Validating Constructs of a U.S.-based Transfer Instrument in Taiwan

Hsin-Chih Chen
Elwood F. Holton III
Reid A. Bates
Louisiana State University

Learning Transfer System Inventory (LTSI) is the only research-based instrument of transfer learning in the U.S.A. to be used in diagnosing strengths and weaknesses of organizational transfer systems. This study validated the LTSI for use in Taiwan. The sample contained 583 responses collected from 20 different organizations. The results of exploratory common factor analyses showed that 15 factors were validated for use in Taiwan. Of the 15, fourteen were identical to the original LTSI.

Keywords: Learning Transfer, Instrument Development, Translation Issue

HRD is a relatively new profession but not a new concept in Taiwan. A review of the history of human resource development in Taiwan vividly illustrates that HRD has been embedded in the government's human resource policy and linked to economic growth since 1953. The Taiwanese government has long perceived that developing highly competent human resources will lead to the nation's economic growth (Kuo & McLean, 1999).

HRD has been instrumental in Taiwan's economic miracle in Asia since the 1960s. Taiwan has been perceived as one of the four "little dragons" (i.e., the most rapidly industrialized countries) in East Asia, along with Hong Kong, Singapore, and Korea. Yuen (1994) asserted that Taiwan's government has created technical training and vocational schools that have dramatically enhanced workers' skills, knowledge and abilities. This factor has led Taiwan to be one of the most powerful economies in the world. According to the global competitiveness report of the World Economic Forum, published by the Center for International Development at Harvard University, Taiwan was ranked 3rd in economic growth, trailing only the U.S.A. and Finland (Cornelius, 2003). Although other factors such as government financial policies or market forces may influence Taiwan's economic growth, the government policies that highly value human capital point out the contribution of HRD to Taiwan's economic growth. Indeed, in a country with limited natural resources such as Taiwan, human capital is a more vital concept than in countries with fruitful natural resources such as the United Sates or China.

Due to the new era of globalization, organizations in Taiwan have been facing more rigorous competition than ever in recent years. As a result, HRD has received additional attention in both the public and private sectors. In the public sector, Taiwan's government has embedded the concept of HRD into the government transformation process. Several recent government policies have reflected the intensive need for human development. One of the most dramatic government policies putting the human resource development concept into action has been the legislation called "Civil Servant Life-Long Learning Passport" (CSLLLP), which is approved by the Central Personnel Administration Department, Executive Yuan (CPA 200264 Act, 2001). The vision of the CSLLLP legislation is to build an integrated human resource system by promoting innovation, continual learning, and employee learning initiatives to effectively and efficiently increase civil service to citizens with an ultimate goal of creating a learning government.

In private sectors, training has been a prevalent concern for organization decision makers. A major industrial and business magazine, Common Wealth, conducted a nation-wide study to the top 1000 companies in Taiwan. The top two priorities of those companies were training and development and research and development. As many as 47.8% of the top 1000 organizations perceived that training and development was the highest priority they needed to address (Chuang, 1998).

Problem Statement and Research Question

The priority on training and increasing expenditures on training have warranted that organizations will, sooner or later, want to know if training has led to higher performance and has created better organizational results. However, a study conducted by Lin and Chiu (1997) found that training evaluation practices in Taiwan focus more on levels of reaction and learning than on those of transfer and organizational results. In addition, training is one way to develop human resources, while transfer is an approach to unleash human expertise. It seems clear that both

should be equally important to HRD in Taiwan. Nevertheless, the current HRD practices in Taiwan seem not to pay enough attention to transfer. In order to focus on transfer issues and to get greater results, researchers and practitioners in Taiwan need to assess work environment factors as well as training factors. Although some transfer research has been conducted in Taiwan, none of them focused on developing a generalizable, valid instrument of transfer for use in organizations. Measuring effectiveness of transfer interventions would not be warranted unless a valid instrument could be deployed. Therefore, developing a valid instrument of learning transfer is important because it will help organizations effectively and efficiently manage transfer interventions by diagnosing the strengths and weaknesses of their transfer systems. Without such an instrument, transfer interventions are difficult to compare and the results may vary from one study to another.

The LTSI is a theoretically-based, generalizable instrument to be used in diagnosing an organization's strengths and weaknesses for learning transfer (Bookter, 1999). It was developed by Holton, Bates, and Ruona (2000) and is the only research-based transfer instrument available in the U.S.A. Therefore, the purpose of this study is to validate, through translation with qualitative, quantitative evaluations and feedback loops, the LTSI for use in Taiwan. The specific research question was "Are the LTSI's 16 factors valid for use in Taiwan's organizations?"

Literature Review

Transfer of Learning Overview

The review on transfer of learning in this study was not intended to be comprehensive. Rather, it is to offer fundamental concepts of transfer of learning for later discussions. The term transfer varies from one discipline to another. From the human resource development perspective, the terms "transfer," "transfer of training," "training transfer," "learning transfer," and "transfer of learning" are generally perceived as interchangeable terms. In general, transfer of training is defined as *the extent to which trainees apply what they learned in training, such as knowledge, skills, behaviors, and attitudes, to their jobs.*

Transfer of training generally consists of some common elements. These common elements are people, outcomes, applications, and contexts. People involved in transfer of training may include trainees, trainers, supervisors, peers, and subordinates (Broad & Newstrom, 1992; Facteau, Dobbins, Russell, Tadd, & Kudisch, 1995). The outcomes of transfer of training include cognitive, skill-based, and affective outcomes (Kraiger, Ford, & Salas, 1993). The application refers to the degree to which trainees are able to maintain or generalize learned skills to their jobs (Baldwin & Ford, 1988). Finally, the context relates to work environment, such as opportunity to transfer and resource availability (Ford et al., 1992).

Factors affecting transfer of training. Baldwin and Ford (1988) suggested that trainee characteristic, work environment, and transfer design factors could influence transfer. Other research investigating personality traits such as self-efficacy (Tracey et al., 2001) and job attitudes (Noe & Schmitt, 1986) are related to training motivation and transfer. Research focusing on investigating the effect of training design factors to transfer finds that transfer strategies such as relapse prevention (Wexley & Nemeroff, 1975) or matching training content to job utility (Bates et al., 1997) will influence transfer. And, research on work environment factors affecting transfer suggests that transfer climate (Rouiller & Goldstein, 1993) and opportunity to perform (Ford et al., 1992) influence transfer.

Managing transfer interventions. Based on a timeframe that transfer interventions could affect transfer of training, Broad and Newstrom (1992) suggested that transfer interventions or strategies could be applied before, during, and after training. The concepts of the before- and after-training interventions are similar to Tannabaum and Yukl's (1992) pre-training and post-training interventions. Several studies have tried to establish the relationship of pre-training interventions to training outcomes (e.g., Facteau et al., 1995). Other studies focusing on the relationship between post-training interventions and transfer of training (e.g., Richman-Hirsch, 2001) investigated the relationships among post-training interventions, work environment, and transfer of training. The results indicated that the goal-setting post-training interventions could affect transfer outcomes. Still, some research examined a combination of pre-training and post-training interventions (Werner, O'Leary-Kelly, Baldwin, & Wexley, 1994). Finally, Holton and Baldwin (2000) provided a broader conceptual framework for managing learning transfer systems. The LTSI can be administered to incorporate this framework and help manage transfer interventions.

LTSI Development

A number of studies have been utilizing the LTSI in different settings. Because the focus of this study was to validate the LTSI in Taiwan, only literature that related to the LTSI development was reviewed. The LTSI development was based on Holton's evaluation model (Holton, 1996; Holton et al., 2000). A summary of the LTSI development can be found in Table 1.

Table 1. *Summary of the LTSI Development*

Construct Validity

Version 1 (LTQ)-Holton, Bates, Seyler, & Carvalho (1997)

- Major purpose: Factorize an interpretable factor structure for transfer climate.
- Instrument: Derived from Rouiller and Goldstein's study (1993) with some item modifications.
- Sample: 189 operating technicians at a petrochemical manufacturing facility.
- Methodology: Exploratory factor analysis.
- Results:
  - People perceive transfer climate by organizational referents (e.g., supervisor, peer/task, or self) rather than the psychological cues suggested by Rouiller and Goldstein (e.g., goal cues or social cues).
  - A nine-construct structure was identified.

Version 2 (LTSI)- Holton et al. (2000)

- Major purpose: Develop a generalizable instrument that provides a factor structure for transfer systems.
- Instrument: LTQ items and some additional items suggested by research.
- Methodology:
  - Fit constructs into Holton's evaluation research and measurement model.
  - Exploratory factor analysis.
- Sample: 1,616 respondents received various training programs from diverse organizations.
- Results: A 16-construct structure was identified with two domain areas: Training in Specific (11 constructs included) and Training in General (five constructs defined).

Divergent and Convergent Validity

Bookter (1999)

- Major purpose: Examine the convergent and divergent validity of the LTSI.
- Instrument: The LTSI and 17 other instruments.
- Methodology: Partial Person's Product Moment correlation coefficient was used to determine the degrees of convergent validity, divergent validity, and nomological network of the LTSI. Sixty-eight validated LTSI items were used for the analysis.
- Sample: 204 training participants from the United States Postal Service completed three surveys with 352 items in total.
- Results:
  - The LTSI was an instrument that contained unique constructs.
  - The LTSI was divergent in nature.
  - Two constructs revealed strong convergent validity.

Cross-cultural construct validation of the LTSI

Yamnill (2001)

- Major purpose: Validate the LTSI constructs in Thailand.
- Instrument: Thai version of the LTSI created through a series of forward-backward translations.
- Methodology: Proportionate sampling, exploratory factor analysis.
- Sample: 1,029 participants from various organizations in Thailand.
- Result: 16 identical LTSI constructs were determined.

Criterion Validity

Study 1-Ruona, Leimback, Holton, & Bates (2002)

- Major purpose:
  - Relationships between Utility Reaction and the LTSI factors.
  - Degree to which Motivation to Transfer is explained by Utility Reaction.
- Instrument: The LTSI.
- Methodology: Correlation and multiple regression analyses.
- Sample: 1,616 participants from various organizations.
- Results:
  - Utility Reaction has higher associations with ability-related and motivation-related constructs in contrast to environment-related constructs.
  - Reaction Utility is a significant predictor to predict Motivation to Transfer ($\Delta R2=.038$).
  - Reaction Utility may be indirectly related to performance but directly related to Motivation to Transfer.

Study 2- Seyler, Holton, Bates, Burnett, and Carvalho (1998)

- Major purpose: Degree to which Motivation to Transfer is explained by 5 sets of the factors.
- Instrument: Some LTSI scales and other instruments.
- Methodology: Correlation and multiple regression analyses.
- Sample: 88 participants in a computer-based training program from two units of a petrochemical organization.
- Results:
  - The full regression model with all factors included explained 60.5% of variance of Motivation to Transfer.
  - Environmental factors, which were derived from the LTSI, contributed to a large amount of variance when other factors were taken into account ($\Delta R2=.264$).

Study 3 Bates, Holton, & Seyler (1997)

- Major purpose: Degree to which individual performance is explained by 11 factors.
- Instrument: Some LTSI items and other instruments.
- Methodology: Correlation and multiple regression analyses.
- Sample: 73 operation operators from two continuous production units in a petrochemical organization.
- Results:
  - The full regression with all factors included explained 36 percent of variance in performance rating.
  - Interpersonal climate constructs were the most powerful predictors in the model.

Study 4 Bates, Holton, Seyler, & Carvalho (2000)

- Major purpose: Examine the predictive relationship of interpersonal factors to individual performance.
- Instrument: Some LTSI items and other instruments.
- Methodology: Correlation and multiple regressions.
- Sample: 73 operation operators from two continuous production units in a petrochemical organization.
- Results:
  - Interpersonal support factors, which explained 38 percent of variance in performance ratings, were significant predictors for individual performance.

Summary of the LTSI Development

- Theoretically based (Holton's Evaluation Model) and empirically tested.
- Psychometrically sound (Construct validity, statistical analysis, criterion validity, cross-cultural construct validity) with acceptable scale reliabilities (Alpha ranges from .63 to .91 with only three of them below .70).

Methodology

Instrument

The LTSI was the instrument used in this study. This version of the LTSI has 89 items, which measure 16 constructs representing two construct domains: Training in Specific (63 items) and Training in General (23 items). Of the eight-nine items, sixty-eight was previously validated (Holton et al., 2000) while 23 were research items that designed to improve relatively low but acceptable liabilities of five constructs. All of the items used a Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree). The LTSI was translated into Mandarin language. Because the quality of translation will ensure the functional equivalence between the two versions of the LTSI, a forward-backward translation with subjective, objective, and pilot evaluations was used to create the Taiwan version of the LTSI (Chen, 2003).

Forward and backward translations. Two bilingual translators (one of whom was the first author) first separately translated the English version of the LTSI to Mandarin. Both translators received HRD graduate degrees. These two translators were attempting to retain the form and the meaning of the items as close to the original as possible, and they agreed to use common language in the translation. Upon completion of the translation, the two forward translators compared their translated instrument item by item to assess the consistency of the translation. Items with disagreement or errors were further discussed and revised until both translators reached a consensus. A first draft version of Taiwan's LTSI (TLTSI) was then finalized, and this version of LTSI was labeled as the TLTSI-draft. A bilingual backward translator, who has never seen the LTSI before and had strong skills in both languages, then translated the TLTSI-draft back to English.

Subjective evaluation. The backward translation was then evaluated by one of the original LTSI authors by comparing the English version to the English back-translation of the TLTSI. The primary focus in this step was to make sure that the meanings of the LTSI items were equivalent in both English versions. Problematic items were sent back through the entire process: that is, they were re-translated and re-back-translated, and reviewed by the LTSI author. This process continued until no items exhibiting substantial differences could be found by the LTSI author.

Objective evaluation. According to Sperber et al. (1994), in most of the cross-cultural studies, the success of translation is based on the "translator's satisfaction," and relatively few have been done through an objective evaluation. As a check on the possible individual bias of the LTSI author, a quantitative approach of evaluation through an objective lens was also conducted in this study. The purpose of this evaluation was to test the quality of the transition by evaluating the two English versions, the original LTSI and the TLTSI-back.

Two measures, comparability of language and similarity of interpretability, were assessed. The former assesses the similarity of words, phrases, and sentences while the later assesses the similarity of an item's meaning. An instrument using a 7-point Likert-type scales ranging from 1 (extremely comparable/similar) to 7 (Not at all comparable/similar) was developed for this step. The instrument was distributed to a group of HRD graduate students and experts. All of them were English monolingual raters. A total of eighteen individuals received the instrument and fifteen of responses were returned, thirteen of which were useable. A 3.0 criteria was set to determine the effect of the two measures (scores above 3.0 indicated potential problematic items.)

In terms of the comparability of language measure, the results showed that 15 items had mean values greater than 3.0, indicating that the wording was not comparable. However, on the similarity of interpretability measure, the results showed that only eight items had mean values greater than 3.0. The similarity of interpretability measure became the primary focus of the translation because it tackles equivalence of meaning and the Mandarin language forces some sentence forms that appear awkward to English readers when back translated. The eight items with mean values of similarity of interpretability measure greater than 3.0 was further examined. None of them has mean value grater than 4.0. A closer examination of these items suggested that problems with these items were due to differences between the two different languages and no further revision was made (see Discussion section for more information on language differences).

Pilot test. The TLTSI was sent to nine HRD practitioners in Taiwan to collect feedback on whether or not the instrument and its instruction were understandable, and the technical terms in the instrument were interpretable in Taiwan. The comments provided by these HRD practitioners indicated that the instrument seemed appropriate for use in Taiwan except for some concerns about the length and possible repetitive items in the instrument. However, the repetitive items were the research items intended to improve the reliability of some lower reliability scales. Therefore, all of the items were retained and the TLTSI was finalized.

Research Design, Population, Sample, and Implementation

This study was a non-experimental survey design. The target population was employees who attended training programs, either within or outside their organization, provided by trainers in Taiwan. Due to geographical, time, and

resource limitations, a combination of purposive and accidental sampling techniques was used. The sample was collected to be as heterogeneous as possible. The primary author attended international HRD conferences to solicit Taiwan's HRD practitioners to participate this study. Thirteen HRD practitioners agreed to serve as instrument administrators and help distribute the instrument in their organizations. Each practitioner received an administration guide and 30 to 100 instruments. The number of instrument to be disseminated in an organization depended on the firm size, trainee accessibility, variety of training programs conducted and organizational type. Some instrument administrators who served in public training institutes were able to distribute instruments to participants from more than one organization. The data, through instrument administrators, were collected from trainees either immediately after the training or not later than two weeks after training. There were 712 instruments distributed and 583 responses collected from 20 different organizations for an 82%response rate. The organizations represented public sector (N=77, P=13.3%) and private sectors (N=267, P=46.3%), education institutes (N=59, P=10.2%), public-for-profit (N=63, P=10.9%), and non-profit (N=100, P=17.3%) organizations. These organizations included airline, army, civil service, computer technology, electronic, petroleum, restaurant, retail, shipbuilding, social work, stock investment, telecommunication, transportation, two insurance and five educational organizations.

Results and Findings

Exploratory factor analysis (EFA) was used in this study. Before the EFA was conducted, data was screened in various ways including tests for extreme values, response pattern, visual normality, and factorability. No serious violation was found. The overall Kaiser's measure of sampling adequacy (MSA) was .932, which means the data was very appropriate for an exploratory factor analysis (EFA). Item to respondent ratios for all of the EFAs described later in this section ranged from 9.2:1 to 22.1:1, supporting factorability of this dataset. An EFA was first conducted using the 68 validated items (Holton, et al., 2000). Following the English language validation procedure, two separate exploratory analyses were run for the two construct domains. In each analysis, common factor analysis with an oblique rotation (Oblimin) was used. A criterion of eigenvalue greater than one was used to determine number of factors to extract. The result showed that 10 out of the 16 LTSI factors were validated, and six were in need of further investigation (five for Training in Specific and one for Training in General). The six factors included two that did not emerge at all (Personal Capacity for Transfer and Performance Coaching), two that merged to a new factor (Perceived Content Validity and Transfer Design), one that had low reliability (Opportunity to Use Learning), and one that contained only two items (Supervisor Sanction).

Extended Analyses

Cross-cultural instrument validation such as was done in this study is not only involved in cultural issues, but also translation, implementation, and reliability issues. Each issue should be carefully examined before decisions are made about construct validity. Before concluding that the six factors were not valid in Taiwan, the authors decided to conduct additional analyses using the 23 research items (89 items in total) for two reasons. First, the TLTSI conducted in Taiwan included 68 validated items and 23 research items. The 23 research items were being tested to improve the scales with lower reliability in the original LTSI. These factors included: Personal Outcomes-Positive (.69), Personal Capacity for Transfer (.68), Supervisor Sanction (.63), Opportunity to Use Learning (.70), and Performance Coaching (.70). Interestingly, four of the six factors, which have not been validated in Taiwan in the 68-item analysis, matched these low reliability factors in the English LTSI. That raised suspicions that something other than cultural issues might be affecting the results. Second, this study was intended not only to validate the current LTSI in Taiwan, but also to develop the most valid LTSI for use in Taiwan. Because this study was exploratory in nature, to make an instrument useful, it seemed dangerous to conclude that factors such as Personal Capacity for Transfer and Performance Coaching do not exist without careful further examination. Also, it made more sense to develop the best possible instrument for use in Taiwan, which meant examining the research items to see if the troublesome factors could be strengthened. If the troublesome factors remained problematic, then the conclusion that certain constructs do not exist in Taiwan could be made more confidently. On the other hand, if problem factors were strengthened or re-emerged when the research items were included, then it seems likely that the problems may have occurred due to other artifacts and not true cultural differences. This is especially true when one considers that five of the six problem factors had been identified as having some weakness in English also.

The procedures for the extended analysis were the same as ones conducted in the previous section except for having research item included. In the Training in Specific domain, sixty-three items were used. These items included 45 validated items and 18 research items. Although the ratio of respondents to items in this analysis dropped to 9.2:1, it was still an acceptable ratio for factor analysis (Hair et al., 1998). Kaiser's measure of sampling adequacy in this analysis was .938. Using a .40 cutoff, quite interestingly, the result initially showed an 11-factor structure that was the same as the English version. These 11 factors explained 65 percent of total variance. However, one of the factors

had only two items with loading greater than .40 that was too weak to be considered as a factor, so it was dropped. A new factor emerged which merged items associated with the Transfer Design and Opportunity to Use Learning constructs in the original LTSI. The new factor was labeled Transferability and defined as *the extent to which trainees perceive that training is designed to facilitate opportunity to apply what they learn to the job*. In the Training in General domain, twenty-six items were used. These items included 23 validated items and three research items. The ratio of respondents to items in this analysis was 22.2: 1. Kaiser's measure of sampling adequacy in this analysis was .933. The results showed a five-factor structure and were consistent with the original LTSI factors. The five factors explained 61.4 percent of the total variance. Overall, reliabilities of the six problematic factors in the 68-item factor analysis all dramatically improved with exception of Opportunity to Use Learning and Transfer Design, which were blended as Transferability in Taiwan's settings. This result can be found in Table 2.

Table 2. *Factors, Reliabilities, and Items Comparisons of the extended Analyses between the LTSI and the TLTSI*

Training in Specific	*LTSI (11 factors)*		*TLTSI (10 factors)*	*Result*
	Validated items	Research items	Items	
Learner Readiness	1, 9. 10, 13 (.73)		9, 10, 13 (.65)	Validated
Motivation to Transfer	2, 3, 4, 5 (.83)		2, 3, 4, 5 (.83)	Validated
Personal Outcome Positive	6, 16, 17 (.69)	7, 8, 15, 18, 22	6, 7, 8, 15, 16, 18, 22 (.91)	Validated
Personal Outcome Negative	14, 21, 23, 24 (.76)		14, 21, 23, 24 (.79)	Validated
Personal Capacity for Transfer	19, 25, **26, 27** (.68)	11, 12, 20	**11, 12,** 19**, 20, 26** (.78)	Validated
Peer Support	28, 29, 30, 31 (.83)		28, 29, 30, 31 (.89)	Validated
Supervisor Support	32, 33, 37, 39, 40, 43 (.91)		32, 33, 37, 39, 40, 43 (.92)	Validated
Supervisor Sanction	38, 44, 45 (.63)	34, 35, 36, 41, 42, 46	34, 35, 36, 38, 41, 42, 45, 46 (.92)	Validated
Perceived Content Validity	47, 48, 49, 58, 59 (.84)		47, 48, 49 (.84)	Validated
Transfer Design	52, 53, 54, 55 (.85)		53, 54, 55, 56, 57, 58, 59 (.92)-	Future investigation
Opportunity to Use Learning	56, 60, **61, 63** (.7)	50, 51, 57, 62	labeled as Transferability	
Training in General	*LTSI (5 factors)*		*TLTSI (5 factors)*	
Transfer Effort-Performance Expectation	65, 66, 69, 71 (.81)		65, 66, 69, 71 (.85)	Validated
Performance-Outcome Expectation	**64**, 67, 68, 70, 72 (.83)		67, 68, 70, 72, 79 (.80)	Validated
Openness to Change	73, 74, **75**, 76, 77, **78** (.85)		**73, 74,** 75**, 76, 77,** 78 (.80)	Validated
Performance Self-Efficacy	82, 83, 84, 85 (.76)		82, 83, 84, 85 (.86)	Validated
Performance Coaching	79, 86, 87, 89 (.7)	80, 81, 88	80, 81, 86, 87, 88, 89 (.88)	Validated

Note. (*)=Reliability. A .40 cutoff criterion was used. Bold numbers represent reverse items.

Discussions

As the result showed, fifteen TLTSI factors are validated for use in Taiwan. The differences in the factor structures between Taiwan and the U.S.A. can be looked at from four perspectives: cultural, translation, instrument design, and implementation. From the cultural standpoint, the merger of the two factors could be due to cultural differences in that trainees in Taiwan perceive Transfer Design and Opportunity to Use Learning as one concept. The predominant training method in Taiwan is more lecture-oriented. Relatively few training courses are designed in ways to encourage participation and involvement. In this sense, the concept of Transfer Design in the U.S.A., which encourages participation and involvement, might not be perceived as a unique factor in Taiwan's culture. Instead, trainees in Taiwan may perceive Transfer Design and Opportunity to Use Learning as a single construct of Transferability. Specifically, trainees in Taiwan may perceive training that they will have an opportunity to use as constituting a good transfer design.

Looking at the translation and instrument design perspectives together, the differences in the factor structures could also be due to either translation errors or the items associated with the lower reliability factors in the original LTSI. However, it is reasonable to think that both of the issues had been reduced somewhat in this study due to the fact subjective and objective evaluations of the translation were conducted. The pilot test with a group of Taiwanese individuals also helped ensure that the translation used common language in Taiwan so the instrument was more understandable. All of these efforts led to a reduction of translation errors and increased the functional equivalence between the instruments in two languages. With regard to instrument design, since the LTSI has strong psychometric qualities and had been validated in the U.S.A, the instrument design was believed to be strong. However, five of the factors that demonstrated problems had a reliability of .70 or lower in the English LTSI. Fortunately, this study was able to use the additional research items to help improve the reliability of the scales. The

results of the 89-item factor analysis show that reliability improved in all of the 5 factors except the Opportunity to Use Learning, which was not present in Taiwan.

From the implementation perspective, the data were collected either immediately after training or two weeks after training in this study. On the other hand, the data for the original LTSI was collected immediately after training only (Holton et al., 2000). The differences in implementation between these two studies could have influenced the factor structures. For example, respondents who returned the instruments immediately after training may have perceived Opportunity to Use Learning differently from those who returned the instrument two weeks after training. The first group of respondents would have reflected on the concept of Opportunity to Use Learning based on their perceptions of what they believed would happen in their work settings, while the latter respondents would have actually experienced whether or not they could apply the training to their jobs. Thus, it is possible that the concepts of Transfer Design and Opportunity to Use Learning may be indistinguishable to participants two weeks after training. In addition, their recall of course activities would be biased by their experience on the job. The author attempted to separate these two groups and to examine the factor structure for each group. Unfortunately, records were not kept of which surveys were returned after training so the analysis could not be completed. However, it is believed that enough were returned after training to possibly have altered the factor structure.

Like any research, this study is not without some limitations. This study began with an assumption that language would be fully translatable. Indeed, this assumption highlights the limitation of the forward-backward translation process. Since the two languages are so different, some translation dilemmas occurred. For example, there is no "tense" in Mandarin. People identify the time a task occurs either by the context of conversations or the modifier (e.g., time adverb) in a sentence. One alternative to eliminate these language limitations is to use the simultaneous instrument development approach. That is, researchers can first generate constructs of interests from both cultures. Once the constructs are identified and determined, researchers can then develop instruments for each language so that language limitations are eliminated. However, this approach also raises issues of cross-cultural comparability of results. In addition, the sampling techniques used limited its generaliability to the greatest extent.

This research also points to some possible revisions in the original LTSI. This study found that the five low reliability factors in the original LTSI are somewhat associated with the factors that did not emerge or continued to have reliability problems in the original LTSI. The same evidence can be found in Yamnill (2001). This implied that the 23 research items are well-developed items that would improve the reliability of the instrument, and further investigation of the 23 research items needs to be done in English to test this assumption. In addition, it is suggested that both the validated and research items be used for future validation of the LTSI in other language and settings so the factors that may exist would not be inappropriately eliminated.

Conclusions

Most of the cross-cultural research that translates instruments from one language to another has been based on direct translation methods (Kinzie & Manson, 1987) and many of the translation processes are completed based solely on a researcher's satisfaction (Sperber et al., 1994). This study took a more rigorous translation process by using the forward-backward translation approach with subjective, objective, and pilot evaluations of the translation that goes beyond what many cross-cultural studies do and what most of the cross-cultural research in HRD has done (e.g., Lien et al., 2002). The rigorous translation process has enhanced the quality of this research endeavor and reduced the biases that likely would have occurred in the translation process.

The LTSI is basically validated in Taiwan because 14 out of 15 validated TLTSI factors are identical to the original LTSI. The 15 validated factors of the TLTSI are ready for use in Taiwan. In addition, the sample included in this study has increased the generalizability of the LTSI. The results of this study combined with previous results in Thailand (Yamnill, 2001) provide encouragement that the LTSI's constructs will validate across cultures.

This study has provided an initial attempt to develop a valid, generalizable transfer instrument in Taiwan by validating the LTSI. Future research should focus on investigating additional factors, particularly in Taiwan's literature and practice, which have not been included in the LTSI. Other directions include, for instance, attempting to confirm the factor structure by using confirmatory factor analysis with different samples or aiming at reducing the size of the instrument to keep it parsimonious while remaining factor structure.

References

Baldwin, T. T., & Ford, J. K. (1988). Transfer of training: A review and directions for future research. *Personnel Psychology, 41,* 63-105.

Bates, R. A., Holton, E. F. III., & Seyler, D. LA. (1997). Factors affecting transfer of training in an industrial setting. *Academy of Human Resource Development Annual Conference Proceedings, USA*, 345-359.

Bates, R. A., Holton, E. F. III, Seyler, D. L., & Carvalho, M. B. (2000). The role of interpersonal factors in the application of computer-based training in an industrial setting. *Human Resource Development International, 3*, 19-42.

Bookter, A. I. (1999). *Convergent and divergent validity of the learning transfer questionnaire.* Unpublished doctoral dissertation, Louisiana State University, Baton Rouge.

Broad, M. L., & Newstrom, J. W. (1992). *Transfer of training: Action-packed strategies to ensure high payoff from training investments.* Reading, Massachusetts: Addison-Wesley Publishing Company, Inc.

Chen, H.-C. (2003). *Cross-cultural construct validation of learning transfer system inventory in Taiwan.* Unpublished doctoral dissertation, Louisiana State University, Baton Rouge.

Chuang, T.-H. (1998, June 5). Economic perspectives of entrepreneurs. *Common Wealth, 21,* 52-58.

Cornelius, P. K. (2003). *The global competitiveness report 2002-2003: World Economic Forum.* New York: Oxford University Press, Inc.

Facteau, J. D., Dobbins, G. H., Russell, J. E., Ladd, R. T., & Kudisch, J. D. (1995). The influence of general perceptions of the training environment on pretraining motivation and perceived training transfer. *Journal of Management, 21,* 1-25.

Ford, J. K., Quinones, M. A., Sego, D. J., & Sorra, J. S. (1992). Factors affecting the opportunity to perform trained tasks on the job. *Personnel Psychology, 45,* 511-527.

Holton, E. F. III. (1996). The flawed four-level evaluation model. *HRDQ, 7*, 5-21.

Holton, E.F.III., & Baldwin,T.T. (2000). Making transfer happen: An action perspective on learning transfer systems. *Advances in Developing Human Resources, 2*(4), 1-6.

Holton, E. F. III, Bates, R. A., & Ruona,W.E. (2000). Development of a generalized learning transfer system inventory. *Human Resource Development Quarterly, 11*, 333-360.

Holton, E. F. III, Bates, R. A., Seyler, D. L., & Carvalho,M.B. (1997). Toward construct validation of a transfer climate instrument. *Human Resource Development Quarterly, 8*, 95-113.

Kuo, C.-M., & McLean, G. N. (1999). The history of Human Resource Development in Taiwan from 1949 to 1999. *Academy of Human Resource Development Conference Proceeding, USA,* p.15-1.

Kraiger, K., Ford, J. K., & Salas, E. (1993). Application of cognitive, skill-based, and affective theories of learning outcomes to new methods of training evaluation. *Journal of Applied Psychology, 78,* 311-328.

Lien, Y.-H., Yang, B., & Li, M. (2002). An examination of psychometric properties of Chinese version of the dimensions of learning organization questionnaire (DLOQ) in Taiwanese context. *Academy of Human Resource Development Conference Proceeding, USA,* p.34-2.

Noe, R. A., & Schmitt, N. (1986). The influence of trainee attitudes on training effectiveness: Test of a model. *Personnel Psychology, 39*, 497-523.

Richman-Hirsch, W. L. (2001). Posttraining interventions to enhance transfer: The moderating effects of work environments. *Human Resource Development Quarterly, 12*, 105-125.

Rouiller, J. Z., & Goldstein, I. L. (1993). The relationship between organizational transfer climate and positive transfer of training. *Human Resource Development Quarterly, 4*, 377-390.

Ruona, W. E. A., Leimback, M., Holton, E. F. III., & Bates, R. A. (2002). The relationship between learner utility reactions and predictors of learning transfer among traninees. *International Journal of Training and Development, 6,* 218-228.

Sperber, A. D., Devellis, R. F., & Boehlecke, B. (1994). Cross-cultural translation: Methodology and validation. *Journal of Cross-Cultural Psychology, 25*, 501-524.

Tannenbaum, S. I., & Yukl, G. (1992). Training and development in work organizations. *Annual Review of Psychology, 43*, 399-441.

Seyler, D. L., Holton, E. F. III., Bates, R. A., Burnett, M. F., & Carvalho, M. B. (1998). Factors affecting motivation to transfer training. *International Journal of Training and Development, 2, 2-16.*

Tracey, J. B., Hinkin, T. R., Tannenbaum, S. I., & Mathieu, J. E. (2001). The influence of individual characteristics and the work environment on varying levels of training outcomes. *HRDQ, 12*, 5-31.

Wexley, K. N., & Nemeroff, W. (1975). Effectiveness of positive reinforcement and goal setting as methods of management development. *Journal of Applied Psychology, 64*, 239-246.

Werner, J. M., O'Leary-Kelly, A. M., Baldwin, T. T., & Wexley, K. N. (1994). Augmenting behavior-modeling training: Testing the effects of pre- and post-training interventions. *HRDQ, 5*, 169-183.

Yamnill, S. (2001). *Factors affecting transfer of training in Thailand.* Unpublished doctoral dissertation, University of Minnesota, Twin Cities.

Yuen, S.-C. (1994). Vocational and technical education: An important player in Taiwan's economic success. *Occupational Education Forum, 22,* 2-21.