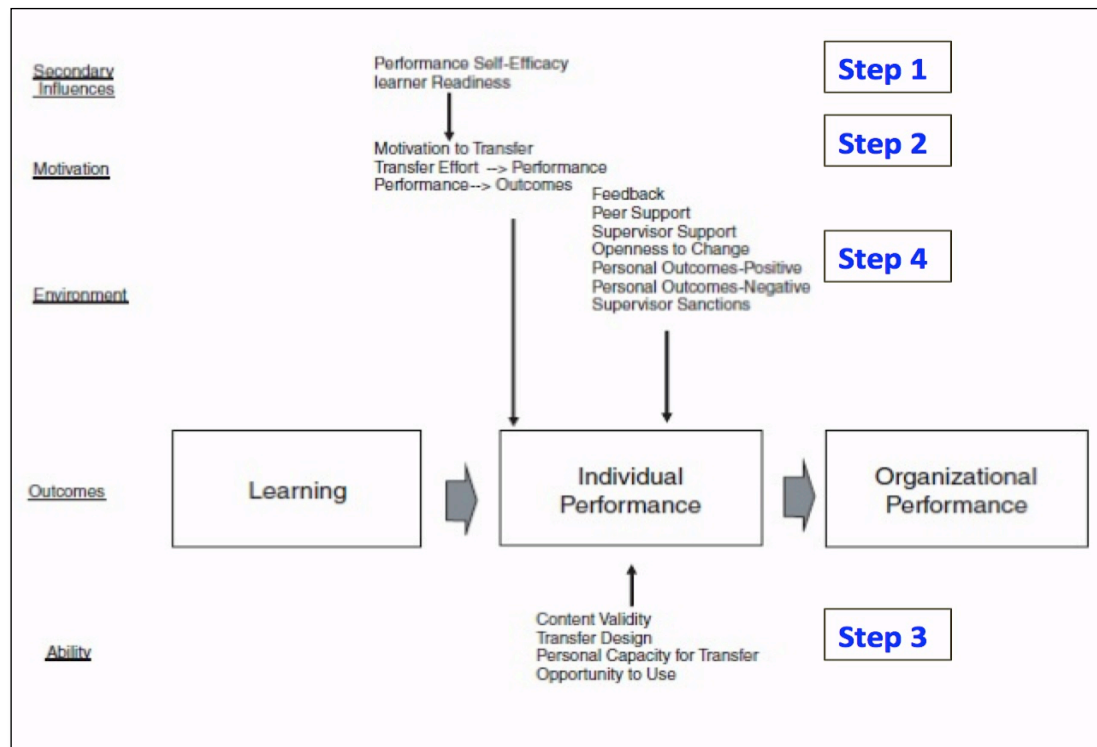


Figure 5. Order of entry of the LTSI factors in the Hierarchical Regression Model

### Diagnostics of the Variate

The diagnostic analysis focused on the aforementioned regression model, which included 16 predictors (LTSI scales), with the difference score between supervisory pre- and post-training ratings as the criterion and a sample size of 202. Diagnostics of the variate included examination of the standardized residuals to identify any violations to the assumptions of linearity, homoscedasticity, normality, and independence of the error terms. Examining the scatter plot of the standardized residuals against the predicted value did not identify any serious departures

from linearity, homoscedasticity, and normality (see Appendix E). The Durbin-Watson statistic was not statistically significant, pointing therefore to the independence of error terms.

Multicollinearity diagnostics did not reveal any collinearity issues. The VIF values for all variables were below the threshold value of 10 and ranged from 1.02 to 2.26, whilst the Tolerance values were all above .10. Examination of the condition indices did not identify any collinearity of combinations of predictor variables; none of the condition indices that exceeded the threshold value of 30 had a substantial proportion of variance for two or more coefficients.

Diagnostic analysis of influential observations used several statistics including centered leverage values, studentized deleted residuals, DFBETA values, and Cook's distance. A total of six observations had centered leverage values over the threshold value of 0.16 calculated based on 16 predictors and a sample size of 202;  $(\text{two times the number of predictors} + 1) / (\text{sample size})$ . None of the observations exhibited Cook's distance values greater than one. However, examining the cases that had substantially higher Cook's distance values compared to a  $4/(\text{sample size} - \text{number of predictors} - 1)$  threshold (i.e., 0.02 based on  $N = 202$ ) revealed a total of ten observations. In terms of studentized deleted residuals, a total of 13 observations had values greater than  $\pm 1.96$ . In terms of DFBETA values none of the observations exhibited values over the  $\pm 2$  threshold. Table 11 presents the detailed results of diagnostic analysis for influential observations. A total of 20 influential observations were identified. Out of these observations, eight were identified by two or more diagnostic measures and were therefore, removed from the sample.

Table 11: Results of Diagnostic Analysis for Influential Observations.

Observation	Centered Leverage Value	Studentized Deleted Residual	Cook's Distance
CS0003			0.05
CS0027		-2.25	
CW0013	0.17		
CW0014	0.17		
DL0017	0.18		
FS0020	0.18		
PC0004			0.03
PC0005			0.03
PC0008		2.76	
PC0011		2.61	0.08
PC0012	0.19	2.31	0.07
PC0014		2.27	
PC0016		2.79	0.03
PC0018		2.60	
PC0028		2.58	0.05
SC0002		2.24	0.03
SC0009		3.44	0.06
SH0008		-2.28	0.03
WM0014	0.19	-2.25	
WM0015		-2.25	

### Hierarchical Multiple Regression Analysis

Results of the initial hierarchical multiple regression analysis ( $N = 202$ ) indicated that none of the examined models were significant (e.g., model 4;  $F = 1.053$ ,  $Sig = .403$ ). After the removal of the eight influential observations the sample size was reduced to 194 cases. The results of the

hierarchical multiple regression after the removal of the influential observations are presented in Table 12. The first set of variables (personal self-efficacy, learner readiness) did not produce a significant model. The addition of the motivation related constructs in step 2 increased explained variance by .055, a significant increase ( $F = 2.99$ ,  $\text{Sig.} = .013$ ). Performance outcome expectations emerged as a significant predictor ( $\beta = -.26$ ,  $p < .05$ ). In step 3, the addition of the ability factors (content validity, transfer design, personal capacity for transfer, opportunity to use) increased explained variance by .039, a significant increase ( $F = 2.22$ ,  $\text{Sig.} = .022$ ).

Table 12: Results of the Hierarchical Regression Analysis between the LTSI Factors and Training Transfer as indicated by the Difference between Supervisory pre- and post-training Ratings.

Predictor	$\beta$	$R^2$	Adj. $R^2$	$F_{\text{model}}/df$	$\Delta R^2$
<i>Model 1</i>		.019	.009	1.86 / 2,191	-
LR	-.07				
PSE	.13				
<i>Model 2</i>		.074	.049	2.99* / 5,188	.055
LR	-.06				
PSE	.13				
MT	.11				
TEPE	.14				
POE	-.26*				
<i>Model 3</i>		.098	.054	2.23* / 9,184	.024
LR	-.08				
PSE	.08				
MT	.07				
TEPE	.12				
POE	-.27*				
CV	.15				

(Table 12 continued)

Predictor	$\beta$	$R^2$	Adj. $R^2$	$F_{\text{model}}/df$	$\Delta R^2$
TD	-.04				
PCap	.04				
OU	.07				
<i>Model 4</i>		.103	.022	1.27 / 16,177	.005
LR	-.08				
PSE	.09				
MT	.08				
TEPE	.13				
POE	-.26*				
CV	.14				
TD	-.04				
PCap	.03				
OU	.07				
SSup	.04				
SOp	-.05				
PrSup	-.009				
POP	-.05				
PON	.03				
PCoa	-.03				
OCha	-.04				

Note: PSE – performance self-efficacy. LR – learner readiness. MT – motivation to transfer. TEPE – transfer effort/performance expectations. POE – performance outcome expectations. CV – content validity. TD – transfer design. PCap – personal capacity. OU – opportunity to use. OCh – openness to change. PCoa – performance coaching. PON – personal outcomes negative. SOp – supervisor opposition. PrSup – peer support. SSup – supervisor support. POP – personal outcomes positive.

\*  $p < .05$ , two-tailed.

The total variance explained in Model 3 was .096 and performance outcome expectations remained the only significant predictor ( $\beta = -.27, p < .05$ ). The addition of the work environment variables in the final step did not produce a significant model ( $F = 1.27, \text{Sig.} = .22$ ), and reduced the variance explained (Adjusted  $R^2$  dropped from .054 in model 3 to .022 in model 4) indicating that the work environment variables did not add value to the explanation of variance in the dependent variable. At this final step, performance outcome expectations remained a significant predictor ( $\beta = -.26, p < .05$ ). Overall, the LTSI factors explained 10.3 percent of the variance in training transfer.

In sum, the results of the statistical analyses indicated that overall the trainees reported moderately high levels of training-related motivation, whilst in terms of social support factors mean values indicated moderate to borderline scores. Interestingly, content validity emerged as a borderline factor suggesting that trainees did not perceive the content of the training as accurately reflecting their job requirements. Second, the confirmatory factor analyses provided evidence of construct validity for the LTSI General and Specific Scales; however, the CFA analysis for the LTSI Specific scales revealed some issues of discriminant validity pertaining to the Opportunity to Use and Personal Capacity constructs.

The correlational analysis identified two significant and positive correlations, albeit small, between training transfer and the LTSI factors of content validity and opportunity to use. Finally, the hierarchical multiple regression analysis produced two statistically significant models. Specifically, adding the training-related motivation factors in step 2 resulted in a significant increase in explained variance. Adding the ability factors in step 3 also resulted in a significant increase in explained variance, explaining 9.8 percent of variance in the dependent variable (model 3;  $R^2 = .098$ ). Performance outcome expectations emerged as the only significant

predictor. The final model, which included the work environment factors, did not add a significant increase in explained variance. Overall, the LTSI factors explained 10.3 percent of the variance in training transfer.

### **Supplemental Analyses**

In light of the results of previous studies examining the relationship of the LTSI and training transfer, the lack of substantial results in the foregoing correlational and hierarchical multiple regression analyses required the researcher to reexamine the use of difference scores as a measure of behavior change (in the context of this study behavior change referred to the change in the frequency in which trainees utilized the behaviors on-the-job taught in training). The use of difference scores as a measure of behavior change is a controversial issue in organizational research with some researchers advocating for (e.g., Allison, 1990; Dalecki & Willits, 1991) and some against (e.g., Edwards 1994; 2001; Fleeson, 2007 ). In sum, researchers supporting the use of difference scores focus on the appropriateness of the research question at hand (e.g., Allison, 1990; Dalecki & Willits, 1991) and advocate for the use of difference scores when the independent variable(s) is temporally subsequent to the time-1 variable (e.g., pre-test) and uncorrelated with the transient (temporal) component of the time-1 variable (Allison, 1990), and when the researcher is interested in change in behavior (Dalecki & Willits, 1991).

On the other hand, critics of difference (or change) scores allude to the inherent unreliability of change scores (because the difference score will always be less reliable than the component variables, e.g., pre-test and post-test) and the challenges involved with interpreting the relationship between the independent variables and the difference scores, mainly stemming from the correlation between the pre-test and the difference scores (Fleeson, 2007). In other words, when using difference scores as the dependent variable it is not clear if the relationship



should be attributed to the change over time or the pre-test score (Fleeson, 2007). One recommended avenue for alleviating the issues associated with the use of difference scores as a measure of behavior change is to treat the time-2 outcome (e.g., post-test scores) as the dependent variable and the time-1 outcome variable (e.g., pre-test scores) as a covariate (i.e., control variable) (Dalecki & Willits, 1991; Fleeson, 2007).

Taking into consideration these methodological issues surrounding the use of difference scores as an outcome variable, the researcher decided to conduct an additional hierarchical multiple regression analysis adhering to the recommendations of Fleeson (2007) and Dalecki and Willits (1991). For this analysis, the average supervisory pre-training score was treated as a covariate and the average supervisory post-training score as the dependent variable. The order of the LTSI factors followed the same rationale as the one initially proposed (Figure 5). Diagnostics of the variate were performed anew on the sample of 202 participants, adhering to the same procedures as outlined for the initial hierarchical regression model (i.e., the model employing the difference scores as the dependent variable). Examination of the standardized residuals against the predicted value did not identify any serious departures from linearity, homoscedasticity, and normality. In terms of multicollinearity, the VIF values, Tolerance values, and condition indices did not reveal any collinearity issues. Diagnostic analysis of influential observations identified ten observations exceeding the threshold values on two or more diagnostic measures (i.e., centered leverage values, studentized deleted residuals, and Cook's distance). These observations were removed from the analysis reducing the sample size to 192 cases.

Table 13 presents the results of the hierarchical multiple regression using supervisory post-training ratings as the dependent variable. Addition of the variables in *each* step resulted in significant changes in  $R^2$ . The control variable (i.e., average supervisory pre-training score)

accounted for 25.4 percent of variance in training transfer, as measured by the average supervisory post-training score and was a significant predictor in every model. In terms of the LTSI factors, performance outcome expectations emerged as significant predictor when added in the model as part of step 3 ( $\beta = -.22, p < .05$ ) and remained significant even after all variables were added to the model. The addition of the work environment variables in the final step (model 5) produced three additional significant predictors: transfer effort performance expectations, performance coaching, and openness to change. Excluding the percent of variance explained by the pre-training scores, the LTSI factors overall explained 10.3 percent of variance in training transfer.

When comparing the results of the two hierarchical multiple regression analyses the second model seems to be more consistent with prior LTSI research because it identifies the transfer system as a whole to be an important factor in explaining training transfer. However, both models lacked practical significance in terms of variance explained, accounting for only 10.3 percent of variance explained in training transfer. The lack of substantial results produced by two alternative approaches signals possible issues pertaining to the measurement of training transfer. These issues are discussed in more detail in Chapter 5.

Table 13: Results of the Hierarchical Regression Analysis between the LTSI Factors and Training Transfer as indicated by Supervisory Post-training ratings.

Predictor	$\beta$	$R^2$	Adj. $R^2$	$F_{\text{model}}/df$	$\Delta R^2$
<i>Model 1</i>		.258	.254	65.97/1,190	-
AvgPreScore	.51*				
<i>Model 2</i>		.259	.247	21.89*/3,183	.001
AvgPreScore	.51*				
LR	-.02				

(Table 13 continued)

Predictor	$\beta$	$R^2$	Adj. $R^2$	$F_{\text{model}}/df$	$\Delta R^2$
PSE	.03				
<i>Model 3</i>		.290	.267	12.58 <sup>*</sup> /6,185	.031
AvgPreScore	.53 <sup>*</sup>				
LR	.01				
PSE	.05				
MT	-.01				
TEPE	.17				
POE	-.22 <sup>*</sup>				
<i>Model 4</i>		.304	.265	7.90 <sup>*</sup> /10,181	.014
AvgPreScore	.54 <sup>*</sup>				
LR	-.001				
PSE	.008				
MT	-.05				
TEPE	.14				
POE	-.22 <sup>*</sup>				
CV	.10				
TD	-.03				
PCap	.04				
OU	.06				
<i>Model 5</i>		.361	.299	5.79 <sup>*</sup> /174,17	.057
AvgPreScore	.50 <sup>*</sup>				
LR	-.002				
PSE	-.005				
MT	-.04				
TEPE	.21 <sup>*</sup>				

(Table 13 continued)

Predictor	$\beta$	$R^2$	Adj. $R^2$	$F_{\text{model}}/df$	$\Delta R^2$
POE	-.20*				
CV	.14				
TD	-.04				
PCap	-.01				
OU	.06				
SSup	.11				
SOp	-.11				
PrSup	.05				
POP	-.14				
PON	-.09				
PCoa	-.16*				
OCha	-.16*				

Note:

AvgPreScore – average pre-training rating score. PSE – performance self-efficacy. LR – learner readiness. MT – motivation to transfer. TEPE – transfer effort/performance expectations. POE – performance outcome expectations. CV – content validity. TD – transfer design. PCap – personal capacity. OU – opportunity to use. OCh – openness to change. PCoa – performance coaching. PON – personal outcomes negative. SOp – supervisor opposition. PrSup – peer support. SSup – supervisor support. POP – personal outcomes positive.

\*  $p < .05$ , two-tailed.

## **CHAPTER 5: DISCUSSION**

The purpose of this study has been to advance the body of LTSI validation research by assessing the ability of the LTSI to predict individual training transfer, as indicated by the difference score of supervisory pre- and post-training ratings. Therefore, the study aimed to answer the following research questions:

1. What is the relationship between the LTSI scales and individual training transfer?
2. To what extent, do the LTSI scales explain variance in individual training transfer?

Therefore, this final chapter will summarize and discuss the implications of the research findings according to the four main objectives of the study; outline the limitations of the study; and, present recommendations for future research.

### **Summary of Findings**

To examine the research questions of interest, the researcher analyzed secondary data that included measures of key transfer system variables, as captured by the LTSI scales, and individual training transfer as indicated by supervisory ratings. The dataset comprised of employees from diverse organizations, mainly from the private sector, who had participated in different types of organizational instructor-led classroom training programs. Access to the data was contingent upon all identifiers being stripped from the database.

The first objective of the study aimed to describe the trainees' perceptions of the transfer system as indicated by their LTSI responses. The use of these scales was supported by evidence from the two confirmatory factor analyses performed as part of the second objective of this study. In general, across the organizations from which the data was collected training-related motivation, personal capacity, and transfer design were rated moderately high indicating that overall trainees felt training was delivered in ways that facilitated application on the job, were motivated to transfer the taught skills and had the time and space in their work to do so. Content

validity emerged as a borderline factor suggesting trainees were largely ambivalent about the relevance of the training content in connection with their job requirements. This is not surprising considering the limited use of needs assessment in practice which often results in the delivery of outdated or irrelevant training that does not accurately reflect the knowledge and skills that employees need in order to perform their jobs. Reward system factors were rated somewhat less favorably (i.e., performance outcome expectations, personal outcomes positive, personal outcomes negative) suggesting the lack of a strong reward system in relation to the application of newly learned skills. Furthermore, trainees' perceptions regarding social support factors (e.g., supervisor support) indicated the lack of a strong interpersonal support system that would encourage and enable the application of newly learned skills in the workplace.

These conclusions are based on the data from a number of organizations. However, the burgeoning research addressing the influence of work context on learning transfer suggests reward systems, social support factors, and other elements can contribute of large differences in the nature of transfer systems from one setting to another. There is no doubt it would have been informative to have examined such differences in this study. Unfortunately, the fragmented nature of the sample and the lack of demographic information prevented the parsing of data required for inferences about the transfer system of a specific organization in the present sample.

The second objective of the study tested the factor structure of the LTSI using confirmatory factor analysis. Separate confirmatory factor analyses were performed to reflect the two construct domains of the LTSI (general and specific). Overall, results of both confirmatory analyses provided evidence of the construct validity of the instrument with satisfactory factor loadings and reliability measures, in addition to evidence of convergent and discriminant validity. Consequently, the findings substantiated that, in general, the set of 51 items included in

the LTSI reflect the 16 constructs these items are intended to measure. Yet, the analyses identified some problematic indicators particularly in relation to the Opportunity to Use scale (i.e., items 33 and 34) that future validation studies should revisit. The latest version of the LTSI (v4; Bates et al., 2012) has addressed some of these issues by modifying the indicators of the Opportunity to Use scale and rewording the content of the problematic items. It is important to note, that this study was one of the few studies to use confirmatory factor analyses to assess the construct validity of the LTSI (see also Bates et al., 2012); most studies thus far have employed exploratory factor analytic techniques. Hence, the current findings contribute to the LTSI validation body of research and further establish its role as a valid diagnostic tool of the transfer system that can be used to advance both transfer research and HRD practice.

Correlational analysis (i.e., Pearson product-moment correlations) was performed to examine the relationship between the LTSI scales and training transfer. Out of the 16 independent variables employed in the study, only two had a statistically significant correlation with training transfer. Specifically, content validity ( $r = .14, p < .05$ ) and opportunity to use ( $r = .14, p < .05$ ) had a positive, albeit small, correlation with training transfer. Prior research studies have identified moderate correlations between various LTSI variables and individual perceptions of training transfer (e.g., Devos et al., 2007); intent to transfer (Hutchins et al., 2013); and transfer performance (Bates et al., 2000). Therefore, the expectation was that additional LTSI factors would be significantly correlated with training transfer, indicating the importance of a system of factors in the transfer process. For instance, a correlational analysis by Devos et al. (2007) examined the relationship between the LTSI factors and perceived training transfer; results identified seven statistically significant and moderate to large correlations.

Nevertheless, the results of the correlational analysis point to the importance of content validity and opportunity to use in the transfer process. Overall, when trainees perceive a training course to be relevant and useful they tend to more frequently utilize the behaviors taught in training on-the-job (e.g., Bates et al., 2000). Furthermore, when trainees are provided with opportunities or resources to apply newly learned skills on the job they tend to more frequently utilize those skills (Ford et al., 1992; Devos et al., 2007; Seyler et al., 1998). Based on the conceptual model of the LTSI, both content validity and opportunity to use are part of the LTSI specific scales (i.e., scales associated with a specific training program a participant has attended) and are grouped under the ability factors.

In terms of assessing the extent to which the LTSI scales explain variance in training transfer, hierarchical multiple regression analysis indicated that the model including the motivation and ability/enabling factors was significant. Specifically, motivation to transfer, transfer effort performance expectations, performance outcome expectations, content validity, transfer design, personal capacity for transfer, and opportunity to use explained 9.8 percent (5.4% adjusted) of the total variance in training transfer. The addition of the work environment factors did not result in a significant increase in explained variance; thus, the full model including all LTSI factors was not significant and overall explained only 10.3 percent of variance in training transfer. These results were puzzling if one considers the importance of work environment factors in the transfer process (e.g., Blume et al., 2010; Holton et al., 2000). Performance outcome expectations emerged as the only significant predictor. Specifically, the effect of performance outcomes expectations was significant and its coefficient was negative indicating that the greater the expectation that changes in job performance will lead to valued outcomes, the lower the application of newly acquired skills on-the-job. This is consistent with



the lack of a strong reward system associated with the application of newly trained skills suggesting that even though trainees perceived that changes in job performance would lead to valued outcomes, they did not necessarily get rewarded for applying the knowledge and skills learned in training on-the-job.

The initial regression analysis in this study used pre- and post- difference scores as the dependent variable. However, the use of such scores is controversial and a number of researchers have discouraged the use of difference scores as indicators of behavior change due to their low reliability and the challenges associated with interpreting the relationship between the independent variables and the difference scores because it is not clear if the relationship should be attributed to the change over time or the pre-test score (Fleeson, 2007). Therefore, a supplemental regression analysis was conducted that controlled for the impact of supervisory pre-training rating scores and used supervisory post-training rating scores as the dependent variable (Dalecki & Willits, 1991). The supplemental analysis provided noticeably different results revealing significant increases in explained variance at each step of the hierarchical multiple regression. Furthermore, the final model identified four significant predictors all stemming from the LTSI General Scales: two factors reflect training-motivation constructs (i.e., performance outcome expectation and transfer effort performance expectations), and the other two reflect work environment factors (i.e., performance coaching and openness to change). Overall, these results supported the notion that the transfer system as a complex of factors is important in explaining training transfer. However, the lack of substantial results in terms of explained variance (LTSI factors explained 10.3% of explained variance in training transfer) remained an issue.

When comparing the results of the two hierarchical multiple regression analyses the second model seems to be more consistent with prior LTSI research because it identifies the transfer system as a whole to be an important factor in explaining training transfer. However, both models lacked practical significance in terms of variance explained, accounting for, at most, 10.3 percent of variance explained in training transfer. The lack of results bearing practical significance by two alternative approaches points to problems pertaining to the measurement of the dependent variable (i.e., training transfer). There are several possible explanations for this, which are outlined in the following section.

### **Limitations**

In the current study, even though the selection of individual training transfer as a criterion measure has important theoretical merit, the ex post facto research design did not allow the researcher to establish the accuracy of training transfer measurement. In other words, it was not feasible to take all the necessary steps that would have otherwise increased the probability that supervisors rated trainees on job behaviors that were presented and learned in training, and allow the researcher to confirm the connection between the job behaviors being rated to the learning objectives that were covered in training. Further investigation revealed that it was possible for raters (or trainers) to select the job behaviors being rated from an online generic list (an add-on feature of the online training transfer tool that participating organizations had access to). This increased the risk of supervisors rating behaviors that were not actually covered as part of the training. In order to develop more valid measures of workplace learning transfer a number of steps can be taken to ensure that trainees are being rated on workplace behaviors that are being taught and learned in training. For instance, Bates et al. (2000) in a study assessing the relationship between select LTSI factors and transfer performance as indicated by supervisory

ratings, implemented a rigorous process to measure the criterion variable which included the identification of the most critical procedures taught in training, the extraction of the most important behaviors to be rated, and the provision of training to supervisors on how to rate. Due to the ex post facto nature of the current study adoption of a similar process to increase the probability of the accurate assessment of training transfer was not possible.

Second, in calculating training transfer the researcher computed a single pre- and post-training average score stemming from the individual ratings on each training objective, thus drastically reducing the variance in the dependent variable. In addition, by describing all the training objectives using a single average score the researcher indirectly assumed unidimensionality of these items (i.e., training objectives) and treated them as measuring the same type of skills (Hattie, 1985). However, the objectives came from a variety of different training programs conducted by different organizations for different purposes. Without access to data tracking these factors it was impossible to discern the extent to which the training objectives were comparable in scope or dimensionality. An attempt was made to address this issue. A post hoc exploratory factor analysis of the post-training ratings was attempted in an effort to uncover any latent dimensions or patterns in the data. However, factor analysis is essentially a large sample technique and the variable to sample size ratio in the present study did not support this analysis.

Another limitation relates to the suitability of the supervisors as raters of training transfer within the context of the current study. Even though "...evidence that trainees have applied the behaviors learned in training back on the job provides the most straightforward assessment of transfer" it is important to select raters who are in the best position to observe trainee behavior (Kraiger, 2002, p. 361). The ex-post facto nature of the current study prevented the researcher

from confirming that supervisors were the most suitable raters; in fact, the wording of some of the job behaviors being rated implied that trainees' behavior would be more directly observed by other raters like peers (e.g., seeks contribution from team members when problem solving and making decisions) or customers (e.g., controls emotion to manage customer frustrations; customers find my ideas to be credible and engaging). It is possible therefore, that supervisors provided ratings for behaviors that they were not actually in a position to directly observe.

Finally, a potential limitation of the current study relates to the value of content validity ( $M = 3.34$ ,  $SD = .69$ ) suggesting that, overall, participants perceived training content as only marginally reflecting their job requirements. Relevance of training content is crucial in enhancing the application of newly acquired skills on the job (Bates et al., 2000). If participants in the current study did not perceive the training to be relevant to their jobs one should not expect great change in behavior. It is quite plausible that trainees did not frequently use what they had learned on-the-job, which could subsequently restrict the range of supervisory rating scores. Yet, the significant difference found between pre- and post-training supervisory ratings suggested that overall trainees after training utilized taught behaviors on-the-job more frequently. The generic nature of some of the training objectives (e.g., listens for understanding; is seen as enthusiastic) in combination with possible response bias associated with subjective measures like supervisory ratings (Podsakoff et al., 2003) could partially explain the higher post-training rating scores assigned by supervisors.

Given these limitations, it was clear that the measurement of the dependent variable was problematic. As Hair et al. (2010) point out "...if the variable used as the dependent measure has substantial measurement error, then even the best independent variables may be unable to achieve acceptable levels of predictive accuracy" (p. 172).

## **Future Research**

The modest variance in training transfer explained by the LTSI factors in this study should be interpreted in light of the stated limitations. Hence, future research should continue to examine the criterion-related validity of the LTSI instrument in relation to transfer outcomes; and, when possible, use techniques, like structural equation modeling, that can account for measurement error or make efforts to reduce measurement error in the criterion variable. Furthermore, future criterion-related research should employ the latest, and most refined, version of the LTSI (v4; Bates et al., 2012).

Future LTSI criterion-related research can benefit from adopting a more targeted focus on the types of training objectives that are being addressed in training and examine the ability of the LTSI to predict training transfer related to the application on-the-job of different types of skills (e.g., open vs. closed skills). Briefly, closed skills refer to specific ways of completing certain tasks, usually prescribed by a series of steps or set of rules, whilst open skills encompass more than one correct way of doing things and trainees have more liberty in how to perform (Yelon & Ford as cited in Blume et al., 2010). It is possible that a combination or subset of LTSI factors is more influential in the transfer of open skills versus closed skills. For example, the transfer of skills acquired during a computer software application training program (i.e., closed skills) might be influenced more by factors like opportunity to use which relates to individuals having access to the required resources (e.g., availability of software program on-the-job) whereas social support factors like peer support or performance feedback might be more crucial in enhancing transfer behavior of open skills (e.g., communication skills). This type of contextualized research that addresses common training objectives or types of skills trained will help advance the field of

transfer research and make it move beyond the question of “Can training transfer?” (Blume et al., 2010, p. 1095).

Furthermore, future LTSI research would benefit from an examination of the interrelationships between the LTSI factors. LTSI validation research has mostly focused on assessing the impact of all (or a subset of) transfer system factors on transfer outcomes; however, few attempts have been made to understand how the LTSI factors interact with each other to then impact training outcomes like individual training transfer. Structural equation modeling techniques can assist in understanding how LTSI factors affect each other and help shed some light not only into the most influential transfer system factors, but also on the way these system factors interconnect.

Finally, future studies should continue to refine the construct validity of the LTSI by employing confirmatory factor analytic procedures when possible; as Hair et al. (2010) point out “...evidence of model stability and generalizability can only come from performing the analysis on additional samples and contexts” (p. 703). Future attempts should also examine the nomological validity of the LTSI; this is an aspect of construct validity that has not been extensively researched. Research examining the connection between the learning transfer system and the learning organization seems promising (e.g., Kim & Callahan, 2013).

### **Conclusion**

Overall, the findings of the current study contribute to the body of LTSI validation research. The dissertation examined the predictive validity of the LTSI in relation to individual training transfer, as indicated by the difference score between pre- and post-training supervisory ratings. A secondary data analysis design was employed using matched data from 202 trainees across different organizations and training sessions. Findings provided support for the

importance of content validity and opportunity to use in the transfer process. Trainees' perceptions of the relevance and usefulness of the course, in addition to the provision of opportunities to apply new learning, are important in increasing the probability of applying behaviors on-the-job taught in training. Furthermore, confirmatory factor analyses provided evidence of the construct validity of the LTSI and reaffirmed its role as a diagnostic tool of the transfer system factors that can be used to advance transfer research and HRD practice.

The role of the LTSI as a predictive measure of training transfer could not be substantiated by the findings of this study. Research design limitations did not allow the researcher to confirm the connection between rated job behaviors to what was taught in training. As a result, it is likely that the rated job behaviors were not closely aligned to the learning objectives, jeopardizing therefore the measurement validity of training transfer. Challenges in measuring training transfer are not new to organizational field research and are often referred to as the "criterion problem" in transfer research, a limitation concerning the how and when to measure training transfer (Ford & Wessbein, 1997). Hopefully, this will not hinder future research endeavors aiming to further examine the role of LTSI as a predictive measure of training transfer.

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## **APPENDIX A: SAMPLE OF BEHAVIORAL OBJECTIVES**

1. Shows sincere interest in others and their concerns, and demonstrates sensitivity to the needs and feelings of others.
2. Helps others resolve sensitive interpersonal problems as appropriate.
3. Looks for ways to help people, and pitches in to help others.
4. Is flexible and open-minded when dealing with a wide range of people.
5. Listens to and considers others' viewpoints and alters opinion when it is appropriate to do so.
6. Listens for understanding, not just a "selective" listener.
7. Effectively gives and solicits feedback to ensure dialogue and understanding.
8. Reports to supervisors or upper management are clear, concise, and well received.
9. Persuasively communicates point-of-view to others.
10. Contributes to an open exchange of ideas in meetings/discussions.
11. Thinks and speaks effectively in impromptu situations.
12. Makes effective presentations and communicates well in front of a group.
13. Controls length of communications - neither too long, nor too short.
14. Develops productive relationships and maintains an atmosphere of trust.
15. Effectively resolves conflict or problem situations.
16. Builds others' confidence and self esteem.
17. Disagrees without being disagreeable, offending, or building resentment.
18. Shows a sensitivity and interest in others & their ideas.
19. Remembers and uses people's names.
20. Takes the initiative to build/strengthen relationships with others.
21. Is assertive, without being aggressive or hostile toward others.
22. Maintains positive focus even under pressure.
23. Displays a willing flexibility, adapts well to change.
24. Projects a positive attitude and approach to others.
25. Utilizes time effectively.
26. Handles the demands of a changing workplace with a positive attitude.
27. Meets new challenges willingly.
28. Is self-directed, sets and achieves goals.
29. Follows through on commitments without supervisor follow-up.
30. Regularly gets the results the supervisor wants.
31. Projects a poised and confident demeanor.
32. Assumes a leadership role rather than waiting for others to lead.
33. Takes appropriate and reasonable risks to solve problems or improve the status quo.
34. Motivates & inspires people toward positive change.
35. Positively influences others' attitudes and behaviors.
36. Uses praise and recognition to motivate people.
37. Obtains willing cooperation / commitment from others.
38. Is seen as enthusiastic.
39. Listens for understanding, not just a selective listener.

40. Persuasively communicates point-of-view to others.
41. Controls length of communications - neither too long, nor too short.
42. Builds others' confidence and self esteem.
43. Remembers and uses peoples' names.
44. Confronts ineffective behaviors or attitudes without a direct attack on the person.
45. Adapts to the personality differences of others.
46. Refrains from negative conversations-criticizing, condemning, complaining.
47. Demonstrates positive body language and tone of voice.
48. Responds appropriately & effectively to criticism, correction or coaching.
49. Motivates & inspires people toward positive change.
50. Positively influences others' attitudes and behaviors.
51. Is seen as enthusiastic.
52. Manages time in a way that does not place undue stress on the team.
53. Plans ahead so deadlines are consistently met.
54. Coaches team members on how to solve problems themselves.
55. Uses a process to drive innovation and better ideas.
56. Delegates so that team members talents are well utilized.
57. Conducts performance appraisals that are motivational and inspiring.
58. Coaches in a way that raises peoples' performance to higher levels.
59. Holds others accountable for results.
60. Gives authority to others when appropriate.
61. Demonstrates positive body language and tone of voice.
62. Pursues the best opportunities by creating and implementing an account plan and contact strategy for sales territory (e.g. categorizing customers) taking into account (potential) value, financial viability, revenue, share, and profit.
63. Approaches right customers as per target customer profile (e.g. organizational size, mailing need, multi-sites).
64. Knows top 20 percent customers.
65. Has a clear strategy for biggest accounts.
66. Actively works on converting pipeline potential (e.g. reviewing sales potential, evaluating and addressing issues affecting sales).
67. Initiates collaborative relationships with key business stakeholders; cultivates an active network of those with the knowledge and influence to advance business goals.
68. Recalls fundamental sales credibility statements and elevator speeches.
69. Selects the most appropriate approach to prospect for new business opportunities.
70. Creates a plan to prepare for sales calls.
71. Demonstrates company's sales techniques.
72. Identifies market trends to develop account and sales strategy.
73. Gathers information to analyze pipeline.
74. Determining the appropriate time to create and present effective proposals to the confirmed decision makers.
75. Understand and Recommend appropriate Gap Tools.

76. Conduct a compelling Credibility Presentation.
77. Demonstrate the ability to conduct the Corporate Solutions Agenda Call with decision makers.
78. Articulate the DC Client Engagement Process (iMap) to decision makers.
79. Develop clear migration plans for existing accounts (department to department, organization wide, vendor/supplier).
80. Create effective account strategies, work-ups and execution plans for all existing and target accounts.
81. Effectively qualify account opportunities using the Account Qualification (Scorecard) Process.
82. Understand and deliver fundamental language (DC Structure, USPs, Elevator Speech, Unique Methodology).
83. Listens for understanding, not just a "selective" listener.
84. Develop and implement personal monthly pipeline and revenue forecasts.
85. Identify and track personal performance metrics (call conversion/closing ratios/etc.).
86. Demonstrate the ability to conduct Agenda Call with decision makers.
87. Enroll individuals using the company Information Sheet process.
88. Demonstrate the ability to plan and conduct New Business Development calls (cold calls).
89. Understand and implement a process to gain alignment with decision makers regarding their individual/team enrollments (Coaching Communication Form process).
90. Leverage graduate conversations to gain decision maker meetings.
91. Conduct effective graduate conversations that uncover tangible, business oriented results (Class Member Credibility Statements).
92. Shows initiative.
93. Is confident in decision-making.
94. Demonstrates a positive attitude; focuses on "I can do it" way of thinking.
95. Expresses self freely and appropriately.
96. Demonstrates a poised, confident demeanor.
97. Demonstrates a willingness to take risks when appropriate.
98. Demonstrates a willingness to accept new challenges.
99. Effectively works with others, even when not in complete agreement.
100. Demonstrates insight into how his/her emotions and behaviors affect others.
101. Effectively resolves disagreements.
102. Expresses genuine interest in other people.
103. Contributes to an atmosphere of trust.
104. Builds others' confidence and self-esteem.
105. Shows respect for other peoples' opinions and ideas.
106. Listens for understanding.
107. Expresses information clearly and concisely.
108. Demonstrates positive body language and voice tone.

109. Persuasively communicates point of view.
110. Seeks suggestions/input from the total team.
111. Effectively prepares and delivers presentations.
112. Effectively thinks on his/her feet.
113. Values team effectiveness over personal advantage.
114. Enlists others to pursue a common goal.
115. Coaches others to higher levels of performance.
116. Encourages and supports others.
117. Helps others view change as an opportunity for growth.
118. Works toward win-win outcomes.
119. Values and acknowledges the contributions of others.
120. Maintains focus when events become chaotic.
121. Is approachable under pressure.
122. Takes action to resolve stressful situations.
123. Controls anger in difficult situations.
124. Responds appropriately to criticism.
125. Maintains work/life balance.
126. Obtains and weighs necessary facts before making a decision.
127. Sets goals to meet expectations.
128. Maintains focus on problems/issues vs. individuals.
129. Seeks opportunities to broaden skills and abilities.
130. Manages resources effectively to meet objectives.
131. Builds a positive work environment.
132. Controls emotion to manage customer frustrations.
133. Uses helpfulness, genuine interest, understanding, and respect to build customer relationships.
134. Meets expectations of external customers.
135. Meets expectations of internal customers.
136. Positively impacts external customers.
137. Respects and provides customer service to internal customers/stakeholders.
138. Seeks to understand what motivates others.
139. Provides sincere and timely recognition.
140. Gains buy-in from people with diverse backgrounds.
141. Communicates effectively with diverse populations.
142. Creates a team performance management culture.
143. Conducts performance reviews in a fair and equitable manner.
144. Holds self accountable to achieve performance standards.
145. Manages self during organizational changes.
146. Transforms vision into action.
147. Establishes a vision for themselves.
148. Gathers and analyzes relevant information before making decisions.
149. Gains innovative solutions by utilizing creative thinking.
150. Identifies the root cause to problems.

151. Leverages time and increased productivity by working smarter.
152. Applies tools to plan, organize, and manage time.
153. Overcomes time management obstacles.
154. Maintains productive team relationships.
155. Creates a trust-based work environment.
156. Changes own behavior to enhance relationships.
157. Positively impacting professional relationships.
158. Learns from experience to improve performance.
159. Helps others learn from experience.
160. Views change as an opportunity for growth.
161. Encourages and supports the ideas of others.
162. Understands the values that drive behavior.
163. Defines roles and responsibilities of people and processes.
164. Creates a clear vision of the future.
165. Respects the values and differences in others.
166. Separates the person from the problem.
167. Provides tools to help others manage stress effectively.
168. Creates a safe environment for exchange of ideas.
169. Recognizes and rewards performance.
170. Encourages and supports innovation.
171. Uses an effective planning process.
172. Uses a process to define performance expectations.
173. Effectively organizes resources to achieve work objectives.
174. Effectively delegates.
175. Utilizes time effectively.
176. Includes others in the group process to reach decisions.
177. Seeks suggestions and input from the total team.
178. Asks questions to gain information.
179. Encourages feedback to build understanding.
180. Uses evidence to support ideas.
181. Quickly and emphatically admits personal mistakes.
182. Leads by example.
183. Provides direction for future development.
184. Effectively manages the performance of others.
185. Builds problem-solving skills in others.
186. Builds others' confidence and self-esteem.
187. Demonstrates positive body language & tone of voice.
188. Effectively resolves conflict or problem situations.
189. Develops productive relationships and maintains an atmosphere of trust.
190. Deals effectively with mistakes by others.
191. Provides consistent feedback / coaching beyond formal reviews.
192. Conducts constructive performance reviews.
193. Identifies off-target performance and coaches to desired level.

194. Clearly defines measurable performance expectations.
195. Regularly discusses individual goals and strategies with associates.
196. Consistently achieves or exceeds stated objectives.
197. Holds positive, productive meetings.
198. Makes decisions effectively.
199. Analyzes problems toward effective solutions.
200. Organizes talents and resources well to achieve work objectives.
201. Ensures effective implementation of plans.
202. Uses an effective planning process for tasks and projects.
203. Connects daily processes with larger organizational objectives.
204. Communicates a clear picture of desired results.
205. Creates an environment that attracts and keeps the right people.
206. Listens and responds effectively to concerns of others.
207. Encourages open communication and feedback.
208. Inspires a sense of commitment, not just compliance.
209. Positively impacts morale / motivation.
210. Contributes to spirit of teamwork / cooperation.
211. Fosters an environment of trust /mutual respect.
212. Inspires associates with a clearly defined vision / direction.
213. Delegates assignments as a way to develop associates.
214. Develops problem-solving skills in others.
215. Involves others appropriately when reaching decisions.
216. Encourages innovation / different approaches.
217. Builds responsibility through empowerment.
218. Helps others view change as positive growth opportunity.
219. Demonstrates vision, thinks beyond the present.
220. Effectively challenges the status quo.
221. Is innovative, seeks creative solutions.
222. Completes important tasks before they become urgent / critical.
223. Follows through on commitments.
224. Exemplifies high professional standards.
225. Actions project a clearly defined set of values / priorities.
226. Celebrates others' successes – both formally and informally.
227. Builds purpose/meaning into associates' work assignments.
228. Receive helpful coaching and accountability.
229. The organizational structure in which I operate enables me to be successful.
230. Believe that internal systems are in place to support my success.
231. Listens for understanding.
232. Shows respect for other people's opinions and ideas.
233. Expresses genuine interest in other people.
234. Work to improve my selling and communication skills.



- 235. Am meeting my business development quarterly goals/metrics/expectations.
- 236. Am appropriately balancing my utilization goals with business development activity.
- 237. Am clear in my messaging when prospecting.
- 238. Actively prospect for new business development opportunities inside and outside my client base.
- 239. Am calm and ask questions when customers give buying objections.
- 240. Collaborates and enlists others across the company to present multi-service solutions to clients.
- 241. Am appropriately enthusiastic and confident when I present my ideas.
- 242. Tailor my solutions to resonate with my clients' strategy and emotions.
- 243. Clients find my solutions credible, creative and engaging.
- 244. Clearly and concisely explain our services and benefits.
- 245. Customers reveal to me their business AND emotional needs.
- 246. Ask clients cross-selling questions that expand opportunities for the company.
- 247. Ask clients questions that push their thinking.
- 248. Tell compelling stories of other clients who have benefited from our services.
- 249. Clearly state the business value of our solutions.
- 250. Displays confidence for business development.
- 251. Demonstrates a positive attitude
- 252. Position myself as a trusted advisor (consultation phase) to my clients rather than a transactional enabler of their plans.
- 253. Delegates so that team members' talents are well utilized
- 254. Personal development is a priority for the company.
- 255. My manager supports and coaches the development of my strategic selling skills
- 256. Strategic selling skills increase my capability to perform my current AND future job.
- 257. I am consciously working on improving my selling, communication, and technical knowledge.
- 258. People notice that I have a positive attitude when I face challenges.
- 259. I am able to describe the value I bring as a person to sales relationships.
- 260. I am confident in my messaging when prospecting into existing customers to deepen the relationship.
- 261. I am confident in my messaging when prospecting new customers.
- 262. My customers embrace my pushback when they treat me in a transactional manner rather than a strategic partner.
- 263. My customers would say I listen to understand the root cause of their objection or complaint.

- 264. My customers see me respond to their objections calmly and confidently.
- 265. My customers express enthusiasm about the ideas I've presented.
- 266. My customers find my ideas to be credible and engaging.
- 267. My customers understand my recommendations, ask intelligent questions and are able to communicate my ideas to their stakeholders.
- 268. I am able to get my customers to articulate the "emotional" context of their requests.
- 269. I assist my customers in helping me understand the strategic as well as the technical reason for their request.
- 270. My customers find my questions to be appropriately challenging and helpful. They say things like, "Good question" or "I hadn't considered that".
- 271. My customers can cite examples in the organization of how my company / I add value.
- 272. My customers believe I understand their goals and engage me for advice and invite me to plan with them.
- 273. My customers see me as a valuable strategic partner rather than a transactional enabler of their plans.

## APPENDIX B: LEARNING TRANSFER SYSTEM INVENTORY

### LEARNING TRANSFER SYSTEM INVENTORY

There is growing interest in how to more effectively develop the knowledge and skills and employees. Of vital interest is the degree to which learning programs actually help you be more effective in your job. The *Learning Transfer System Inventory* has been designed to provide information about the characteristics of the workplace that might make training more useful.

Your cooperation in completing this questionnaire will greatly assist us in making training more effective. Contributing to this effort is simple and will require only 15 minutes of your time

#### ***Instrument Instructions***

The *Learning Transfer System Inventory* contains 51 statements. Using the indicated scale of 1 to 5, with 1 being strongly disagree and 5 being strongly agree, indicate the extent to which you agree or disagree with each statement. Please mark your answers by circling or checking the numbered scale to the right of each item. Your individual ratings will be kept completely confidential.

Please respond to each statement as honestly as you can. Your first response to the item is usually the most accurate, so trust your initial response. It is usually best to not think too long about each item.

With your assistance, the data provided by this questionnaire will be used to improve training in your organization.

## LEARNING TRANSFER SYSTEM INVENTORY

Please circle the number (1, 2, 3, 4 or 5) to the right of each item that most closely reflects your opinion about training.

1 - Strongly disagree	2 - Disagree	3 - Neither agree nor disagree
4 - Agree	5 - Strongly agree	

**For the following items, please think about THIS SPECIFIC TRAINING PROGRAM :**

1.	Prior to the training, I knew how the program was supposed to affect my performance.	1	2	3	4	5
2.	Training will increase my personal productivity.	1	2	3	4	5
3.	When I leave training, I can't wait to get back to work to try what I learned.	1	2	3	4	5
4.	I believe the training will help me do my current job better.	1	2	3	4	5
5.	If I use what I learn in training, it will help me get higher performance ratings.	1	2	3	4	5
6.	If I use this training I am more likely to be rewarded.	1	2	3	4	5
7.	I am likely to receive some recognition if I use my newly learned skills on the job.	1	2	3	4	5
8.	Before the training, I had a good understanding of how it would fit my job-related development.	1	2	3	4	5
9.	I knew what to expect from the training before it began.	1	2	3	4	5
10.	I don't have time to try to use this training.	1	2	3	4	5
11.	Trying to use this training will take too much energy away from my other work.	1	2	3	4	5
12.	Employees in this organization are penalized for not using what they have learned in training.	1	2	3	4	5
13.	My workload allows me time to try the new things I have learned.	1	2	3	4	5
14.	There is too much happening at work right now for me to try to use this training.	1	2	3	4	5
15.	If I do not use new techniques taught in training I will be reprimanded.	1	2	3	4	5
16.	If I do not utilize my training I will be cautioned about it.	1	2	3	4	5

**Please turn to the next page**

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	1 - Strongly disagree	2 - Disagree	3 - Neither agree nor disagree	4 - Agree	5 - Strongly agree
17. I have time in my schedule to change the way I do things to fit my new learning.	1	2	3	4	5
18. My colleagues appreciate my using new skills I have learned in training.	1	2	3	4	5
19. My colleagues encourage me to use the skills I have learned in training.	1	2	3	4	5
20. At work, my colleagues expect me to use what I learn in training.	1	2	3	4	5
21. My supervisor meets with me regularly to work on problems I may be having in trying to use my training.	1	2	3	4	5
22. My supervisor meets with me to discuss ways to apply training on the job.	1	2	3	4	5
23. My supervisor will object if I try to use this training on the job.	1	2	3	4	5
24. My supervisor will oppose the use of techniques I learned in this training.	1	2	3	4	5
25. My supervisor thinks I am being less effective when I use the techniques taught in this training.	1	2	3	4	5
26. My supervisor sets goals for me which encourage me to apply my training on the job.	1	2	3	4	5
27. The instructional aids (equipment, illustrations, etc.) used in training are very similar to real things I use on the job.	1	2	3	4	5
28. The methods used in training are very similar to how we do it on the job.	1	2	3	4	5
29. I like the way training seems so much like my job.	1	2	3	4	5
30. It is clear to me that the people conducting the training understand how I will use what I learn.	1	2	3	4	5
31. The trainer(s) used lots of examples that showed me how I could use my learning on the job.	1	2	3	4	5
32. The way the trainer(s) taught the material made me feel more confident I could apply it.	1	2	3	4	5
33. There are enough human resources available to allow me to use skills acquired in training.	1	2	3	4	5
34. Our current staffing level is adequate for me to use this training.	1	2	3	4	5
<p><b>Please complete questions 35 - 51 on the following page.</b>  <b>Note that these items have new instructions</b>  <b>Please read them carefully</b></p>					

		1 - Strongly disagree	2 - Disagree	3 - Neither agree nor disagree	4 - Agree	5 - Strongly agree
<b>For the following items, please <u>THINK ABOUT TRAINING IN GENERAL</u> in your organization.</b>						
35.	My job performance improves when I use new things that I have learned.	1	2	3	4	5
36.	The harder I work at learning, the better I do my job.	1	2	3	4	5
37.	For the most part, the people who get rewarded around here are the ones that do something to deserve it.	1	2	3	4	5
38.	When I do things to improve my performance, good things happen to me.	1	2	3	4	5
39.	Training usually helps me increase my productivity.	1	2	3	4	5
40.	The more training I apply on my job, the better I do my job.	1	2	3	4	5
41.	My job is ideal for someone who likes to get rewarded when they do something really good.	1	2	3	4	5
42.	Experienced employees in my group ridicule others when they use techniques they learn in training.	1	2	3	4	5
43.	People in my group are not willing to put in the effort to change the way things are done.	1	2	3	4	5
44.	My workgroup is reluctant to try new ways of doing things.	1	2	3	4	5
45.	People often make suggestions about how I can improve my job performance.	1	2	3	4	5
46.	I get a lot of advice from others about how to do my job better.	1	2	3	4	5
47.	I am confident in my ability to use new skills at work.	1	2	3	4	5
48.	I never doubt my ability to use newly learned skills on the job.	1	2	3	4	5
49.	I am sure I can overcome obstacles on the job that hinder my use of new skills or knowledge.	1	2	3	4	5
50.	At work, I feel very confident using what I learned in training even in the face of difficult or taxing situations.	1	2	3	4	5
51.	People often tell me things to help me improve my job performance.	1	2	3	4	5
<b><i>Thank you for your time!!!</i></b>						

## APPENDIX C: INSTITUTIONAL REVIEW BOARD APPROVAL

### ACTION ON EXEMPTION APPROVAL REQUEST



**TO:** Vicky Katsioloudes  
SHREWD

**FROM:** Dennis Landin  
Chair, Institutional Review Board

**DATE:** August 25, 2015

**RE:** IRB# E9451

**TITLE:** Supervisory Ratings as a Measure of Training Transfer: Testing the Predictive Validity of the Learning Transfer System Inventory

Institutional Review Board  
Dr. Dennis Landin, Chair  
130 David Boyd Hall  
Baton Rouge, LA 70803  
P: 225.578.8692  
F: 225.578.5983  
[irb@lsu.edu](mailto:irb@lsu.edu) | [lsu.edu/irb](http://lsu.edu/irb)

**New Protocol/Modification/Continuation:** New Protocol

**Review Date:** 8/20/2015

**Approved** X **Disapproved** \_\_\_\_\_

**Approval Date:** 8/25/2015 **Approval Expiration Date:** 8/24/2018

**Exemption Category/Paragraph:** 4a

**Signed Consent Waived?:** NA. All data are secondary.

**Re-review frequency:** (three years unless otherwise stated)

**LSU Proposal Number** (if applicable):

**Protocol Matches Scope of Work in Grant proposal:** (if applicable)

**By:** Dennis Landin, Chairman 

**PRINCIPAL INVESTIGATOR: PLEASE READ THE FOLLOWING –**  
**Continuing approval is CONDITIONAL on:**

1. Adherence to the approved protocol, familiarity with, and adherence to the ethical standards of the Belmont Report, and LSU's Assurance of Compliance with DHHS regulations for the protection of human subjects\*
2. Prior approval of a change in protocol, including revision of the consent documents or an increase in the number of subjects over that approved.
3. Obtaining renewed approval (or submittal of a termination report), prior to the approval expiration date, upon request by the IRB office (irrespective of when the project actually begins); notification of project termination.
4. Retention of documentation of informed consent and study records for at least 3 years after the study ends.
5. Continuing attention to the physical and psychological well-being and informed consent of the individual participants, including notification of new information that might affect consent.
6. A prompt report to the IRB of any adverse event affecting a participant potentially arising from the study.
7. Notification of the IRB of a serious compliance failure.
8. **SPECIAL NOTE:**

*\*All investigators and support staff have access to copies of the Belmont Report, LSU's Assurance with DHHS, DHHS (45 CFR 46) and FDA regulations governing use of human subjects, and other relevant documents in print in this office or on our World Wide Web site at <http://www.lsu.edu/irb>*

## APPENDIX D: TABLES

Table 10: Pearson Correlation Coefficient Table of the LTSI Factors.

LTSI Factors	Content Validity	Transfer Design	Personal Capacity	Opportunity to Use	Motivation to Transfer	Learner Readiness	Performance Self-Efficacy
Content Validity							
Transfer Design	.561**						
Personal Capacity	.342**	.365**					
Opportunity to Use	.459**	.494**	.557**				
Motivation to Transfer	.412**	.540**	.424**	.392**			
Learner Readiness	.263**	.207**	0.09	.187**	.238**		
Performance Self-Efficacy	.338**	.377**	.375**	.444**	.350**	.153*	
Transfer Effort Performance Expectations (TEPE)	.377**	.465**	.373**	.439**	.564**	.280**	.432**
Performance Outcome Expectations (POE)	.321**	.426**	.265**	.345**	.413**	.321**	.386**
Supervisor Support	.427**	.257**	.166*	.298**	.249**	.256**	.144*
Supervisor Opposition	-.247**	-.375**	-.454**	-.285**	-.339**	-.04	-.267**
Peer Support	.386**	.339**	.387**	.359**	.410**	.227**	.319**
Personal Outcomes Positive	.358**	.494**	.318**	.361**	.631**	.257**	.343**
Personal Outcomes Negative	.13	-.02	-.236**	-.142*	-.02	.08	-.175*
Performance Coaching	.255**	0.12	.168*	.255**	.213**	.08	.212**
Openness to Change	.239**	.222**	.168*	.13	.06	.06	.14

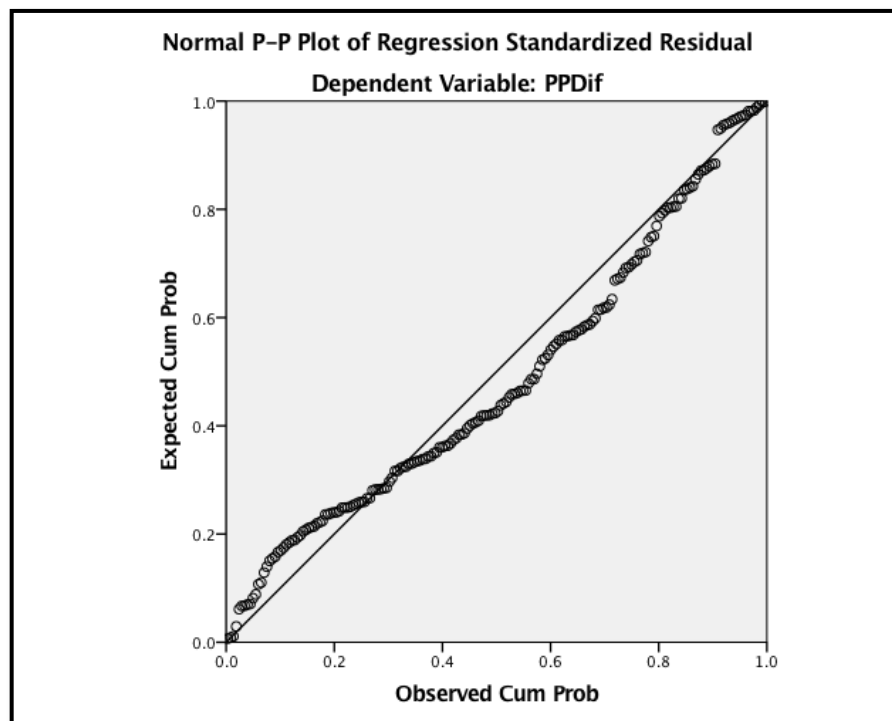
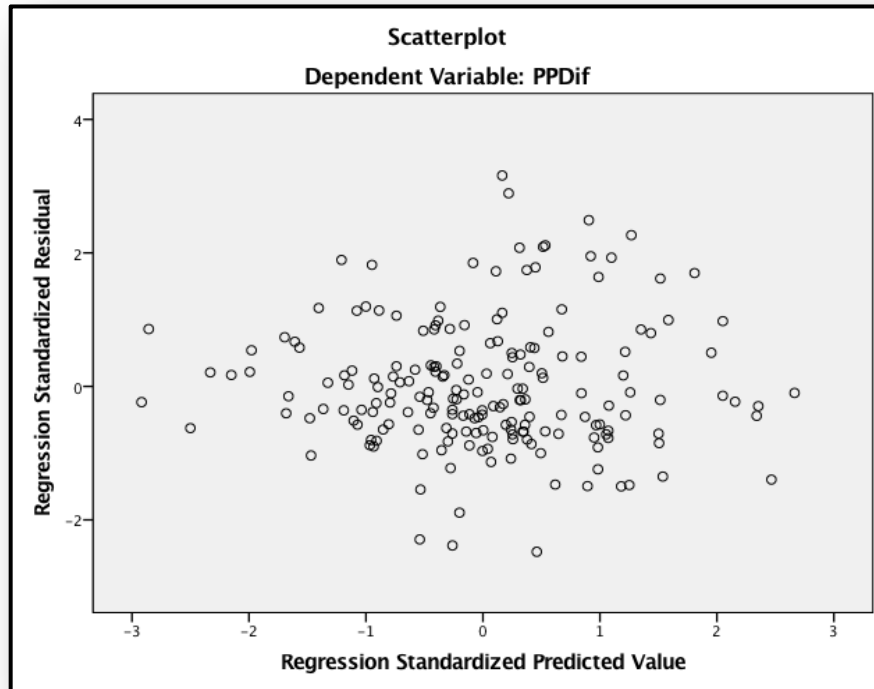


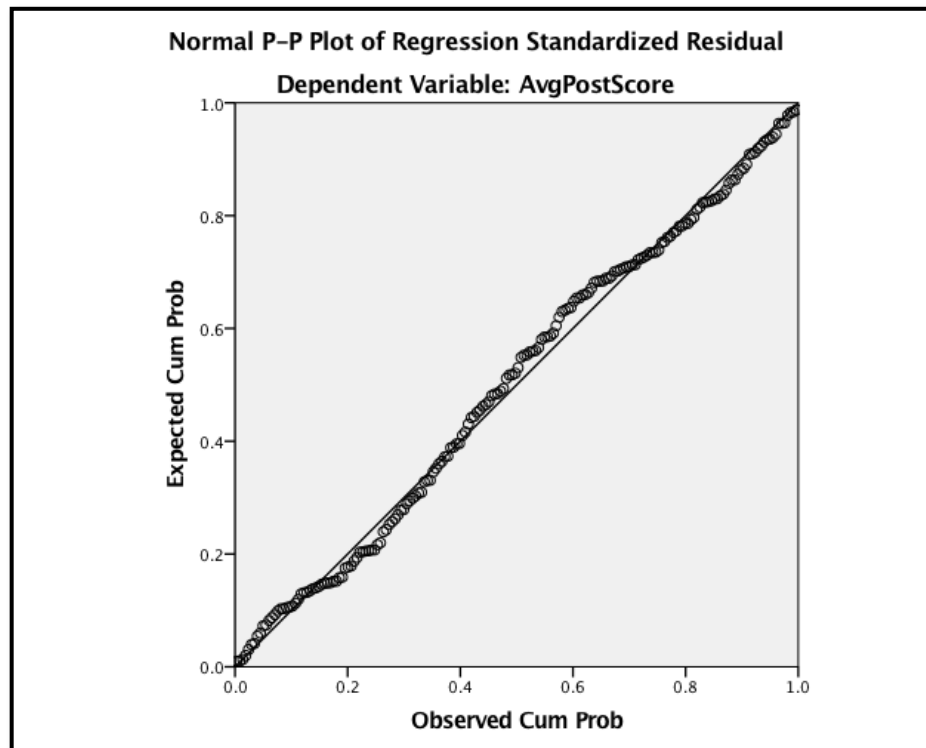
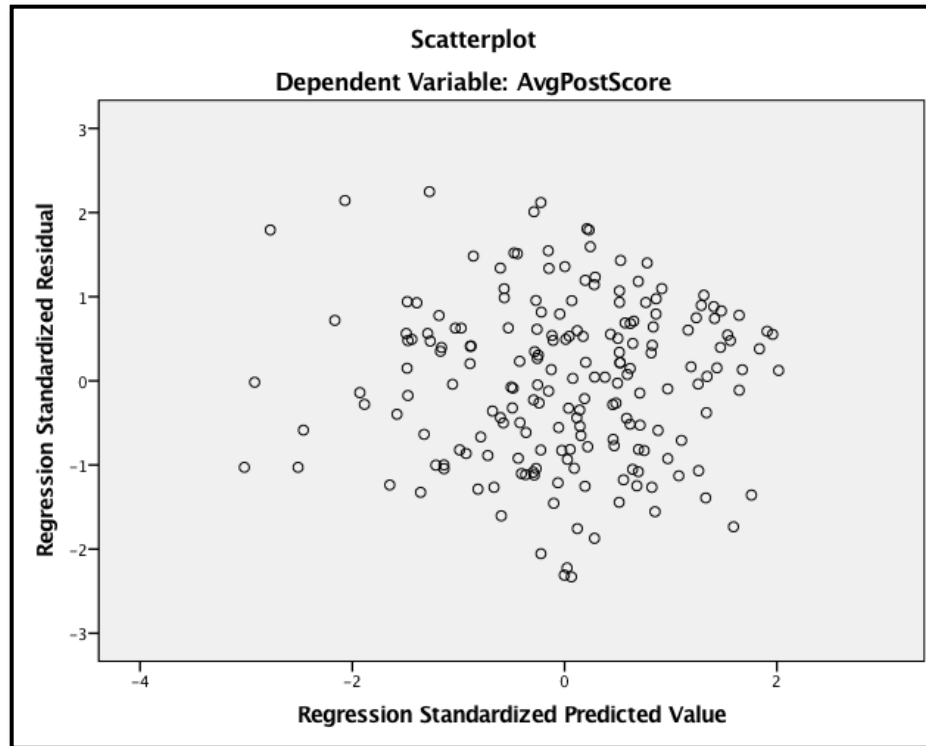
(Table 10 continued)

LTSI Factors	TEPE	POE	Supervisor Support	Supervisor Opposition	Peer Support	Personal Outcomes Positive	Personal Outcomes Negative	Performance Coaching
Content Validity								
Transfer Design								
Personal Capacity								
Opportunity to Use								
Motivation to Transfer								
Learner Readiness								
Performance Self-Efficacy								
Transfer Effort Performance Expectations (TEPE)								
Performance Outcome Expectations (POE)	.581**							
Supervisor Support	.267**	.354**						
Supervisor Opposition	-.340**	-.296**	-.141*					
Peer Support	.417**	.487**	.436**	-.238**				
Personal Outcomes Positive	.584**	.570**	.301**	-.311**	.482**			
Personal Outcomes Negative	-.01	-0.02	.10	.157*	.152*	.07		
Performance Coaching	.330**	.304**	.399**	-.06	.413**	.238**	.04	
Openness to Change	.157*	.150*	.235**	-.300**	.196**	.10	.02	.06

\*  $p < .05$ , two-tailed. \*\* $p < .01$ , two-tailed.

## APPENDIX E: DIAGNOSTIC PLOTS





## VITA

Vicky Katsiolouides holds a Bachelor of Arts in Psychology from West Chester University and a Master of Science in Social and Organizational Psychology from the London School of Economics and Political Science. Her passion for lifelong learning and her work in the field of training and development motivated her to pursue a doctoral degree in Human Resource Education and Workforce Development under the guidance of Dr. Elwood Holton and Dr. Reid Bates. During her doctoral studies she had the opportunity to teach courses in leadership development and human resource development. She is actively involved in the Academy of Human Resource Development and the Academy of Management as a presenter and reviewer. Her current research interests include training transfer, leadership development, and female entrepreneurship. She is co-author of an article published in *The Leadership Quarterly* and has other articles forthcoming. Vicky has extensive experience in the training and development field and has worked in diverse cultural settings including Cyprus, Greece, the United Kingdom, and the United States.