# Development of a Generalized Learning Transfer System Inventory

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*This study expands on the concept of the learning transfer system and reports on the validation of an instrument to measure factors in the system affecting transfer of learning. The Learning Transfer System Inventory (LTSI) was developed and administered to 1,616 training participants from a wide range of organizations. Exploratory common factor analysis revealed a clean interpretable factor structure of sixteen transfer system constructs. Second-order factor analysis suggested a three-factor higher order structure of climate, job utility, and rewards. The instrument development process, factor structure, and use of the LTSI as a diagnostic tool in organizations are discussed.*

An accountant returns from a training program and reports to his colleagues that there is no way this new system will work in their culture. A woman begins to implement a model of leadership she recently learned at a training session and her supervisor criticizes her "new way of doing things." In these examples, neither training program produced positive job performance changes, but these employees were not struggling with or complaining about the training they had attended. Rather, the challenges they faced arose when they turned their attention to transferring their new learning to on-the-job performance. The outcome for both of these employees was most likely frustration, confusion, and a diminished opportunity to implement improved ways of doing their work.

This problem is only magnified when one analyzes recent statistics, which indicate that investment in training activities aimed at improving employees' job performance represents a huge financial expenditure in the United States. In 1997 organizations with more than one hundred employees were estimated

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to have spent $58.6 billion in direct costs on formal training (Lakewood Research, 1997). With the inclusion of indirect costs, informal on-the-job training, and costs incurred by smaller organizations, total training expenditures could easily reach $200 billion or more annually. Of this expenditure, as little as 10 percent is projected to pay off in performance improvements resulting from the transfer of learned knowledge, skills, and abilities to the job (Baldwin and Ford, 1988). Although the exact amount of transfer is unknown, the transfer problem is believed to be so pervasive that there is rarely a learning-performance situation in which such a problem does not exist (Broad and Newstrom, 1992)—and the ultimate negative effect on individuals and organizations is clear.

Learning and transfer of learning are critical outcomes in HRD. Research during the last ten years has demonstrated that transfer of learning is complex and involves multiple factors and influences (Noe and Schmitt, 1986; Baldwin and Ford, 1988; Rouiller and Goldstein, 1993; Ford and Weissbein, 1997; Holton, Bates, and Leimbach, 1997; Holton, Bates, Ruona, and Leimbach, 1998). Much of this research has focused on design factors (Noe and Schmitt, 1986), but significantly less has been done to understand how work environment factors influence transfer of training (Baldwin and Ford, 1988; Tannenbaum and Yukl, 1992).

Organizations wishing to enhance the return on investment from learning-training investments must understand all the factors that affect transfer of learning, and then intervene to improve factors inhibiting transfer. The first step in improving transfer is an accurate diagnosis of those factors that are inhibiting it. To date, no tool has emerged to conduct such a diagnosis. The lack of a well-validated and reasonably comprehensive set of scales to measure factors in the transfer system may be a key barrier to improving organizational transfer systems. The purpose of this study is to move toward the goal of a general transfer system instrument by (a) expanding the concept of the learning transfer system and (b) reporting on the construct validation of an instrument to measure factors affecting transfer of learning.

## Current State of Research on Transfer of Learning

The literature on transfer of learning has been largely concentrated in two areas. The first is important work to understand what transfer of learning is and what affects it. The second involves the measurement of transfer factors. A brief review of each area follows to provide a context for the current study.

***What Factors Affect Transfer of Learning?*** Although there are multiple definitions, it is generally agreed that transfer of learning involves the application, generalizability, and maintenance of new knowledge and skills (Ford and Weissbein, 1997). Since Baldwin and Ford (1988), researchers have generally viewed transfer as being affected by a system of influences. In their model it is seen as a function of three sets of factors: trainee characteristics, including ability, personality, and motivation; training design, including a strong transfer design and appropriate content; and the work environment, including support and opportunity to use (Baldwin and Ford, 1988).

Research into trainee characteristics has identified a wide range of cognitive, psychomotor, and physical ability constructs that may influence transfer task performance. Fleishman and Mumford (1989), for example, have developed a set of fifty descriptor constructs for ability characteristics that influence task performance. General cognitive ability has been extensively studied and shown to be a reliable predictor of job and training performance (Hunter, 1986). Specific personality traits such as locus of control (Kren, 1992) and job attitudes like job involvement (Noe and Schmitt, 1986) and organizational commitment (Mathieu and Zajac, 1990) have been linked to training-related motivation.

Research on design factors suggests designing training tasks to be similar to transfer tasks (Goldstein and Musicante, 1986). In addition, including behavioral modeling elements (Gist, Schwoerer, and Rosen, 1989), self-management, and relapse prevention strategies (Wexley and Nemeroff, 1975) in training is likely to enhance transfer. Finally, ensuring that training content is consistent with job requirements (Bates, Holton, and Seyler, 1998) can positively influence transfer.

Research done to understand how work environment factors influence transfer of training has been limited (Baldwin and Ford, 1988; Tannenbaum and Yukl, 1992). Most recent attention has been focused on how work environment factors affect the transfer of learning to the job through a transfer-of-training climate. Transfer climate is seen as a mediating variable in the relationship between the organizational context and an individual's job attitudes and work behavior. Thus, even when learning occurs in training, the transfer climate may either support or inhibit application of learning on the job (Mathieu, Tannenbaum, and Salas, 1992). Several studies have established that transfer climate can significantly affect an individual's ability and motivation to transfer learning to job performance (Huczynski and Lewis, 1980; Rouiller and Goldstein, 1993; Tracey, Tannenbaum, and Kavanaugh, 1995; Tziner, Haccoun, and Kadish, 1991; Xiao, 1996). Although many authors support the importance of transfer climate—some stating that it may even be as important as training itself (Rouiller and Goldstein, 1993)—there is still not a clear understanding of what constitutes an organizational transfer climate (Tannenbaum and Yukl, 1992).

More broadly, there is not a clear consensus on the nomological network of factors affecting transfer of learning in the workplace. Transfer climate is but one set of factors that influences transfer, though the term is sometimes incorrectly used to refer to the full set of influences. Other influences on transfer include training design, personal characteristics, opportunity to use training, and motivational influences. We prefer to use *transfer system,* which we define as all factors in the person, training, and organization that influence transfer of learning to job performance. Thus, the transfer system is a broader construct than transfer climate but includes all factors traditionally referred to as transfer climate. For example, the validity of the training content is part of the system of influences that affects transfer but is not a climate construct. Transfer can only be completely understood and predicted by examining the entire system of influences.

***Measuring Factors Affecting Transfer.*** Another key challenge facing HRD professionals is that a wide variety of measures have been used to assess various factors affecting transfer. These measures range from single-item scales to quantify constructs to multiple-item content-validated but situation-specific scales. This raises several concerns. First, the tendency toward custom-designed scales for each study makes generalization of findings across studies questionable and conclusions about the latent construct structure of transfer climate difficult. Second, these studies often do not include factor analyses to validate hypothesized scale constructs. Third, some of the scales, particularly single-item measures, have questionable psychometric qualities. Not surprisingly, different studies have produced a variety of conclusions about the relationship between transfer system variables and performance, perhaps because of instrumentation differences.

Recently, Ford and Weissbein (1997) reviewed twenty empirical studies on transfer that have appeared in the literature since Baldwin and Ford (1988). To illustrate our point, we examined the measurement of transfer factors in those studies. First, nine of the studies were experimental where some aspect of training was manipulated and transfer measured, so they did not use any of the measures of the type on which we are focusing. In addition, one study (Warr and Bunce, 1995) focused on factors affecting motivation to learn, not on transfer factors, and another study (Smith-Jentsch, Jentsch, Payne, and Salas, 1996) used reported negative events, so no further measurement analysis was needed.

The remaining nine were quasi-experimental and employed some type of transfer factor measure. Examining them led to some interesting observations. First, each of the studies created new scales for their study. Only in one study (Tracey, Tannenbaum, and Kavanagh, 1995) was there any overlap with previously developed measures, as some of Rouiller and Goldstein's (1993) items were used.

Second, only three of the nine studies reported any type of standard content or construct validation procedures. Rouiller and Goldstein (1993) reported using rational clustering procedures and extensive content validation procedures but did not conduct factor analyses. The other two (Facteau and others,1995; Tracey, Tannenbaum, and Kavanagh, 1995) used factor analysis for construct validation. Thus, the other six studies reported no attempt to establish the content or construct validity of their measures.

The fact that transfer researchers have not used acceptable scale development procedures is a significant problem. Without minimally validated scales, the chance for substantive misspecification of models, misinterpretation of findings, and measurement error is significantly increased. We are not suggesting that previous research was flawed but that transfer research is at a stage where researchers need to move to more rigorously developed and consistent measures of transfer variables.

## Purpose of the Research

What is needed, and what should be an important goal for HRD research, is the development of a valid and generalizable set of transfer system scales. An established set of transfer system scales with validated constructs and known psychometric qualities would facilitate valid cross-study comparisons and add significantly to understanding the transfer process. In addition, it would facilitate transfer research by reducing or eliminating the need for redundant instrument design. Development of a general transfer system instrument would not preclude the addition of situation-specific scales. Rather, it would provide a foundation of validated constructs with established applicability across populations and settings. Research in organizational behavior, which produced a series of tested and generally accepted job attitude scales, provides a strong example of the value of such a goal.

From a broader perspective, defining and accurately measuring factors affecting transfer of training is important because it helps HRD move beyond the question of *whether* training works to *why* training works (Tannenbaum and Yukl, 1992). For example, without controlling for the influence of the transfer system, evaluation results are likely to vary considerably and yield erroneous conclusions about the causes of intervention outcomes (Holton, 1996). Having valid and reliable measures of the transfer system also has significant diagnostic potential: they can be used to identify when an organization is ready for a training intervention and provide information to guide pretraining interventions aimed at increasing training effectiveness. From a theoretical perspective, identifying and measuring dimensions of the work context that affect use of learned skills and behaviors provides a more complete conceptual framework of training effectiveness.

Earlier research (Holton, Bates, Seyler, and Carvalho, 1997a, 1997b), reported on an attempt to validate the transfer system constructs and instrument proposed by Rouiller and Goldstein (1993) through factor analysis. Significant differences were found in the construct structure that led us to conclude that Rouiller and Goldstein's constructs may not have been an appropriate basis for a generalized instrument. The Holton, Bates, Seyler, and Carvalho (1997a) study then factor-analyzed an expanded instrument incorporating several additional transfer system constructs. The nine-factor solution that emerged suggested the presence of additional transfer constructs and indicated that transfer constructs were perceived by individuals according to organizational referent as opposed to the psychological cues identified by Rouiller and Goldstein (1993).

This study continues this stream of research. The primary purpose of this article is to report on construct validation using factor analysis of an expanded version of the earlier instrument. The Learning Transfer System Inventory (LTSI) includes seven additional scales added after our previous efforts, for a total of sixteen scales. By adding those scales, the instrument now contains a more comprehensive set of constructs affecting the transfer of training. More specifically, this study addressed the following research questions:

RESEARCH QUESTION 1: *Will exploratory factor analysis of the Learning Transfer System Inventory (LTSI) result in an interpretable factor structure of latent transfer system constructs?*

RESEARCH QUESTION 2: *Will higher-order factor analysis of the Learning Transfer System Inventory (LTSI) result in an interpretable second-order factor structure of latent transfer system constructs?*

## Method

***Instrument Development.*** This study examines version 2 of the LTSI, which includes a pool of 112 items representing sixteen constructs. This instrument emerged from earlier research that produced version 1 of the instrument (see Holton, Bates, Seyler, and Carvalho, 1997a, for a complete report on the development of that instrument). Briefly, version 1 evolved from Rouiller and Goldstein's (1993) sixty-three-item instrument that was modified to fit the organization involved in the earlier study. Modification included deletion of fourteen items that were not appropriate for that organization; addition of seven items, constructed to represent an opportunity to perform construct that was not included in Rouiller and Goldstein's (1993) instrument; and addition of ten other items constructed to strengthen certain scales or to replace deleted items with ones more appropriate for that organization. These changes resulted in the testing of a sixty-six-item instrument.

Common factor analysis with oblique rotation identified nine constructs: supervisor support, opportunity to use, transfer design, peer support, supervisor sanction, personal outcomes-positive, personal outcomes-negative, change resistance, and content validity. All of them are consistent with transfer of workplace learning research. Four items were dropped, leaving a sixty-two-item instrument. Version 1 of the instrument has shown initial evidence of content, construct, and criterion validity (Bates, Holton, and Seyler, 2000; Seyler and others, 1998).

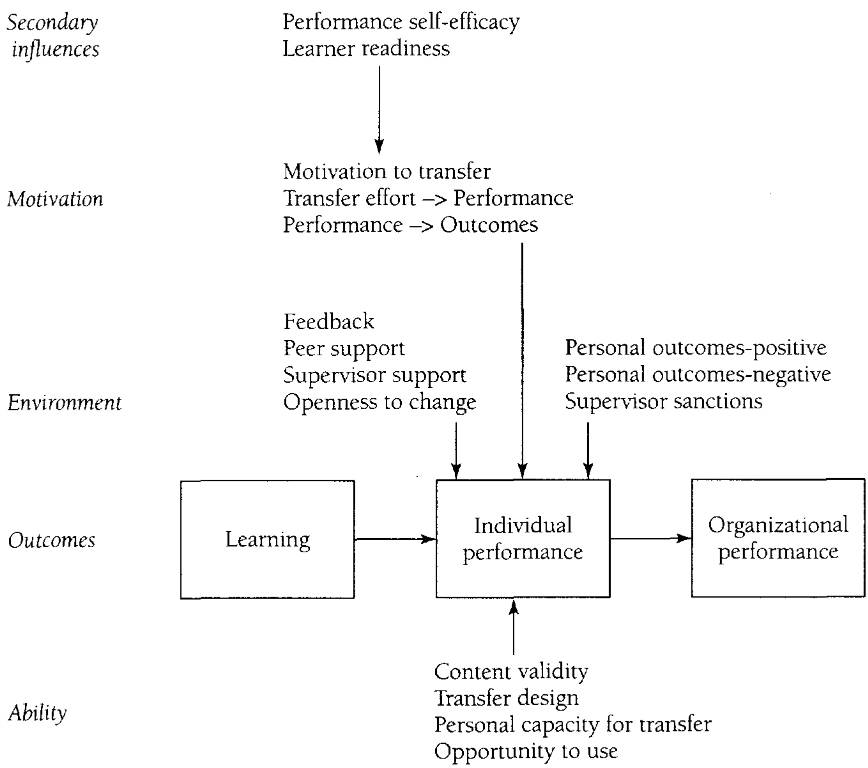
Version 1 was the foundation for the instrument developed in this study, which we will call version 2. Because version 1 had a disproportionate number of items across constructs (for example, twenty-three items measuring supervisor support), we first reduced the number of items by selecting only the highest loading items from its large scales.

Next, we used the HRD Research and Evaluation Model (Holton, 1996) as the theoretical framework to expand the constructs in the instrument. Following Noe and Schmitt (1986), the macrostructure of that model hypothesizes that HRD outcomes are a function of ability, motivation, and environmental influences at three outcome levels: learning, individual performance, and organizational performance. Secondary influences are also included, particularly those affecting motivation.

We first fit the nine constructs from version 1 into the theoretical framework. Then we searched the literature to identify other constructs that had not been included in version 1 and would fit in the theoretical frame. This led to the addition of important new constructs such as performance self-efficacy (Gist, 1987), expectancy-related constructs (transfer effort-performance and performance-outcomes), personal capacity for transfer (Ford, Quinones, Sego, and Sorra, 1992), feedback-performance coaching, learner readiness (Knowles, Holton, and Swanson, 1998), and general motivation to transfer.

Figure 1 shows how the complete set of transfer factors in this study fit in that model. It shows that scales were created to assess factors affecting trainees' ability to transfer learning, their motivation to transfer, and the transfer environment. Note that this figure is a subset of the larger model and only includes elements

**Figure 1. Learning Transfer System Inventory: Conceptual Model of Instrument Constructs**



affecting the transfer of learning to individual performance. The full model includes ability, motivation, environment, and secondary influence constructs for learning outcomes and organizational performance outcomes as well.

The instrument items were divided into two sections representing two construct domains. The first section contained seventy-six items measuring eleven constructs representing factors affecting the particular training program the trainee was attending. The instructions for this section directed respondents to "think about *this specific training program.*" Constructs included in this section were learner readiness, motivation to transfer, positive personal outcomes, negative personal outcomes, personal capacity for transfer, peer support, supervisor support, supervisor sanctions, perceived content validity, transfer design, and opportunity to use (which incorporates the physical environment).

Another thirty-six items measured five constructs. These constructs were less program-specific and represent more general factors that may influence any training program conducted. For these items, trainees were instructed to "think about *training in general* in your organization." Constructs in the second section included transfer effort-performance, performance-outcomes, openness to change, performance self-efficacy, and feedback-performance coaching.

Items were designed to measure individual perceptions of constructs, including individual perceptions of climate variables in some cases. Although climate often refers to group-level shared interpretation of organizations, it can also be an individual-level construct, often referred to as psychological climate. James and McIntyre (1996) noted that it is important to study climate from the individual perspective because people perceive particular climates differently and respond in terms of how they perceive them. Chan's (1998) typology of composition models emphasizes that there are multiple approaches to aggregating group data, depending on the desired interpretation. Because transfer of learning refers to *individual behaviors* resulting from learning, it is most appropriate to assess *individual perceptions* of transfer climate because it is those perceptions that will shape the individual's behavior. Nonclimate constructs are also measured at the individual perception level for the same reasons.

***Sample.*** The LTSI was administered to 1,616 people in a wide variety of organizations and training programs (see Table 1). Questionnaires were administered to respondents at the conclusion of a training program. Completion of the survey was voluntary. Because responses were anonymous, it was not possible to track and compare relevant characteristics of nonrespondents with individuals who completed the questionnaire.

Because the purpose of this research program was to develop a generalized instrument that could be used across a wide range of training programs and organizations, the sample was deliberately chosen to be as heterogeneous as possible. It included respondents from a variety of industries, including shipping, power, computer-precision manufacturing, insurance, chemical, industrial tool–construction, nonprofits, and municipal and state governments. The municipal and state government classes were offered by a central training

**Table 1. Selected Demographics**

| *Organization Type* | *n* | *Percentage* | *Training Type* | *n* | *Percentage* |
|---|---|---|---|---|---|
| Government | 676 | 41.8 | Technical skills | 544 | 33.7 |
| State (175) | | | Sales/Customer service | 434 | 26.9 |
| Local (501) | | | Volunteer management | 192 | 11.9 |
| For-profit organization | 432 | 26.7 | Leadership/Management | 175 | 10.8 |
| Nonprofit organization | 192 | 11.9 | Professional skills | 80 | 5.0 |
| Public training classes (mostly for-profit) | 316 | 19.6 | Supervisory skills | 67 | 4.1 |
| | | | Clerical | 62 | 3.8 |
| | | | Communication | 44 | 2.7 |
| | | | Computer | 18 | 1.1 |
| Total | 1616 | | Total | 1616 | |

organization, so the classes included representatives from a wide variety of agencies and functions.

A wide range of employees attended the various training programs. These included secretaries, manufacturing operators, technicians, engineers, managers, professionals, salespeople, and law enforcement personnel. The training programs covered a wide variety of topics including sales, safety, volunteer management, project management, computer and technical skills, quality science, emergency medicine education, and various classes related to leadership, middle management, and supervision.

***Analysis: Research Question 1.*** A central question for researchers developing instruments is whether to use exploratory (EFA) or confirmatory factor analysis (CFA). Unfortunately, there are no generally accepted decision rules and there is continuing discussion about appropriate use of the two methods (Crowley and Fan, 1997; Holloway, 1995; Hurley and others, 1997). Generally, CFA is driven by specification of a theoretically grounded structure of hypothesized latent variables and indicators. As such, it requires the presence of strong theory. EFA, in contrast, makes no such presumption, even though items may have been derived from some conceptual framework. In its purest form, EFA makes no assumptions about the number of factors. In practice, CFA becomes exploratory when models are re-specified, and EFA may be confirmatory when it is used to confirm loosely constructed models underlying data. Anderson and Gerbing (1988) suggest that the two might be better viewed as an ordered progression. Bentler and Chou (1987) take a stronger position, suggesting that the measurement model in CFA should be based on well-known exploratory factor analysis.

EFA was determined to be the best method at this stage from several perspectives. From a theoretical perspective, no strong theory exists in the general transfer literature. Although a conceptual model was used to guide instrument development, the model had not yet been tested. From a statistical perspective, the following reasons also support the use of EFA at this stage:

- EFA is considered more appropriate in early stages of scale development because CFA does not show cross-loadings on other factors (Kelloway, 1995).
- EFA may be more appropriate for scale development (Hurley and others, 1997).
- EFA provides a more direct picture of dimensionality (Hurley and others, 1997).
- The use of modification indices to alter models is an exploratory use of CFA and is not without controversy (Anderson and Gerbing, 1988) and may not be appropriate (Williams, 1995).
- The use of maximum likelihood estimates for exploratory analysis may result in biased parameter estimates (Brannick, 1995).

We chose to take the longer but more thorough path of beginning with exploratory analysis, followed by future confirmatory studies.

The EFA approach used here was common factor analysis because it is more appropriate than principal components analysis when the objective is to identify latent structures, rather than for pure prediction (Nunnally and Bernstein, 1994). An oblique rotation was used because it is also more appropriate for latent variable investigation when latent variables are expected to have some correlation (Hair, Anderson, Tatham, and Black, 1998).

Construct validation has traditionally consisted of establishing convergent and divergent validity with other constructs through correlational studies. More recently, factor analysis has been recognized as "a powerful and indispensable method of construct validation" (Kerlinger, 1986, p. 427) that "is at the heart of the measurement of psychological constructs" (Nunnally and Bernstein, 1994, p. 111). The combination of common factor analysis with subsequent convergent and divergent validity studies results in a more complete construct validation.

The items in the two sections of the instrument represented two distinct construct domains: program-specific transfer constructs and general transfer constructs. They were therefore factor-analyzed separately with seventy-six items pertaining to the specific training program in one pool, and thirty-six items pertaining to the general transfer constructs in the second pool. The large sample (1,616) resulted in a respondent-to-item ratio of 21.3:1 for specific training items and 44.9:1 for the general items. Generally a ratio of between 5:1 to 10:1 is desirable (Hair, Anderson, Tatham, and Black, 1998). This sample would therefore be considered to have strong respondent-to-item ratios.

***Analysis: Research Question 2.*** A second-order factor analysis was conducted to address research question 2. When first-order factors are allowed to correlate, as is the case with oblique rotations, the possibility exists that one or more higher-level general factors exist (Gorsuch, 1997b). Second-order factors are generally neither widely used nor well understood. First-order factors provide a close-up, detailed view of the data structure. Second-order factors provide a more general view of the constructs. Both offer useful insights into the conceptual structure of the construct domain being studied (Gorsuch, 1983; Thompson, 1990).

Gorsuch (1997a, 1983) cautions that interpretations of second-order factors are often based on first-order factor labels, which are interpretations of instrument items. The effect of this common practice is to create interpretations of interpretations, a practice that is risky at best. He proposed several strategies to relate the higher-order factors to the original instrument items, including using procedures proposed by Schmid and Leiman (1957).

More recently, he recommends that higher-order factors be interpreted by their relationships to the original instrument items by extension analysis (Gorsuch, 1997a) and has moved away from using the Schmid-Leiman procedure (R. Gorsuch, personal communication, July 20, 1998). According to Gorsuch (1997a), extension analysis is a procedure used to determine the relationship between variables not being factored with the higher-order factors when those variables potentially share some variance with the factors. If they do, the simple correlation between the variable and the factor will be inflated and thus is inappropriate to use. In the case of higher-order factor analysis, the second-order factor is derived from the first-order factors that were derived from the items. Thus, when the second-order factors are correlated with the original items, they will share covariance that will lead to inflated correlations. The second-order factors and items may also share variance with some other factor outside the data, also inflating their correlation. Extension analysis reduces the correlation to the covariance that the first-order factors and the original items both share with the second-order factors. Gorsuch (1997a, 1990) offers new procedures and software that improves on traditional extension analysis.

After the initial exploratory analysis for research question 1 using SPSS, the items were analyzed to determine the most appropriate set of items to retain for each factor. Factor loadings, reliabilities, and theoretical consistency were examined. The item-level data for the remaining items were entered into Gorsuch's computer program *UniMult* (Gorsuch, 1990) to conduct the second-order factor analysis and extension analysis because it is the only program that uses his recommended procedures. Common factor analysis with oblique rotation (promax) was used for the second-order factor analysis.

## Results

***Research Question 1.*** EFA resulted in an exceptionally clean and interpretable sixteen-factor structure that closely resembled that of the hypothesized factors (see Table 2). The average loading on the major factor was .62 with only a .05 average loading on nonmajor factors. Cronbach alpha reliabilities ranged from .63 to .91, with only three of the scales below .70 ($\alpha$ = .63, .68, and .69).

**Table 2. LTSI Factor Definitions and Descriptive Data**

| *Factor* | *Definition* | *Sample Item* | *Number Items* | $\alpha$ | *Average—Major Factor*[1] | *Average—Other Factors*[2] |
|---|---|---|---|---|---|---|
| *General Scales* | | | | | | |
| Learner readiness | The extent to which individuals are prepared to enter and participate in training | Before the training I had a good understanding of how it would fit my job-related development. | 4 | .73 | .64 | .04 |
| Motivation to transfer | The direction, intensity, and persistence of effort toward utilizing in a work setting skills and knowledge learned | I get excited when I think about trying to use my new learning on my job | 4 | .83 | .65 | .04 |
| Positive personal outcomes | The degree to which applying training on the job leads to outcomes that are positive for the individual | Employees in this organization receive various "perks" when they utilize newly learned skills on the job | 3 | .69 | .56 | .05 |
| 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 | If I do not utilize my training I will be cautioned about it | 4 | .76 | .65 | .04 |
| 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 to the job | My workload allows me time to try the new things I have learned | 4 | .68 | .56 | .04 |
| Peer support | The extent to which peers reinforce and support use of learning on the job | My colleagues encourage me to use the skills I have learned in training | 4 | .83 | .66 | .04 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Supervisor support | The extent to which supervisors-managers support and reinforce use of training on the job | My supervisor sets goals for me that encourage me to apply my training on the job | 6 | .91 | .75 | .04 |
| Supervisor sanctions | The extent to which individuals perceive negative responses from supervisors-managers when applying skills learned in training | My supervisor opposes the use of the techniques I learned in training | 3 | .63 | .46 | .06 |
| Perceived content validity | The extent to which trainees judge training content to reflect job requirements accurately | What is taught in training closely matches my job requirements | 5 | .84 | .58 | .05 |
| Transfer design | The degree to which (1) training has been designed and delivered to give trainees the ability to transfer learning to the job, and (2) training instructions match job requirements | The activities and exercises the trainers used helped me know how to apply my learning on the job | 4 | .85 | .70 | .03 |
| 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 | The resources I need to use what I learned will be available to me after training | 4 | .70 | .54 | .06 |
| Transfer effort—performance expectations | The expectation that effort devoted to transferring learning will lead to changes in job performance | My job performance improves when I use new things that I have learned | 4 | .81 | .65 | .05 |
| Performance-outcomes expectations | The expectation that changes in job performance will lead to valued outcomes | When I do things to improve my performance, good things happen to me | 5 | .83 | .65 | .06 |

*(Continued)*

Table 2. LTSI Factor Definitions and Descriptive Data (*Continued*)

| *Factor* | *Definition* | *Sample Item* | *Number Items* | $\alpha$ | *Average—Major Factor*[1] | *Average—Other Factors*[2] |
|---|---|---|---|---|---|---|
| *General Scales* | | | | | | |
| Resistance-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 | People in my group are open to changing the way they do things | 6 | .85 | .70 | .04 |
| Performance self-efficacy | An individual's general belief that he is able to change his performance when he wants to | I am confident in my ability to use newly learned skills on the job | 4 | .76 | .58 | .08 |
| Performance coaching | Formal and informal indicators from an organization about an individual's job performance | After training, I get feedback from people about how well I am applying what I learned | 4 | .70 | .56 | .08 |

[1]Average of the factor loadings for items loading on this factor (for example, the major factor)

[2]Average of the factor loadings for these items on factors other than the major factor (that is, the average cross-loading)

*Note:* The full version of the instrument is not provided because research on the instrument is continuing. Researchers who wish to use the instrument may obtain the full instrument from the first author.

As might be expected from an early stage instrument, a number of items did not load on any factor, others loaded weakly, and some loaded on different factors than hypothesized. Ultimately, sixty-eight items were retained in the final instrument, assessing sixteen constructs. Table 3 shows factor loadings for items retained in the instrument. Cross-loadings less than .20 have been deleted from the table for clarity, showing that very few items had any substantial cross-loading.

*Training-Specific Scales.* Kaiser's measure of sampling adequacy (MSA) for the data set, a measure of the data set's appropriateness for factor analysis, was .94. All but ten of the items had an MSA above .90, and none were below .80. Because overall MSA values above .90 and item MSAs above .80 are considered appropriate for factor analysis (Hair, Anderson, Tatham, and Black, 1998), no items were deleted. Initial examination of the eigenvalues greater than 1 suggested the presence of fourteen factors, but three of them were uninterpretable due to weak factor loadings. The remaining eleven factors, capturing 54.2 percent of the variance, corresponded approximately to the hypothesized factors, although a number of items did not load on the factors as expected. Names, definitions, sample item, and reliabilities for each factor are also shown in Table 2.

Using a conservative cutoff for factor loadings of .40 along with reliability analysis led to 68 items being retained. Most had acceptable reliability, though one scale, supervisor sanctions ($\alpha = .63$), was substantially below the .70 minimum recommended by Nunnally and Bernstein (1994) for early stage instruments. Two other scales, positive personal outcomes ($\alpha = .69$) and personal capacity for transfer ($\alpha = .68$) were closer to .70.

*General Scales.* Kaiser's measure of sampling adequacy (MSA) for the data set was .926, indicating it was suitable for factor analysis. Seven of the items had an MSA above .80 and the rest were above .90, so none were deleted. Initial examination of the eigenvalues greater than 1 suggested the presence of six factors but one was uninterpretable. The sixth factor included only two items loading above .40 and consisted of negatively worded items designed as part of the transfer effort–performance scale. Given questionable factor loadings, and the possibility that the items simply reflected response errors, this factor was dropped.

The remaining five factors corresponded approximately to the hypothesized factors, though a number of items did not load on the expected factors. Names, definitions, sample item, and reliabilities for each factor are also shown in Table 2. Using a somewhat conservative cutoff for factor loadings of .40 along with reliability analysis led to twenty-three items being retained. All had acceptable reliability.

Table 4 shows the interfactor correlations. Only a few correlations exceeded .30, further emphasizing the conceptual distinction between the factors.

**Table 3. Partial Factor Table with Loadings for Items Retained and Cross-Loadings > .20**

| | *Training Specific Scales* | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| *Item#* | *Content Validity* | *Supervisor/Mgr. Support* | *Pers. Outcomes-Positive* | *Pers. Outcomes-Negative* | *Learner Readiness* | *Peer Support* | *Pers. Capacity for Transfer* | *Supervisor-Mgr. Sanctions* | *Opportunity to Use Learning* | *Transfer Design* | *Motivation to Transfer Learning* |
| 63 | 71 | | | | | | | | | | |
| 64 | 63 | | | | | | | | | | |
| 60 | 58 | | | | | | | | | | |
| 59 | 51 | | | | | | | | | | |
| 71 | 47 | | | | | | | | | −25 | |
| 44 | | 80 | | | | | | | | | |
| 43 | | 75 | | | | | | | | | |
| 50 | | 75 | | | | | | | | | |
| 49 | | 73 | | | | | | | | | |
| 53 | | 73 | | | | | | | | | |
| 47 | | 71 | | | | | | | | | |
| 46 | | 70 | | | | | | | | | |
| 21 | | | 62 | | | | | | | | |
| 11 | | | 61 | | | | | | | | |
| 26 | | | 45 | 28 | | | | | | | |

| | *General Scales* | | | | |
|---|---|---|---|---|---|
| | 12 | 13 | 14 | 15 | 16 |
| *Item #* | *Perf. Outcomes Expect.* | *Resistance to Change* | *Performance Self-Efficacy* | *Performance Coaching* | *Transfer Effort-Perf. Expect* |
| 80 | 75 | | | | |
| 81 | 66 | | | 21 | |
| 90 | 65 | | | | |
| 85 | 61 | | | | |
| 77 | −57 | | | | |
| 97 | | 85 | | | |
| 95 | | −74 | | | |
| 96 | | 73 | | | |
| 98 | | −69 | | | |
| 92 | | 62 | | | |
| 93 | | 59 | | | |
| 102 | | | −69 | | |
| 101 | | | −59 | | 21 |
| 103 | | | −50 | | |
| 99 | | | −47 | | 40 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 31 | | 79 | | | | | | | 106 | | 68 | |
| 29 | | 75 | | | | | | | 111 | | 55 | |
| 32 | | 58 | | | | | | | 107 | | 54 | |
| 18 | | 49 | | | | | | | 100 | 23 | 48 | |
| 19 | | | 79 | | | | | | 79 | | | 72 |
| 15 | | | 67 | | | | | | 78 | | | 64 |
| 5 | | | 67 | | | | | | 86 | | | 64 |
| 23 | | | 43 | | | | | −29 | 84 | | | 61 |
| 37 | | | | 80 | | | | | | | | |
| 36 | | | | 75 | | | | | | | | |
| 41 | | | | 59 | | | | | | | | |
| 42 | | | | 51 | | | | | | | | |
| 33 | | | | | 71 | | | | | | | |
| 28 | | | | | 71 | | | | | | | |
| 34 | | | | | 43 | | | | | | | |
| 35 | | | | | 40 | | | | | | | |
| 55 | | | | | | 53 | | | | | | |
| 48 | −22 | | | | | 43 | | | | | | |
| 54 | | | | | | 42 | | | | | | |
| 75 | | | | | | | −64 | | | | | |
| 73 | | | | | | | −64 | | | | | |
| 70 | | | | | | | 45 | 25 | | | | |
| 72 | | | | | | | 41 | | | | | |
| 68 | | | | | | | | −88 | | | | |
| 69 | | | | | | | | −78 | | | | |

*(Continued)*

**Table 3. Partial Factor Table with Loadings for Items Retained and Cross-Loadings > .20 (*Continued*)**

| | Training Specific Scales | | | | | | | | | | | | General Scales | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *1* | *2* | *3* | *4* | *5* | *6* | *7* | *8* | *9* | *10* | *11* | | *12* | *13* | *14* | *15* | *16* |
| *Item#* | *Content Validity* | *Supervisor/Mgr. Support* | *Pers. Outcomes-Positive* | *Pers. Outcomes-Negative* | *Learner Readiness* | *Peer Support* | *Pers. Capacity for Transfer* | *Supervisor-Mgr. Sanctions* | *Opportunity to Use Learning* | *Transfer Design* | *Motivation to Transfer Learning* | *Item #* | *Perf. Outcomes Expect.* | *Resistance to Change* | *Performance Self-Efficacy* | *Performance Coaching* | *Transfer Effort-Perf. Expect* |
| 67 | | | | | | | | | | −65 | | | | | | | |
| 66 | | | | | | | | | | −50 | | | | | | | |
| 8 | | | | | | | | | | | −69 | | | | | | |
| 7 | | | | | | | | | | | −69 | | | | | | |
| 6 | | | | | | | | | | | −64 | | | | | | |
| 9 | | | | | | | | | | | −60 | | | | | | |
| Eigenvalues: | | | | | | | | | | | | | | | | | |
| | 15.6 | 5.5 | 3.9 | 3.1 | 2.3 | 2.1 | 1.9 | 1.6 | 1.4 | 1.3 | 1.1 | | 8.9 | 2.9 | 2.5 | 1.8 | 1.6 |

**Table 4. Interfactor Correlations**

| *Specific Scales* | *1* | *2* | *3* | *4* | *5* | *6* | *7* | *8* | *9* | *10* | *11* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Learner readiness | 1.00 | | | | | | | | | | |
| 2. Motivation to transfer | .15 | | | | | | | | | | |
| 3. P O positive | −.05 | −.25 | | | | | | | | | |
| 4. P O negative | −.16 | .05 | .20 | | | | | | | | |
| 5. Personal capacity | .22 | .26 | .00 | −.06 | | | | | | | |
| 6. Peer support | .25 | .28 | −.03 | −.17 | .25 | | | | | | |
| 7. Supervisor support | −.17 | −.17 | .28 | .19 | −.24 | −.31 | | | | | |
| 8. Supervisor sanctions | .11 | −.05 | .12 | .04 | .14 | .21 | −.20 | | | | |
| 9. Content validity | −.30 | −.33 | −.02 | .12 | −.30 | −.30 | .24 | −.10 | | | |
| 10. Transfer design | .19 | .43 | −.02 | .05 | .22 | .31 | −.11 | .00 | −.48 | | |
| 11. Opportunity to use | −.14 | −.22 | −.02 | −.10 | −.40 | −.25 | .15 | −.26 | .29 | −.31 | |

| *General Scales* | *12* | *13* | *14* | *15* | *16* |
|---|---|---|---|---|---|
| 12. Transfer effort performance expectations | 1.00 | | | | |
| 13. Performance outcome expectations | .41 | | | | |
| 14. Resist/open to change | −.15 | −.37 | | | |
| 15. Performance self-efficacy | −.24 | −.14 | .28 | | |
| 16. Performance coaching | .34 | .47 | −.31 | −.15 | |

This analysis confirms the importance of using EFA in early stages of instrument development. Although the hypothesized factor structure was ultimately supported, significant modification to the measurement model was necessary. CFA also could have missed the items that loaded on different factors.

***Research Question 2.*** The second-order factor analysis was also conducted in two sets: training-specific scales and general scales. After the initial exploratory analysis for research question 1, the items were analyzed to determine the most appropriate set of items to retain for each factor. Factor loadings, reliabilities, and theoretical consistency were examined. In total, forty-four items were dropped, leaving sixty-eight items measuring the sixteen constructs in the LTSI.

*Training-Specific Scales.* The initial second-order factor analysis indicated that three second-order factors had an eigenvalue greater than 1 (4.83, 1.64, 1.15), suggesting a three-factor solution. However, closer examination of the factor loadings showed that five of the eleven scales had substantial cross-loadings, with three of them greater than .30. In addition, two of the factors were correlated at .68. Together these facts suggested that the three-factor solution was not the most interpretable solution. The four-factor solution was also examined because the eigenvalue for the fourth factor was .99. However, the four-factor solution did not improve interpretability. Five of the factors had substantial cross-loadings, one of the factors had only a single-scale loading on it, and two of the factors were correlated at .70.

The two-factor solution offered the cleanest solution. The factor loadings are shown in Table 5. Eight scales loaded cleanly on the first and largest factor: opportunity to use learning, transfer design, content validity, personal capacity for transfer, peer support, learner readiness, supervisor-manager sanctions, and motivation to transfer learning. Two scales loaded cleanly on the second factor: personal outcomes-positive and personal outcomes-negative. One scale, supervisor support, cross-loaded between the two factors, loading slightly heavier on the first factor (.45 vs. 39). The two factors were only correlated at .37.

As discussed earlier, interpretation and labeling of these factors must be done after examining the correlations with the original items that produced the first-order factors. Extension analysis (Gorsuch, 1997a) produced the adjusted correlations shown in Table 6 between the original items and the second-order factors. These correlations include only the covariance that the first-order factors and the items share with the second-order factors, and not with each other. For the first factor, the largest correlations were found for items used in the content validity, opportunity to use learning, transfer design, peer

**Table 5. Second-Order Factor Loadings: Training-Specific Scales**

| | *Second-Order Factor* | |
|---|---|---|
| | *1* | *2* |
| *First-Order Factor* | *Job Utility* | *Rewards* |
| 8. Opportunity to use learning | −87 | 24 |
| 1. Transfer design | 86 | −06 |
| 9. Content validity | 74 | −11 |
| 5. Personal capacity for transfer | 72 | −04 |
| 6. Peer support | 62 | 26 |
| 7. Learner readiness | 62 | 13 |
| 10. Supervisor/Manager sanctions | −62 | 11 |
| 4. Motivation to transfer learning | 54 | 15 |
| 2. Supervisor/Manager support | 45 | 39 |
| 11. Personal outcomes-positive | −23 | 74 |
| 3. Personal outcomes-negative | −07 | 67 |
| Eigenvalue | 4.83 | 1.64 |

**Table 6. Correlations Between Items and Second-Order Factors for Training-Specific Scales**

| *Item #* | *First-Order Factor* | *Adjusted Correlation w/ Second-Order Factor Job Utility* | *Adjusted Correlation w/ Second-Order Factor Rewards* |
|---|---|---|---|
| 60 | 9-Content validity | .64 | .19 |
| 64 | 9-Content validity | .63 | .24 |
| 71 | 9-Content validity | .63 | .15 |
| 63 | 9-Content validity | .60 | .17 |
| 70 | 8-Opportunity to use learning | .58 | .13 |
| 72 | 8-Opportunity to use learning | .57 | .08 |
| 67 | 1-Transfer design | .57 | .14 |
| 66 | 1-Transfer design | .56 | .17 |
| 41 | 6-Peer support | .56 | .37 |
| 37 | 6-Peer support | .54 | .39 |
| 59 | 9-Content validity | .53 | .16 |
| 36 | 6-Peer support | .52 | .37 |
| 8 | 4-Motivation to transfer learning | .52 | .21 |
| 69 | 1-Transfer design | .50 | .06 |
| 68 | 1-Transfer design | .49 | .08 |
| 42 | 6-Peer support | .48 | .30 |
| 33 | 5-Personal capacity for transfer | .48 | .22 |
| 28 | 5-Personal capacity for transfer | .48 | .19 |
| 55 | 10-Supervisor/Manager sanctions | −.43 | −.10 |
| 15 | 7-Learner readiness | .42 | .20 |
| 6 | 4-Motivation to transfer learning | .41 | .18 |
| 7 | 4-Motivation to transfer learning | .41 | .31 |
| 34 | 4-capacity for transfer | −.40 | .01 |
| 48 | 10-Supervisor/Manager sanctions | −.40 | −.14 |
| 23 | 7-Learner readiness | .37 | .20 |
| 54 | 10-Supervisor/Manager sanctions | −.29 | −.04 |
| 5 | 7-Learner readiness | .27 | .17 |
| 19 | 7-Learner readiness | .27 | .16 |
| 35 | 5-Personal capacity for transfer | −.21 | .01 |
| 44 | 2-Supervisor/Manager support | .47 | .50 |
| 43 | 2-Supervisor/Manager support | .43 | .48 |
| 49 | 2-Supervisor/Manager support | .41 | .45 |
| 47 | 2-Supervisor/Manager support | .48 | .43 |
| 53 | 2-Supervisor/Manager support | .46 | .43 |
| 50 | 2-Supervisor/Manager support | .43 | .40 |
| 21 | 11-Personal outcomes-positive | .18 | .56 |
| 26 | 11-Personal outcomes-positive | .03 | .50 |
| 11 | 11-Personal outcomes-positive | .19 | .48 |
| 9 | 11-Personal outcomes-positive | .40 | .34 |
| 31 | 3-Personal outcomes-negative | .11 | .50 |
| 32 | 3-Personal outcomes-negative | .29 | .48 |
| 29 | 3-Personal outcomes-negative | .03 | .46 |
| 18 | 3-Personal outcomes-negative | −.04 | .35 |

support, and personal capacity for transfer scales. Items from the learner readiness, supervisor-manager sanctions, and motivation to transfer learning scales had more modest correlations. Close inspection of the items loading highest on this factor suggested that it was made up mostly of items referencing some aspect of *job utility*.

For the second factor, both items from personal outcomes-positive and personal outcomes-negative scales were correlated about the same. This second-order factor was labeled *rewards* because all items referred to the presence or absence of some valued outcome for use of learning.

Items from the supervisor support scale were correlated almost identically with both second-order factors. Clearly, a strong cross-loading such as this presents interpretation problems. However, close examination of the items suggested conceptual support for retaining this higher-order cross-loading as it indicates that a portion of supervisor support operates as a signal of job utility and a portion operates as a reward.

*General Scales.* The five first-order general factors were subjected to the same second-order factor analysis procedure. Only the first factor produced an eigenvalue greater than 1, and it was substantially higher than the second factor (3.08 versus .81), indicating that only one second-order factor was appropriate. This factor was labeled *climate*. Table 7 shows the variance explained ($R^2$) in the variable by the factor. All first-order factors except openness to change had more than 50 percent of the variance explained by the second-order factor.

## Discussion

This study identified and defined sixteen factors that affect transfer of learning using exploratory factor analysis. Eleven of the constructs represent factors affecting a specific training program, whereas five of them were classified as general factors because they are expected to affect all training programs. Scales developed to measure these sixteen constructs yielded exceptionally clean

**Table 7. Second-Order Factor $R^2$: General Scales**

| *First-Order Factor* | *Second-Order Factor $R^2$* *Climate* |
|---|---|
| 12-Transfer effort/Performance expectations | 54 |
| 14-Openness to change | 32 |
| 13-Performance-outcome expectancy | 62 |
| 15-Performance self-efficacy | 54 |
| 16-Performance coaching | 61 |
| Eigenvalue | 3.08 |

*Note:* Factor loadings for one-factor solutions are the variance explained ($R^2$) in the variable by the factor.

loadings and interpretable factors. Reliabilities were acceptable on all scales, with only three scales having reliabilities below .70 (.63, .68, and .69).

This analysis offers several key strengths. First, it was based on a very large and extremely diverse sample. This provides a high level of confidence that the instrument will work well across many types of training and in most organizations. In addition, instrument constructs were developed from sound theory (Holton, 1996) and research. Finally, this instrument builds on the results of several previous research efforts and followed generally accepted instrument development processes.

The second-order factor analysis was revealing in several ways. First, a total of three higher-order factors were identified: *climate, job utility,* and *rewards.* Baldwin and Ford (1988) proposed that transfer factors would be represented by three domains: work environment, training design, and trainee characteristics. The job utility factor roughly corresponds to their training design domain, whereas the climate and rewards factors fit in the work environment domain. The few trainee characteristics assessed by this instrument (learner readiness, performance self-efficacy) did not emerge as a separate second-order factor. There are likely other trainee characteristics such as personality and work attitudes that are relevant to transfer but not assessed by this instrument. Future research might combine the LTSI with other instruments to assess trainee characteristics more completely.

Second, supervisor support cross-loaded on job utility and rewards factors, and items in the scale were almost equally correlated with the higher-order factors. This finding suggests that supervisor support may play a dual role in transfer. On the one hand, supervisors act as gatekeepers for employees to apply learned skills on the job through their support. For example, they may set work procedures and rules, provide opportunities for job application, and provide training opportunities. A second and equally important role is that support serves as a reward to employees by signaling to them that their learning application efforts are viewed positively. Although it would be more elegant to have two clean second-order factors, the dual role portrayed here is conceptually sound. Baldwin and Ford (1988) emphasized that supervisor support is a multidimensional construct that includes both utilization-focused activities, such as goal setting and encouragement to attend training, as well as reward-focused activities, such as praise, better assignments, and other extrinsic rewards. This factor structure supports their argument.

As HRD shifts toward performance improvement, measurement of factors affecting transfer will become more important. Validation studies such as this are important to develop standard instruments to measure transfer system constructs across multiple organizations and intervention types. With psychometrically strong instrumentation, HRD will be in a position to provide more definitive answers to questions about the nature of learning transfer in the workplace and about barriers and enablers to transfer. Without strong instrumentation, researchers will be limited in their ability to arrive at general conclusions and prescriptions about transfer systems because there will always be a question about the extent to which measurement error contributes to the findings.

This study represented an initial step in the construct validation of the LTSI. Future work needs to be done to strengthen the reliabilities for several of the scales. The research reported here should also be complemented by research examining the convergent and divergent validity of the constructs. A cross-validation study with confirmatory factor analysis would also further establish the construct validity of the instrument. Future research should also demonstrate the criterion-related validity of the instrument. This may involve studies directed at linking quality of transfer systems to individual (for example, learning transfer, performance improvement), process (for example, unit or team productivity), and organizational level (for example, innovation) outcomes.

A valid measure of key learning-transfer system factors would open the door to a wide range of important research. Future research could examine the role of training investment, motivation, and learning transfer systems in organizations undergoing major change. Developing learning transfer system profiles for high and low performing organizations undergoing change would provide insight into how these systems influence individual motivation and increase our understanding of how training investments and the resulting learning are managed to meet the demands of change effectively. Longitudinal research could examine the impact of interventions implemented to transform underachieving learning transfer systems into high performing ones. Changes in individual performance resulting from the application of learning from training, business process capabilities, and organizational performance could be tracked to provide insight into how transfer systems can be effectively changed to improve performance at various levels in an organization. Finally, a validated LTSI would permit international comparisons of learning transfer systems in organizations operating under different cultural, political, and social conditions.

This study has established that an instrument to measure factors in transfer systems can be developed with rigorous psychometric procedures. It is incumbent upon transfer researchers to stop using weak, unvalidated measures in order to advance the theory of training transfer. With such an understanding, practitioners can turn their attention to managing transfer conditions in organizations to enhance performance outcomes of training.

## Implications for Practice

The Learning Transfer System Inventory (LTSI) also has application far beyond the research community. We suggested at the beginning of this article that organizations should be working to understand the transfer system and intervene to eliminate barriers that inhibit transfer. Our goal has been to develop an instrument that was both validated for research purposes *and* useful for practice. Thus, the LTSI also potentially provides a more sound diagnostic inventory to identify targets for organizational interventions.

Practitioners can use the LTSI in a variety of ways:

- To assess potential transfer factor problems before conducting major learning interventions
- As part of follow-up evaluations of existing training programs
- As a diagnostic tool for investigating known transfer of training problems
- To target interventions designed to enhance transfer
- To incorporate evaluation of transfer of learning systems as part of regular employee assessments
- To conduct needs assessment for training programs to provide skills to supervisors and trainers that will aid transfer

Our experience is that the LTSI is best utilized as a "pulse-taking" diagnostic tool in an action-research (Cummings and Worley, 1998) approach to organization development. That is, the LTSI's primary benefit is to identify problem areas. After pinpointing factors that are potential barriers in the transfer system, follow-up focus groups and interviews with appropriate employees are then used to help understand the meaning of the findings. For example, suppose scores on the supervisor support scale are low. Focus groups would reveal what specific types of support are missing and what employees would like supervisors to do, and possibly would provide insights into the reasons why supervisors are not providing support.

Participants can then be engaged in a collaborative action planning strategy to enhance transfer of learning. Interventions might include team building (if peer support is low), supervisor training (if supervisor support is low), getting trainees more involved in training design (if transfer design or content validity is low), providing greater recognition for use of new skills (if positive personal outcomes are low), or increasing feedback (if performance coaching is low). This short list of examples emphasizes our point that a psychometrically sound diagnostic tool is vitally important for practitioners as well. When one considers the wide range of interventions that an organization might undertake to influence the transfer system, it is clear that it would be easy for the wrong intervention to be chosen without sound diagnostic data.

This emphasizes the importance of using the LTSI as a starting point for collaborative planning with affected employees. There is increasing evidence that transfer of learning can be enhanced by interventions (Broad, 1997). Traditionally, transfer of learning has been more a matter of study and research than intervention. In today's knowledge economy, transfer of learning is necessary to build intellectual capital in organizations. It then follows that measurement tools such as the LTSI have to move out of the research domain into practical use and that interventions be developed to respond to problems it identifies.

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