Construct Validation of an Arabic Version of the Learning Transfer System Inventory (LTSI) for use in Jordan

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The purpose of this study was to translate and validate an Arabic version of the Learning Transfer System Inventory (LTSI) for use in Jordan. The LTSI was administered to 450 employees employed by public and private sector organizations operating in Jordan. Principle axis factoring with oblique rotation was used to uncover the underlying structure of the Arabic version of the LTSI (ALTSI). Results showed a latent factor structure highly consistent with the original LTSI..

Keywords: Learning Transfer, Construct Validation, Jordan

The world has become a globalized economic system, where countries with high levels of technology, finance, and information have more advantages in controlling the sources of human capital, raw materials, and product development and distribution. Jordan, a small but strategic country, plugged into the world economic system by privatizing its economy to attract foreign investments and is pursuing further steps in developing human capital in both private and public sectors (Central Bank of Jordan, 1994). Human Resource Development (HRD) in Jordan leads to the economic development of the whole nation and plays an essential role in the development of the countries surrounding Jordan (Central Bank of Jordan, 1994).

Jordanian organizations, like organizations throughout the Middle East, have invested heavily in the training and development of their employees. For example, organizations in the Middle East spend more than twice on training per employee ($783) than do organizations in Latin America ($311). This level of investment per employee is also substantially higher than the overall world average ($630) (ASTD, 2002). In short, Jordanian organizations - as with US organizations - see investment in training activities as critical for continuously improving individual job performance and overall organizational success.

The challenge of such investments, however, is assuring that the training that occurs can be transferred into on-the-job performance. Although virtually no research has been done on learning transfer in organizations operating Jordan or other Middle Eastern countries, it is likely that these organizations face similar transfer challenges as their Western counterparts. For example, in organizations operating in the US the transfer problem – or the inability of individuals to take what is learned in training and transfer it to improved job performance – is so pervasive that there is rarely a learning-to-performance situation in which such a problem does not exist (Broad & Newstrom, 1992). Although the precise amount of transfer that occurs across training programs has not been empirically determined, the most cited estimate is that only 10 to 15% of learning is ultimately applied on the job.

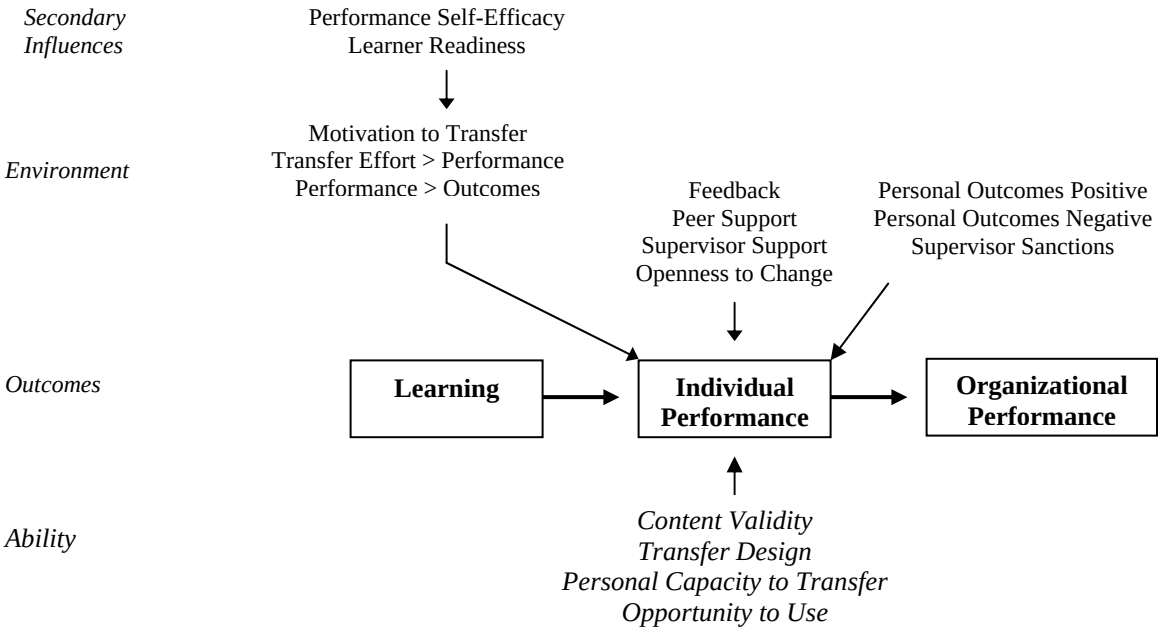
The transfer problem has generated a good deal of research interest in HRD. Since Baldwin & Ford's (1988) landmark review of transfer research over a decade ago a good deal of progress has been made in understanding the complex of factors that can influence learning transfer in the workplace. For example, a range of research has been focused on understanding the various dimensions of training design that can influence transfer (e.g., Kraiger, Salas, & Cannon-Bowers, 1995; Goldstein & Musicante, 1986). Other research has examined a range of individual difference variables that can affect transfer including readiness for training (Tannenbaum & Yukl, 1992), efficacy beliefs (Eden & Kinnar, 1991) and even workplace literacy (Bates & Holton, in press). Another stream of research has examined the influence of work environments focusing on factors such as interpersonal support, (Bates, Holton, Seyler, & Carvalho, 2000), opportunity to transfer (Ford, Quinones, Sego, & Sorra, 1992), and culture (Tracey, Tannenbaum & Kavanagh, 1995). More recently, researchers have concluded that a systems perspective of training transfer is a more useful approach because of the importance of examining a variety of factors that interact together to influence training transfer (Kozlowski & Salas, 1997; Mathieu, Martineau, & Tannenbaum, 1993). For example, Holton, Bates, & Ruona, (2000) conceptualized a model of training transfer, which included a whole set of transfer factors. The conceptual transfer model recognizes that transfer is influenced by a system of factors (the learning transfer system). This system includes factors such as interpersonal support for transfer, reward systems, personal characteristics, motivational influences, and training design elements. Coincident with this has been the recognition

that a fundamental and critical shortcoming of transfer research has been the inability to assess, measure, and diagnose the complex or system of factors that can influence transfer. To this end, efforts have been made to develop valid and comprehensive measurement tools for assessing transfer and critical antecedent factors. One such instrument is the Learning Transfer Systems Inventory (LTSI) (Holton et al., 2000). The LTSI has been widely used across different organizations and training types to diagnose barriers and catalysts to transfer, and several studies have provided evidence of the instrument's construct (Holton et. al., 2000; Bookter, 1999) and criterion-related validity (Bates, 2001; Bates, Holton, Seyler, & Carvalho, 2000). More recent research suggests the LTSI may also have cross-cultural applicability (e.g., Chen, 2003; Yamnill, 2001). The goal of the present study is to extend to cross-cultural applicability of the LTSI to organizations operating in Arabic cultures with a specific focus on Jordan.

The Learning Transfer Systems Inventory (LTSI)

The LTSI is currently the only validated instrument available that measures a comprehensive set of learning transfer system factors. It is based on the theoretical framework of the HRD Research and Evaluation Model (Holton, 1996). The macro-structure of the model (see Figure 1) views training outcomes as a function of ability, motivation, and environmental factors (Noe & Schmitt, 1986) at three outcome levels: learning, individual performance, and organizational performance. Secondary influences such as efficacy beliefs are included and are believed to influence transfer primarily through their influence on motivation. The LTSI assesses 16 factors that are group to represent the four factor in the macro structure of the Research and Evaluation Model. These include motivation elements (motivation to transfer, transfer-effort expectations, and effort-performance expectations), environmental elements (supervisor support, supervisor sanctions, peer support, personal-outcomes positive, personal-outcomes negative, and openness to change), ability/enabling elements (content validity, transfer design, opportunity to apply training, and personal capacity for transfer), and secondary elements (self-efficacy and learner readiness). The first three categories can directly influence learning transfer whereas secondary influences have indirect influence on learning transfer through their influences on motivation.

Figure 1.Conceptual Model of the LTSI



The LTSI can be used in multiple ways to improve training effectiveness and transfer in organizations. It can be used before training as a diagnostic tool to discover unknown and potential transfer problems and identify leverage points for change. It can be used as an additional evaluative tool following training to obtain additional information about why a training program did or did not work. The LTSI is also valuable as a diagnostic tool for investigating known transfer of training problems; as a means for targeting interventions designed to enhance transfer; as a mechanism for incorporating evaluation of transfer into regular employee assessments; and as an assessment tool to identify knowledge and skills needed by supervisors and trainers to support learning transfer (Holton, 2003).

Research Question

For Jordanian organizations, access to instruments such as the LTSI is critical. The capacity to assess transfer and transfer-related factors would not only help provide more complete understanding of training effectiveness in Jordanian organizations, but accurate assessment is a critical first step if organizations are to realize the full benefit from training investments. This research reports on efforts to translate and establish construct validity of an Arabic version of the LTSI for use in Jordanian organizations. The following research question was addressed: *Will construct validation of an Arabic version of the LTSI (the ALTSI) using exploratory factor analysis result in an interpretable factor structure consistent with the original LTSI?*

Methodology and Research Design

Population and Sample

The population for this study included public and private sector organizations operating in Jordan. The sample was chosen as heterogeneous as possible to ensure organizational mixture. Initial access to the organizations was gained through personal contacts. Because of limited access to subjects in Jordan, both purposive sampling and convenient sampling (Ary, Jacob, & Razavieh, 1996) were used. Specifically, organizations were included in the study if they had provided some type of employee training within six months prior to our initial contact and were willing to participate in the study. Twenty-eight organizations participated and provided an initial sample of 500 employees. Data were collected from 450 subjects for a response rate of 90%.

Instrumentation

The LTSI is an 89-item instrument with two sections. The first section of contains items measuring 11 constructs representing factors affecting the specific training program that respondents have completed. Respondents are directed *"to think about this specific training program"* when responding to these items. The constructs in this section are program specific in that they are expected to vary depending on the training program. The second section of the LTSI contains 26 items measuring five constructs that reference factors that reflect respondents' general experience with training in the organization. Respondents are directed to "*think about training in general in your organization"* when responding to these items. Since transfer of learning refers to individual behaviors, items in the LTSI were designed to measure individual perceptions of constructs. Respondents are asked to rate the items on a Likert-type scale ranging from 1 = strongly disagree to 5 = strongly agree.

The LTSI was translated into Arabic. To ensure equivalence of meaning of the items and constructs between the Arabic and English versions of the LTSI, a rigorous translation process was used that included forward and backward translation and subjective, objective, and pilot evaluations. The goal of the translation and various evaluation procedures was to produce an Arabic version of the LTSI with items that were equivalent *in meaning* to the original English version. This last point is important because the goal was an *equivalent translation* not an identical word-by-word translation. Equivalent translations emphasize functional equivalence or the equivalence of meaning of items across the original and translated instruments. Functional equivalence helps to ensure that the instrument works in the new target culture as well as it does in the original culture because the item-by-item translation is based on achieving equivalence in meaning rather than just the form of the sentence or word-by-word translations. The translation process is summarized below.

Forward and backward translation. Two translators bilingual in English and Arabic separately translated the English version of the LTSI into Arabic (forward translation). These translators were instructed to retain both the form (language) and the meaning of the items as close to the original as possible but to give priority to meaning equivalence and they agreed to use common language in the translation. The two translations were then compared to assess the item-by-item consistency. In the case of discrepancies or disagreements, the items were discussed and revised until consensus was reached. When the Arabic translation was finalized, the instrument was then back-translated (from Arabic to English) by two other people bilingual in English and Arabic.

Subjective evaluation. The items in the back-translated English version were then evaluated by one of the original LTSI authors to ensure that the meanings of the LTSI items were equivalent in both the original English versions and the back-translated version. If substantial differences in meaning were found between items, those items were put through the forward and back-translation process again until the author was satisfied there was meaning equivalence.

Objective evaluation. Following the subjective evaluation, a more 'objective' approach was used to further establish meaning equivalence. In this evaluation, a group of 19 native English speakers (HRD graduate students and other HRD professionals) rated the equivalence of meaning between the original LTSI items and the back-translated (English) items. A 7-point Likert-type rating scale was used with anchors ranging from 1 (Not at all similar in meaning) to 7 (Very similar in meaning). Items with mean ratings below four were put through the forward and back-translation process until adequate meaning equivalence was established. No items fell below this threshold and therefore no further revisions were made to the translated instrument.

Pilot test. The Arabic version of the LTSI was pilot tested with a group of 12 employees in Jordan to collect feedback on instructions and language in the instrument. This feedback did not lead to any substantive changes.

Data Collection

The ALTSI was administered in Jordan to employees at varying time lengths following an episode of organizational training. Time of administration varied from directly after training to six months after training. When distributed immediately after a training program, either the researchers or the administrator of the training distributed and collected the instruments. In the other cases, the instruments were distributed to trainees through the human resources personnel and then returned to the researchers. Responses were anonymous.

Data Analysis

Exploratory (common) factor analysis was used to identify the latent construct structure of the ALTSI and to provide some evidence of construct validity. Common factor analysis is considered more appropriate than principal component analysis when the objective is identification of latent structures (Nunnally & Bernstein 1994) and more accurate than principal components analysis when the data correspond to the assumptions of the common factor model (Fabrigar, Wegener, MacCallum, & Strahan, 1999). Oblique rotation was employed because of its suitability for latent variable investigation when latent variables may or may not be orthogonal (Hair, Anderson, Tatham, & Black, 1998). The initial criterion used to determine the number of factors to retain was an eigenvalue greater than or equal to one.

Results

Demographic Profile

The 450 respondents were almost equally divided between males and females. The participants in this sample were predominantly age 30 and older (71.4%) and that the majority of the respondents held a bachelor's degree (69.1%). Forty-two percent of the respondents had work experiences that ranged between four to ten years. Finally, most of the respondents (61.8%) worked in private organizations.

Factor Analysis

The data were screened in several ways to ensure their normality and appropriateness for factor analysis. With respect to normality, visual inspection of the histogram, mean, median, mode, skewness, and kurtosis for each item shows that the data are normally distributed. With regard to the appropriateness of the data for factor analysis, two statistical tests (overall Measure of Sampling Adequacy (MSA) and the Bartlett Test of Sphericity) were conducted. Both of these measures quantify the intercorrelations among variables and provide evidence of the factorability of the data. The results of the MSA (.87) and the Bartlett Test of Sphericity ($p < .05$) indicated that the data were suitable for factor analysis. The two sections of items in the instrument (training-specific and training-in-general) were factor analyzed separately since each represents a different domain of constructs.

Training-specific domain (63 items). The item-to-respondent ratios for the training-specific section was approximately 7:1, well within the recommended ratio for factor analysis. The MSA for individual items was examined first in order to exclude any that did not meet the minimum recommended value of .60 or higher (Hair et al., 1998). None fell below this value. The overall MSA for the training-specific items was then examined and at .87 it indicated this set of items was appropriate for factor analysis. Exploratory factor analysis procedures were completed for the purpose of identifying the latent constructs underlying the data. The criteria for determining how many factors to extract included eigenvalue greater than one rule, and a visual inspection of both the scree plot (Ary et al., 1996) and several trial solutions. The initial analysis was run without specifying how many factors to retain. This procedure resulted in 16 factors explaining 64.40% of the common variance. However, this factor structure did not appear to be the best representation of the data because of multiple cross-loadings and latent factors

that were difficult to interpret. The scree plot indicated the extraction of 9 to 13 factors. The final determination of how many factors to retain was made after comparing solutions extracting 13, 12, 11, 10, and 9 factors respectively.

The 12-factor solution for the training-specific items explained 57.23% of the common variance and produced the latent structure that was the best representation of the data. Of those 12 factors, 11 closely matched that the constructs in the original LTSI. However, the 12th factor was dropped because it contained two items that did not have a strong conceptual connection to one another and that cross-loaded (>.20) across multiple factors. The residual correlation matrix was also examined and no meaningful residuals were found, further suggesting that the 12-factor structure was the appropriate and that the extraction of more or fewer factors would not improve the structures representation of the data. Items were retained on factors if they had a minimum loading of .30 and were deleted if they had a cross loading above .20. Using these criteria, 44 items of the original 63 items were retained on the ALTSI and accounted for 55.16% of the total variance. Nineteen items were dropped because of low factor loadings and/or cross-loadings. All but one item loaded on the factor it was associated with in the original LTSI. Factor loadings for items retained in this solution ranged from .34 to .77 with an average loading of .61 on major factor and .05 on the rest of the factors. In short, the 12 factor solution extracted 11 interpretable factors including highly consistent with the following constructs from the original LTSI: learner readiness, motivation to transfer learning, personal outcomes-positive, personal outcomes-negative, personal capacity for transfer, peer support, supervisor/manager support, supervisor/manager sanctions, perceived content validity, transfer design, and opportunity to use training.

Table 1. *Factor Loadings, Eigenvalues, and Variance Explained for the ALTSI Training-Specific Factors*

Training-Specific Factors											
1		2		3		4		5		6	
Transfer Design		Sup Sanctions		Lrnr Readiness		P O Positive		Sup Support		Mot to Transfer	
Items	Loading	Items	Loading	Items	Loading	Items	Loading	Items	Loading	Items	Loading
52	.74	36	.62	13	.72	8	-.87	39	.72	4	.62
54	.70	35	.63	10	.68	7	-.86	33	.70	3	.60
51	.63	45	.62	9	.60	6	-.83	40	.69	2	.57
53	.62	34	.60	1	.51	15	-.34	43	.65	5	.52
55	.58	44	.44					37	.58		
		41	.43					32	.57		
Eigenvalues/percentage of variance explained											
11.71		5.28		3.05		2.75		2.07		1.87	
18.59		8.39		4.85		4.37		3.28		2.97	

Table 1 (con't)

Training-Specific Factors									
7		8		9		10		11	
P O Negative		Personal Capacity		Peer Support		Content Validity		Opp to Use	
Items	Loading	Items	Loading	Items	Loading	Items	Loading	Items	Loading
21	.74	11	.74	29	.77	47	-.59	61	-.69
14	.51	20	.59	30	.74	48	-.58	63	-.67
24	.45	12	.48	28	.61	58	-.45		
				31	.58				
Eigenvalues/percentage of variance explained									
1.77		1.74		1.60		1.53		1.37	
2.81		2.77		2.53		2.43		2.18	

In sum, loading of items was characterized by interpretable simple structure, meaning that it has high loadings on one factor and minimum cross-loadings on the rest of the factors. Finally, all factors had an acceptable reliability ranging from .62-.87, with an average alpha of .76, suggesting that this factor structure should be retained. Eight of the 11 scales exceeded Nunnally and Bernstein's (1994) suggested minimum reliability of at least .70 for instruments in early stages of development.

Training-in-general domain (26 items). The item to variables ratio was approximately 21:1, again well within the recommended ratio for factor analysis.. All individual items in the training-in-general domain had an acceptable MSA value above .60 (Hair et al., 1998), and the MSA for the this section as a whole was .85, indicating it was appropriate for factor analysis. The initial examination of the eigenvalues greater than one suggested the presence

of seven factors, explaining 60.78% of the total variance. However, this factor structure contained multiple cross-loading greater than .20 and at least one scale that was difficult to interpret. In addition, the scree plot indicated the extraction of anywhere from 5 to 7 factors might be appropriate. In an effort to respond to these issues, the final decision of how many factors to extract was made after comparing solutions extracting 7, 6, and 5 factors respectively.

The five-factor solution explained 52.51% of the common variance, it represented the most meaningful solution in terms of interpretable latent factors, and it was highly consistent with the original LTSI (Holton et al., 2000). The residual matrix was also examined for the five-factor solution and very low correlations existed, suggesting that the extraction of additional factors may not be appropriate. After using a cut off value of .30, along with deleting cross-loadings above .20, 22 items of the original 26 items were retained. These factors included transfer of effort-performance expectations, performance-outcomes expectations, resistance/openness to change, performance self-efficacy and feedback/performance coaching. The average loading on major factor was .61 with an average loading of .05 on the rest of the factors. Overall reliabilities were above the minimum level (.70) except for the *resistance/openness to change* factor which yielded an alpha of .53. Reliabilities ranged from .79 to .86, with an average alpha of .76, indicating that true factors did exist.

Table 2. *Factor Loadings, Eigenvalues, and Variance Explained for the ALTSI Training-in-General Factors.*

Training-in-General Factors									
1		2		3		4		5	
Feedback		Perf Self-Efficacy		Perf > Outcomes		Open to Change		Transfer Effort > Perf	
Items	Loading	Items	Loading	Items	Loading	Items	Loading	Items	Loading
80	.78	83	-.73	67	-.84	76	.57	66	.78
86	.75	84	-.59	68	-.80	74	.53	65	.65
81	.73	82	-.59	72	-.67	77	.44	69	.56
89	.59	85	-.52			73	.33	71	.52
88	.50					78	.30		
79	.37								
Eigenvalues/percentage of variance explained									
6.62		2.26		1.94		1.56		1.28	
25.45		8.71		7.45		6.00		4.90	

Summary of Factor Analysis Results

For both the training-specific and training-in-general analyses (a) factor loadings reflected interpretable simple structures; (b) only items with loading .40 or higher were included in the scales; and (c) average item loading values were greater than .50 on major factors and less than .15 on other factors for all scales. Except for the *Openness to Change* construct, all the ALTSI constructs showed acceptable levels of internal consistency as measured by Cronbach's alpha for scales in the early stages of development (.79-.86). For the training-specific domain, 11 factors emerged, explaining 55.16% of the total variance. All items (except for one item) loaded on their respective factors as hypothesized by the original LTSI. Finally, using a cut off for factor loadings of .30, and deleting cross-loading above .20, 44 items were retained for the calculation of scale scores. For the training-in-general domain, five factors were extracted, explaining 52.51% of the variance. Twenty-two items were retained and were highly consistent with that of the original LTSI items.

Discussion

The original LTSI is well-grounded in previous research and theory and has exhibited fairly robust psychometric qualities. Previous research in the U.S. has established the construct validity (Holton et al., 2000), convergent/divergent validity (Bookter, 1999), and criterion-related validity of the instrument (Bates, 2001; Bates et al., 2000; Seyler, Holton, Bates, Burnett, & Carvalho, 1998). In addition, the LTSI has shown evidence of cross-cultural construct validity in both Thailand (Yamnill, 2001) and Taiwan (Chen, 2003). The results of the present factor analysis indicated that 16 latent factors (with 66 items) emerged from the Jordanian data collected with the ALTSI. These factors closely matched the factors found in the original LTSI. Results suggest that the Arabic version of the LTSI can provide reliable and internally consistent measurement for learning transfer system constructs in Jordan. These results are consistent with other cross-cultural instrument validation research done with the LTSI and suggest the constructs assessed by the LTSI may be robust across cultures.

This study proposes new areas for future research. First, the psychometric properties of several ALTSI scales could be improved. For example, there is a need to increase the number of items on several factors. Factors such as *performance outcomes-negative, capacity for transfer, content validity, and performance outcomes-expectations* had only three items while *opportunity to use training* had two items. Increasing the number of items on these scales to four or five would enhance their reliability. In addition, the reliability estimate for the *openness to change* scale was lower than desirable (.53). Several items on this scale may require revision in order to enhance scale reliability.

The second recommendation would be to add more factors to the ALTSI that may specifically pertain to the Jordanian culture. A qualitative effort that includes interviews and focus groups would be helpful in uncovering those factors. For instance, Jordanians are characterized as being a collectivistic society, then organizational commitment and job involvement might play a role in facilitating or hindering learning transfer. Therefore, factors specifically related to theses constructs could be developed.

At the third stage a confirmatory factor analysis (CFA) of the ALTSI would further establish the construct validity of the scales. CFA methodology is necessary to confirm that those items found to belong to a certain factor in the initial exploratory factor analysis actually exist. Once confirmed, the ALTSI can be explored with a different sample to ensure that the factor structure exists in the Jordanian culture. Path modeling and structural equation modeling are other techniques that could be used to demonstrate the predictive relationship and its direction among the ALTSI constructs in the Jordanian culture. These techniques could be used as a first step toward theory development. The fourth stage would be to establish the criterion validity of the ALTSI by establishing its ability to predict other important domains in the field of HRD such as organizational learning (Kaiser, 2000) and training participation (Bates, 2001).

The final stage would involve comparing the responses from the Jordanian culture with those from the American culture after employing invariance testing techniques. Invariance testing allows comparison of results across different sampling parameters to determine how similar or different the results are. This is an important technique in establishing the replicability of results for future research.

Implications for the Field of HRD

This research is important because it represents an important effort to disseminate and share HRD tools and expertise across geographic and cultural boundaries. This is critically important given the global nature of business today and the internationalization of the field of HRD. For example, creating an Arabic version of the LTSI will enable HRD practitioners in Jordan to investigate the factors that influence transfer and to more fully evaluate the effectiveness of training. It also has the potential to enable the comparison of transfer systems across geographic and cultural boundaries and to help us learn more about how learning and performance are linked and facilitated. Understanding this linkage may be even more critical in developing economies where effective learning-performance linkages are perhaps not as well understood or pursued but nevertheless have the potential to dramatically improve individual performance and organizational competitiveness. Certainly the study of learning transfer can draw attention to the importance of transfer in the viability of organizations and the economy as a whole in Jordan and spur greater intent and effort in understanding training effectiveness. Moreover, knowing that many international and multinational organizations are expanding overseas, the local and international HRD functions, will gain deeper understanding of the transfer systems that exists in Arabic cultures, develop interventions to enhance learning transfer, and ultimately improve organizational performance.

On the other hand, HRD in the U. S. will have further proofs to the validity and reliability of the LTSI psychometric properties. The LTSI can be used to guide the efforts of the HRD function in enhancing training effectiveness and diagnose early problems with learning transfer. Such effort will have a great benefit to the organization as a whole by contributing to the bottom line results and further may provide further evidence to the credibility of the HRD function.

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