The Construct of the Learning Organization: Dimensions, Measurement, and Validation

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This research describes efforts to develop and validate a multidimensional measure of the learning organization. An instrument was developed based on a critical review of both the conceptualization and practice of this construct. Supporting validity evidence for the instrument was obtained from several sources, including best model-data fit among alternative measurement models, nomological network among dimensions of the learning organization, and organizational performance outcomes. Acceptable reliability estimates were obtained for the seven proposed dimensions. Consequently, the instrument, Dimensions of the Learning Organization Questionnaire, was recommended for use in organizational studies.

The concept of the learning organization has received increasing attention in the field of organizational studies, yet little is known about how to measure it. Despite growing attention to the learning organization, the lack of a theoretically derived measure of the construct has deterred substantive research in this area. Tsang (1997) observes that most writings in this area tend to be prescriptive and lack systematic and solid empirical research. Learning organization theorists argue that there has been considerable conceptual confusion about the nature of learning at the organizational level (Argyris & Schön, 1978, 1996; Brown & Duguid, 1991; Fiol & Lyles, 1985; Gephart, Marsick, Van Buren, & Spiro, 1996; Hedberg, 1981; Huber, 1991; Isaacs & Senge, 1992; March & Olsen, 1976; Meyer, 1982; Miner & Mezias, 1996; Tsang, 1997). From a theoretical perspective and for research purposes, researchers need to know the dimensionality of this concept and its relationships with other organizational variables. The purpose of this study is to contribute to this growing literature by developing and validating a measure of the learning organization.

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Construct Definition

In the past, organizational researchers have focused their work on conceptualization of the learning organization, identifying characteristics of such enterprises that have the capacity to learn, adapt, and change. A number of approaches to defining the construct have emerged.

Systems Thinking. Senge (1990) defines the learning organization as an organization that possesses not only an adaptive capacity but also "generativity"—that is, the ability to create alternative futures. Senge identifies the five disciplines that a learning organization should possess: team learning—emphasis on the learning activities of the group rather than on the development of team process; shared visions—ability to unearth shared "pictures of the future" that foster genuine commitment and enrollment rather than compliance; mental models—deeply held internal images of how the world works; personal mastery—continually clarifying and deepening personal vision, focusing energies, developing patience, and seeing reality objectively; and system thinking—ability to see interrelationships rather than linear cause-effect chains.

In sum, Senge's approach is to identify a set of principles of learning organizations. It is believed that these identified conditions are necessary to build a learning organization. Although these principles can be used as valuable guidelines in working toward learning organization status, the observable characteristics of such organizations have not yet been clearly identified.

Learning Perspective. Pedler, Burgoyne, and Boydell (1991) define the learning organization as "an organization that facilitates the learning of all of its members and continuously transforms itself in order to meet its strategic goals" (p. 1). They identified eleven areas through which this occurs: a learning approach to strategy, participative policymaking, informating, formative accounting and control, internal exchange, reward flexibility, enabling structures, boundary workers as environmental scanners, intercompany learning, learning climate, and self-development for everyone.

This learning perspective provides comprehensive aspects of learning at all organizational levels. The traditional elements of management are incorporated to support learning. Although this approach has the merit of comprehensiveness, it fails to provide a parsimonious framework of the construct. Furthermore, the eleven identified areas are conceptually overlapping, and thus the nondistinctive components of the concept make it less useful in guiding instrument development. These authors, like Senge, have an instrument used primarily as a consultative aid rather than a research tool.

Strategic Perspective. According to the strategic approach to the learning organization, a learning organization requires an understanding of the strategic internal drivers necessary for building learning capability. Garvin (1993) defines a learning organization as "an organization skilled at creating, acquiring, and transferring knowledge, and at modifying its behavior to reflect new knowledge and insights" (p. 80). Having synthesized the description of management practices and policies related to this construct in the literature, Goh (1998) contends that learning organizations have five core strategic building blocks: clarity and support for mission and vision, shared leadership and involvement, a culture that encourages experimentation, the ability to transfer knowledge across organizational boundaries, and teamwork and cooperation. Further, the strategic building blocks require two main supporting foundations. The first is an effective organization design that is aligned with and supports these building blocks. The other consists of the appropriate employee skills and competencies needed for the tasks and roles described in these strategic building blocks.

The strategic perspective of the learning organization posits that certain managerial practices or strategic building blocks are prerequisites for becoming a learning organization. These strategic building blocks can serve as practical guidelines for operational and managerial practice, and along with the two supporting foundations they can also provide advice for management and organizational consultants. However, the strategic perspective emphasizes the macro level and thus neglects some of the commonly identified elements of a learning organization, such as individual or continuous learning. Furthermore, the proposed five strategic building blocks are not conceptually parallel because some of them refer to the organization's ability (that is, transfer of knowledge) whereas the others reflect organizational culture (that is, experimentation, teamwork, and cooperation). Consequently, this perspective was not selected as the theoretical guide for the development of a set of consistent measures of a singular organizational construct—learning organization.

Integrative Perspective. Watkins and Marsick (1993, 1996) provide an integrative model of a learning organization. They originally defined the concept of the learning organization as "one that learns continuously and transforms itself. . . . Learning is a continuous, strategically used process—integrated with and running parallel to work" (1996, p. 4). In their more recent book, Marsick and Watkins (1999) state,

> We originally defined the learning organization as one that is characterized by continuous learning for continuous improvement, and by the capacity to transform itself (Watkins & Marsick, 1993, 1996). This definition captures a principle, but in and of itself, is not operational. What does it look like when learning becomes an intentional part of the business strategy? People are aligned around a common vision. They sense and interpret their changing environment. They generate new knowledge which they use, in turn, to create innovative products and services to meet customer needs. We have identified seven action imperatives that characterize companies traveling toward this goal. . . . Our model emphasizes three key components: (1) systems-level, continuous learning (2) that is created in order to create and manage knowledge outcomes (3) which lead to improvement in the organization's performance, and ultimately its value, as measured through both financial

> assets and nonfinancial intellectual capital. Learning helps people to create and manage knowledge that builds a system's intellectual capital.

Their proposed learning organization model integrates two main organizational constituents: people and structure. These two constituents are also viewed as interactive components of organizational change and development. Watkins and Marsick (1993, 1996) identified seven distinct but interrelated dimensions of a learning organization at individual, team, and organizational levels. These dimensions and their definitions are described as follows. The first dimension, *continuous learning,* represents an organization's effort to create continuous learning opportunities for all of its members. The second dimension, *inquiry and dialogue,* refers to an organization's effort in creating a culture of questioning, feedback, and experimentation. The third dimension, *team learning,* reflects the "spirit of collaboration and the collaborative skills that undergird the effective use of teams" (Watkins & Marsick, 1996, p. 6). The fourth dimension, *empowerment,* signifies an organization's process to create and share a collective vision and get feedback from its members about the gap between the current status and the new vision. The fifth dimension, embedded system, indicates efforts to establish systems to capture and share learning. The sixth dimension, system connection, reflects global thinking and actions to connect the organization to its internal and external environment. The seventh dimension, *strategic leadership,* shows the extent to which leaders "think strategically about how to use learning to create change and to move the organization in new directions or new markets" (p. 7). The learning organization is viewed as one that has the capacity to integrate people and structures in order to move toward continuous learning and change.

This review of the conceptualizations of the learning organization reveals that there are as many definitions as there are different perspectives on this organizational construct. Garvin (1993) contends that although organizational theorists have studied this concept for many years, a clear definition remains elusive.

Theoretical Foundation of This Study

Although there are different approaches to and definitions of a learning organization, some common characteristics can be identified. First, all approaches to the construct of a learning organization assume that organizations are organic entities like individuals and have the capacity to learn. More and more organizational researchers realize that an organization's learning capability will be the only sustainable competitive advantage in the future. Second, there is a difference between two related yet distinct constructs—the learning organization and organizational learning. The construct of the learning organization normally refers to organizations that have displayed these continuous learning and adaptive characteristics, or have worked to instill them. Organizational learning, in contrast, denotes collective learning experiences used to acquire knowledge and develop skills. Third, the characteristics of a learning organization should be reflected at different organizational levels—generally, individual, team or group, and structural or system levels.

Watkins and Marsick's (1993, 1996) framework of learning organization served as the theoretical foundation for the current study. This theoretical framework has several distinctive characteristics. First, it has a clear and inclusive definition of the construct of the learning organization. It defines the construct from an organizational culture perspective and thus provides adequate measurement domains for scale construction. Second, it includes dimensions of a learning organization at all levels. Redding (1997) reviewed several assessment tools of learning organizations and suggested that the framework created by Watkins and Marsick (1996) was among the few that covered all learning levels (that is, individual, team, and organizational) and system areas. Third, this model not only identifies main dimensions of the learning organization in the literature but also integrates them in a theoretical framework by specifying their relationships. Such a theoretical framework not only provides useful guidelines for instrument development and validation but also suggests further organizational studies. Last, it defines the proposed seven dimensions of a learning organization from the perspective of action imperatives and thus has practical implications. This action perspective of the learning organization both provides a consistent cultural perspective on the construct and suggests several observable actions that can be taken to build a learning organization. In the process of instrument development, it is essential to construct a set of observable variables to form measures for latent variables or theoretical constructs.

In a recent comprehensive review of literature on learning organizations, Örtenblad (2002) developed a typology of the idea of a learning organization. He suggested that there are four understandings of the learning organization concept. The first is the *old organizational learning perspective,* which focuses on the storage of knowledge in the organizational mind. Learning is viewed as applications of knowledge at different levels. The second type is the *learning at work perspective,* which sees a learning organization as an organization where individuals learn at the workplace. The third is the *learning climate perspective,* which sees the learning organization as one that facilitates the learning of its employees. The fourth is the *learning structure perspective,* which regards the learning organization as a flexible entity. Among the twelve perspectives of the learning organization evaluated by Örtenblad (2002) Watkins and Marsick's (1993) approach is the only theoretical framework that covers all four understandings of the idea of a learning organization in the literature.

Purpose of This Study

As a step toward gaining a better understanding of the construct of the learning organization, this study was designed to develop and validate an instrument measuring such an organization's dimensions. The study investigates the construct validity of the instrument by examining the number of dimensions thought to explain the interrelations among items included in the instrument, and by examining the relationship between learning characteristics of organizations measured on the instrument and organizational outcome variables. Three questions were identified to guide the study:

Can a reliable measure of a learning organization be developed to reflect dimensions of the learning organization identified in the literature?

To what extent do the proposed dimensions of the learning organization explain the covariation of learning characteristics of organizations in response to the items in the instrument?

What is the relationship between learning characteristics of organizations and the organizational outcome variables of financial and knowledge performance?

Methods

The methods were as follows.

Instrument Development. A separate scale was used to measure each of the seven dimensions of a learning organization proposed by Watkins and Marsick (1993, 1996). An item pool was generated by the instrument authors based on behavioral evidence of each dimension identified in their research on the learning organization. The authors of the instrument are the experts in the field, and they checked relevant literature to ensure that the instrument covered adequate content area for the construct of learning organization. Respondents were asked to rate each question about how things were in their organizations on a six-point Likert-type scale that ranged from "almost never true" to "almost always true." For instrument consistency, each scale originally included six items. Items were further refined through item analysis procedures. Item analysis was conducted along with expert evaluation by a panel of graduate students in two universities for coherence and readability. One dimension—continuous learning—was elaborated to seven items because it was determined that one item measured two critical concepts.

Three stages of field testing were conducted in the instrument development process to ensure the reliability and content validity of the scale. At each of the stages, managers and human resource developers from different organizations filled out the scale with regard to the learning organization dimensions as reflected in their organization or work group. A total of 48 subjects participated in the first stage and responded to the first version of the instrument, 71 subjects participated in the second stage and returned surveys in the second version, and 191 subjects participated in the third stage. All of the responses were then coded and analyzed using the SPSS program. Item analysis procedures were performed at each stage. Reliability testing enabled the revision of each version of the instrument into the final form. Analysis of internal consistency (as reflected by Cronbach's alpha) for each scale identified items with low item–total correlations. These items were replaced or revised in later versions with an overall eye toward content validity. The field tests continued until acceptable reliability and content validity were achieved.

In addition, a set of twelve items was added to the third version of the scale, which permitted the respondents to indicate the extent to which the performance of their work group or organization this year was better or worse than last year in a number of key areas. These items were designed to measure a construct of organizational knowledge and financial performance. Measures of organizational performance were then included in the instrument in order to establish a nomological network among organizational performance and the dimensions of a learning organization. Consequently, an instrument that consisted of seven dimensions of a learning organization and two measures of organizational performance was developed. This instrument was named Dimensions of the Learning Organization Questionnaire (DLOQ). Here the term *dimensions* is used to reflect different aspects of the construct of the learning organization. According to Bollen (1989), dimensions "are components that cannot be easily subdivided into additional components" (p. 180).

Sample. The primary sample used for construct validation comes from a data set of an ongoing process of instrument development and validation. A total of 836 subjects consisted of a nonrandom sample from multiple organizations. Nearly half (49 percent) of the subjects worked in the service sector, 42 percent worked in manufacturing, and only 4 percent worked in government or other public organizations. More than one-third (37 percent) of the subjects reported their organizations had annual revenues over $100 million, 32 percent reported annual revenues between $25 and $99 million, 26 percent reported annual revenues between $2 and $25 million, and only 5 percent reported annual revenues under $2 million. The subjects' roles in the organization included senior management (19 percent), middle management (37 percent), supervisory (12 percent), nonmanagement (technical-professional; 24 percent), and nonmanagement (hourly employee; 8 percent). Their educational experiences ranged from high school (10 percent) to associate degree (11 percent), undergraduate degree (39 percent), and graduate degree (40 percent).

Data Analysis. The objective of the data analysis was to examine the construct reliability and validity of the theory-based seven-dimensional measure of the learning organization.

Data Analysis Strategy. Several techniques were employed to determine a final form of the instrument with adequate psychometric properties and demonstrable construct validity. *Construct validity* refers to the extent to which a scale developer can ensure exactly what the instrument is measuring (AERA, APA, & NCME, 1985; Crocker & Algina, 1986). Confirmatory factor analysis (CFA) was selected to assess the construct validity for the measure of dimensions of the learning organization. This technique was appropriate because it examined whether the proposed dimensions of the learning organization had some attributes that could provide organized interpretations of learning behaviors. CFA can be used to verify the adequacy of the item to factor associations and the number of dimensions underlying the construct (Bollen, 1989; Thompson & Daniel, 1996). Structural equation modeling (SEM) was used to assess the relations between dimensions of the learning organization and organizational performance measures. All analyses were performed with LISREL 8, based on the covariance matrices generated by PRELIS 2 (Jöreskog & Sörbom, 1993a, 1993b).

Data analysis consisted of three distinct phases. Because the total data pool was relatively large ($N = 836$), two independent samples were drawn from the pool to provide a means of cross-validating the results. Thus in Phase 1, the entire sample was divided into two random samples with an equal number of subjects ($N = 418$). These two samples were designated as exploratory and confirmatory samples. In this phase of the data analysis, three alternative measurement models were tested for both of the samples. Phase 2 consisted of refining the instrument by the model generation method. The reliability for the measures of the learning organization was estimated for both the initial and refined instruments. Phase 3 was used to assess the nomological validity of the DLOQ with SEM technique.

Alternative Measurement Models. The construct validity for the measures of the DLOQ were first examined by testing alternative measurement models, following Jöreskog's (1993) method of alternative models (AM). Three competing measurement models were formulated and tested. The first model was a null model where no common latent variable was assumed to exist among the observed variables represented by the instrument items. This is also called the baseline model because it is the simplest and most restrictive model that can be used to compare other less restrictive models. This model assumed that there was no common concept for us to investigate among various learning activities in the organization. The second model assumed that one factor underlay the observed variables and that the covariations among the observed variables could be adequately explained by a single construct of the learning organization. In other words, this model assumed that the learning organization is a unidimensional concept. This model actually fits an assumption held by many practitioners who view the learning organization as one concept that covers knowledge management, leadership, vision, and organizational culture. The third model consisted of seven latent variables representing seven proposed dimensions of the construct. This model was of interest because we wanted to see if the proposed constructs explained the covariances among observed variables reasonably well and if this model showed a significant improvement in the model-data fit over the null model and one-factor model.

Refining the Instrument. Because the construct of a learning organization is relatively new and quite complex, and also because the measurement of such a construct with solid psychometric properties did not exist in the literature, we did not expect all of the initial items to form an excellent measurement model that fitted the data well. During the instrument development process, we included as many items as we could to ensure content validity and internally consistent reliability for each of the scales. Consequently, there was a need to validate a concise form of the instrument by including only those items that most accurately represented the designated dimensions from statistical and substantive viewpoints. A model generating (MG) method (Jöreskog, 1993) was employed to retain those representative items for the exploratory sample. The objective of this MG process was to search for a shorter form of the instrument while maintaining the original theoretical structure, and to approximate simple structure as closely as possible. Items were deleted one by one until an acceptable fitting model was obtained. During the process of deletion, care was taken to maintain a balance of items per scale, with a minimum of three items per scale. This particular consideration was included in the analysis in order to avoid possible identification and convergence problems (Bollen, 1989).

The model generation method was used to test for the exploratory sample and resulted in a shortened version of the instrument. Then the retained items were tested with the validation sample to ensure the adequacy of the item selection.

Examining Instrument Reliability. A number of measurement models have been proposed to estimate the reliability of a scale (Lord & Novick, 1968). One of the most common reliability estimates is Cronbach's coefficient alpha (1951). However, it has been suggested that Cronbach's coefficient alpha represents the lower bound of the reliability coefficient, because it assumes that all individual items measure the true score of the latent variable equally well (Bollen, 1989; Crocker & Algina, 1986). The coefficient alpha represents a classic model of reliability estimation where an individual's true score is viewed as the average of an infinite number of respondent scores of the same test. Therefore, a more realistic measurement model was required to estimate the reliability of the instrument.

Cronbach's (1951) coefficient alpha assumes a tau-equivalent model. The tau-equivalent model assumes that each item is an equally accurate indicator of the same true score, and that the separate item errors are uncorrelated and have different variances. However, the tau-equivalent model is quite restrictive and tends to be biased in estimating reliability because items in a scale do not all perform equally well in measuring the same true score. The tau-equivalent model cannot be used to estimate reliability for individual items when the equality of the items' association to the true score is not maintained (Bollen, 1989; Fleishman & Benson, 1987; Lord & Novick, 1968).

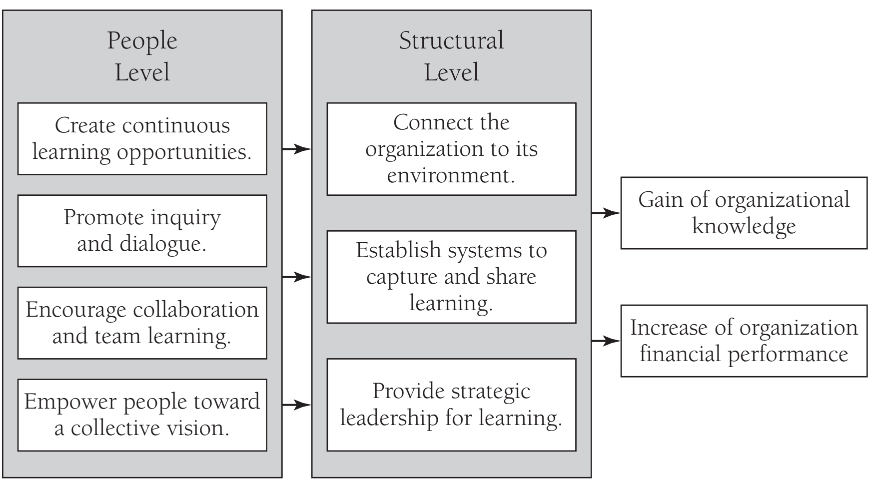
The congeneric model (Jöreskog, 1969) is less restrictive. The model assumes only that each item reflects the same true score but to different degrees, and that item errors may differ or even be correlated. The congeneric model was deemed to be appropriate in estimating the reliability of the instrument for the current study. To assess the reliability with a congeneric model, a confirmatory factor analysis needs to be performed and the reliability estimates can be obtained by calculating the proportion of item variance that can be accounted for by the latent variable (Fleishman & Benson, 1987).

Assessing Nomological Validity. Organizations use a variety of ways to learn, and their behaviors could be reported from as many perspectives as there are observers. These different learning dimensions collectively define the concept of the learning organization. The learning organization is a construct that researchers postulate to reflect interpretable learning behaviors in organizations. The empirical evidence of interrelations among constructs provides a means for establishing and validating theoretical frameworks in social science research. Social science works at discovering laws underlying social phenomena, and involves a back-and-forth process (empirical evidence versus theorizing). The theoretical relations among the concepts of interest, or the interlocking system of lawful relations, is referred to as a nomological network by Cronbach and Meehl (1955). The concept of nomological validity is a significant contribution in psychometric literature, and it is a useful design in the practice of scale validation (Benson & Hagtvet, 1996).

Cronbach and Meehl (1955) maintain that a "rigorous (though perhaps probabilistic) chain of inference is required to establish a test [or a scale] as a measure of a construct. To validate a claim that a test measures a construct, a nomological net surrounding the concept must exist" (p. 291). In other words, a "necessary condition for a construct to be scientifically admissible is that it occur[s] on a nomological net, at least *some* [italics in original] of whose laws involve observables" (p. 290). For the current study, the nomological networks between the dimensions of a learning organization and organizational outcome variables were examined. Two variables, financial performance and knowledge performance, were constructed in the DLOQ to establish a nomological net between learning behaviors and outcomes. According to Watkins and Marsick (1993, 1996), there are three levels of organizational learning. The first is the individual level, which is composed by two dimensions of organizational learning: *continuous learning* and *dialogue and inquiry.* The second is the team or group level, which is reflected by *team learning and collaboration.* The third is the organizational level, which has four dimensions of organizational learning: *embedded system, system connection, empowerment,* and *provide leadership for learning.* These three levels can be further considered to belong to one of the two components of Watkins and Marsick's (1993) model of a learning organization. The first component represents the people who make up an organization, and the second component represents the structures and culture created by the organization's social institution. We hypothesized that the organization needs to work with people at the individual and group level first. People also need to be empowered to take learning initiatives. "In other words, individuals learn first as individuals, but as they join together in organizational change, they learn as clusters, teams, networks, and increasingly larger units" (Watkins & Marsick, 1996, p. 4). It was also reasoned that the structural level learning activity could serve as a refining function by filtering and incorporating individual and group learning into the organization's mission or ultimate performance outcomes. Although people initiate change on their own as a result of their learning, organizations must create facilitative structures to support and capture learning in order to move toward their missions. Specifically, we hypothesized that three variables—*system connection, embedded system,* and *provide leadership for learning*—are the mediators between individual-level learning activities and organizational outcomes. In Figure 1, a proposed model captures the hypotheses about the relationships among dimensions of the learning organization and outcome variables.

Following Benson and Hagtvet (1996), the method of structural equation modeling (SEM) was used to examine the relationships postulated in Figure 1. We used the exploratory sample to search for a fitted model of SEM and tested that model in the confirmatory sample. If there is a structural model representing the nomological network that fits the data, and the hypothesized relations among the constructs are found to be significant in the desirable directions, then there are significant relations between the proposed seven dimensions of the learning organization and the two organizational outcome variables. It then can be concluded that learning behaviors measured on the instrument are significantly related to organizational outcomes in a way implied by the theory. Therefore, evidence of nomological validity could be provided for the instrument.

Figure 1. Nomological Network of the Dimensions of Learning Organization and Performance Outcomes



Evaluating Model-Data Fit. In confirmatory factor analysis and structural equation modeling, a decision to accept or reject a model is usually made using an overall chi-square goodness-of-fit measure. A model is acceptable only if residuals between elements of the sample covariance matrix and the covariance matrix reproduced according to the model converge in probability to zero as the sample size goes to infinity. Nevertheless, the chi-square test is limited in testing various models because of its sensitivity to sample size. As sample size increases, even trivial residuals might increase the likelihood of falsely rejecting the model. Furthermore, the chi-square test is established to determine a restrictive hypothesis that the model being tested is the true model with regard to a sample. In other words, the chi-square test demands a perfectly reproduced covariance matrix based on the theoretical model. As a matter of fact, most social-behavioral models are merely approximations of "reality" or "truth." Consequently, the chi-square significance test is limited in model testing practice, and a variety of alternative statistical indices are proposed to determine the adequacy of the measurement and structural equation models (Bollen, 1989). Therefore, most researchers rely on a variety of alternative fit indices to reduce the dependence on sample size when assessing model fit. Because the various indices differ in their specific assumptions, researchers advocate that the models be judged using multiple fit indices that represent different families of measures of fit; one must take into account the degree of substantive meaning for a model (Bollen & Long, 1993).

This study selected six criterion indices: the chi-square test, Jöreskog and Sörbom's (1989) goodness-of-fit index (GFI) and goodness-of-fit index adjusted for degree of freedom (AGFI), Bentler's (1990) comparative fit index (CFI), Bentler and Bonett's (1980) non-normed fit index (NNFI), and Steiger's (1990) root mean square error of approximation (RMSEA). The GFI and AGFI reflect the proportion of the joint amount of data variance and covariance that can be explained by the measurement model being tested. The NNFI is a relative fit index that compares the model being tested to a baseline model (null model), taking into account the degrees of freedom. The CFI indicates the degree of fit between the hypothesized and null measurement models. The RMSEA represents a real advance in the evaluation of model fit from both the statistical and the conceptual viewpoint. Browne and Cudeck (1993) argue that because theoretical models are at best approximations of reality, the null hypothesis for any measurement-structural equation model (that is, conventional chi-square test that the data fit the model perfectly) will rarely be true. Rather than testing the null hypothesis of *exact fit* between the covariance matrix of sample and that of model for population, RMSEA establishes a hypothesis of *close fit* between the model and population. RMSEA values of .05 or less indicate a very close fit between the sample and the theoretical model, accounting for degrees of freedom. Values less than .08 reflect reasonably good fitting models (Browne & Cudeck, 1993).

Results

The results of this study were as follows.

Descriptive Statistics and Reliability Estimates. Table 1 presents univariate statistics, reliability estimates, and correlations among dimensions included in the DLOQ. In general, all of the subscales had nearly one one-point standard deviation on a six-point scale and thus showed adequate variations to capture the variability among different organizations. All of the correlation coefficients were significant at the level of .001, indicating strong convergent validity of the subscales in assessing one construct of a learning organization. However, few correlations were very high, and the results suggest that some dimensions may lack adequate discriminant validity. Specifically, certain correlations among dimensions in the people and system levels tend to be higher than .70 and higher than those correlations at each of the levels. On one hand, these results tend to confirm our hypothesis that a learning organization needs to be implemented at both the people and system levels. On the other hand, the results imply that a more parsimonious assessment for the construct of learning organization is warranted.

The Cronbach's coefficient alpha reliability estimates for the seven dimensions of a learning organization tend to be acceptable (all were above .80). Reliability estimates for two outcome variables were also reasonable (.74 and .77, respectively). Given that this is an initial effort at measurement of a learning organization, the overall reliability estimates are satisfactory.

Alternative Measurement Models. Table 2 gives the fit indices of the three alternative measurement models in a simple factor structure and a complex structure. A simple factor structure assumes that each item is designed solely to measure one factor, and measurement errors are not allowed to be correlated. A complex factor structure is a more realistic model where items are permitted to load on a second factor and measurement errors can be correlated. The modification index for the LISREL was examined to identify whether adding parameters to the hypothesized model was warranted. Specifically, twenty additional links were added to the simple structure model (six of them were secondary loadings and fourteen were correlated measurement errors). In evaluating measurement models, we did not rely on chi-square tests to assess overall fit because of their sensitivity to sample size and other biases. Based on the selected fit indices, the proposed seven-factor model fitted the data best among the alternative measurement models for both exploratory and confirmatory samples. The seven-factor structure model accounted for about three-fourths of item variances and covariances as was indicated by GFI. Also, the values of the RMSEAs (all were less than .08) indicated that the proposed seven-factor structure formed appropriate measurement models (Browne & Cudeck, 1993).

Fit indices for the measurement model designed to assess organizational outcomes are presented in Table 3. The results indicated that the proposed

Table 1. Means, Standard Deviations, Reliabilities, and Zero-Order Intercorrelations Among Dimensions of Learning Organization

Variables[a]	*N*	*M*	*SD*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
1. Continuous learning	836	3.90	.92	(.81)[b]								
2. Inquiry and dialogue	836	3.79	.92	.75	(.87)							
3. Team learning	833	3.85	.96	.71	.74	(.86)						
4. Embedded system	834	3.34	.99	.63	.58	.64	(.81)					
5. Empowerment	833	3.66	.97	.66	.67	.71	.67	(.84)				
6. System connection	834	3.93	.96	.67	.64	.67	.62	.77	(.80)			
7. Provide leadership	835	4.13	.98	.70	.70	.68	.65	.76	.76	(.87)		
8. Financial performance	819	4.13	.95	.37	.35	.42	.33	.36	.37	.41	(.74)	
9. Knowledge performance	821	4.10	.97	.29	.45	.48	.44	.50	.51	.51	.59	(.77)

Note: This was a two-tailed test; all of the correlation coefficients are significant at the level of $p < .001$.

[a]Each dimension is measured by six-point scale.

[b]Internal consistency estimates (coefficient alpha) are presented in the diagonal.

Table 2. Fit Indices for Alternative Measurement Models in the Simple and Complex Factor Structures of Learning Construct for Exploratory and Confirmatory Samples

	Simple Factor Structure			*Complex Structure*
Fit Index	*Null Model*	*One-Factor*	*Seven-Factor*	*Seven-Factor*
Exploratory Sample				
χ^2	11211.06	3630.98	2740.77	2031.88
df	861	819	798	778
χ^2/df	13.02	4.43	3.43	2.61
RMSEA	.17	.09	.08	.06
RMSR	.39	.06	.05	.05
GFI	.13	.67	.76	.82
AGFI	.09	.64	.73	.79
NNFI (TLI)	0	.71	.80	.87
CFI	0	.73	.81	.88
Confirmatory Sample				
χ^2	12378.21	3517.09	2904.96	2746.29
df	861	819	798	778
χ^2/df	14.38	4.29	3.64	3.53
RMSEA	.18	.09	.08	.08
RMSR	.43	.06	.06	.06
GFI	.11	.67	.73	.75
AGFI	.07	.64	.69	.71
NNFI (TLI)	0	.75	.80	.81
CFI	0	.77	.82	.83

Note: RMSEA = root mean square error of approximation; RMSR = root mean square residual; GFI = goodness-fit-index; AGI = adjusted GFI; NNFI = non-normed fit index; CFI = comparative fit index.

two-factor model fitted the data best among alternative measurement models being tested for both exploratory and confirmatory samples. Although this model failed to reproduce a variance and covariance matrix close to the matrix from data (as indicated by the moderate magnitude of the average residuals), the modified model formed an appropriate measurement model for two outcome variables. The refined complex structure formed a measurement model with acceptable comparative fit indices. The goodness-of-fit index reached .90, indicating that more than 90 percent of item variances and covariances could be explained by the proposed two-dimensional factor structure. Overall, the results indicated that the twelve-item measurement model for the constructs of *financial performance* and *knowledge performance* fitted the data moderately.

These results indicated that the learning organization is a multidimensional construct. Although the measurement model of forty-two items with a seven-factor structure represented the best among three alternative measurement models being tested, this factor structure and its corresponding items did not establish a good measurement model. For example, the variance and covariance explained by the model was relatively low (around 75 percent). In fact, the seven-factor model failed to show excellent fit on most of the indices.

Table 3. Fit Indices for Alternative Measurement Models in the Simple and Complex Factor Structures of Performance Outcome for Exploratory and Confirmatory Samples

	Simple Factor Structure			*Complex Structure*
Fit Index	*Null Model*	*One-Factor*	*Two-Factor*	*Two-Factor*
Exploratory Sample				
χ^2	1696.33	452.46	413.40	208.62
df	66	54	53	49
χ^2/df	25.71	8.38	7.80	4.26
RMSEA	.24	.13	.13	.09
RMSR	.32	.08	.08	.05
GFI	.44	.84	.86	.93
AGFI	.33	.77	.80	.89
NNFI (TLI)	0	.70	.73	.87
CFI	0	.76	.78	.90
Confirmatory Sample				
χ^2	1949.40	333.70	317.65	284.53
df	66	54	53	49
χ^2/df	29.54	6.18	5.99	5.81
RMSEA	.26	.11	.11	.11
RMSR	.36	.06	.06	.06
GFI	.37	.89	.89	.91
AGFI	.25	.84	.84	.85
NNFI (TLI)	0	.82	.83	.83
CFI	0	.85	.86	.88

Note: RMSEA = root mean square error of approximation; RMSR = root mean square residual; GFI = goodness-fit-index; AGI = adjusted GFI; NNFI = non-normed fit index; CFI = comparative fit index.

Normally, the researchers expect a well-fitting model to have estimated values close to 1.0 on ad hoc fit indices such as GFI, AGFI, NNFI, and CFI. Even if a complex factor structure was allowed and significant measurement errors were free to be correlated, the complex measurement still failed to generate good fitting indices. Similar results were found for the twelve items with the two-factor model of organizational performance outcomes.

Instrument Refinement. The seven-factor model with forty-two items was lengthy and did not fit the data very well. There was a considerable portion of item variation (one-quarter) that could not be explained by the proposed dimensions of the learning organization. This implies that the proposed factor structure might have been incorrect, or that the factor structure was adequate but the number and nature of items were not adequate indicators of the proposed dimensions. Therefore, it was necessary to examine how the measurement items were represented by the proposed dimensions. It was also of interest to identify a shorter version of the instrument while maintaining the same (or even better) psychometric properties. Such a shorter version of the instrument is of particular interest for research purposes when it can be incorporated with other instruments in examining relationships among several important organizational variables. Ideally, the fit of the measurement model will improve when inadequate items are discarded from the scale while adequate items are retained. In order to refine the instrument by including those items that adequately represent the presumed dimensions of a learning organization, the MG method was used and a series of CFA were conducted for the exploratory sample. The objective of this item deletion process was to retain a set of sample items in a simple structure as closely as possible while maintaining the original theoretical structure.

Half of the original items were deleted from the scale using the MG process and the remaining half constituted the academic version of the DLOQ (Marsick & Watkins, 2003). Table 4 reports fit indices for the refined measures of both learning organization and performance outcomes in exploratory and confirmatory samples. Although the fit indices were less strong for the confirmatory sample, all of the ad hoc fit indices are either above or close to .90, indicating adequate model-data fit. About 90 percent of the variances and covariances of the reported learning culture could be explained by the proposed seven dimensions of learning organization (GFI was .92 and .87 for the two samples, respectively). Furthermore, the CFA results indicated that all of the retained items loaded on their designated dimensions with strong associations. Because the refined measures have formed adequate measurement models for both exploratory and confirmatory samples, evidence of construct validity for the refined academic version of the DLOQ has been provided.

Table 5 reports the reliability estimates for the dimensions of the learning organization measured in the DLOQ. The reliability was estimated by the

Table 4. Fit Indices for Refined Measures of Learning Organization and Performance Outcomes in Exploratory and Confirmatory Samples

	Measurement of Learning Construct		*Measurement of Performance Outcome*	
Fit Index	*Exploratory Sample*	*Confirmatory Sample*	*Exploratory Sample*	*Confirmatory Sample*
χ^2	390.31	617.35	32.33	43.58
df	168	168	8	8
χ^2/df	2.32	3.67	4.04	5.45
RMSEA	.06	.08	.09	.10
RMSR	.04	.05	.04	.05
GFI	.92	.87	.98	.97
AGFI	.89	.82	.94	.91
NNFI (TLI)	.94	.89	.93	.89
CFI	.95	.91	.96	.94

Note: RMSEA = root mean square error of approximation; RMSR = root mean square residual; GFI = goodness-fit-index; AGI = adjusted GFI; NNFI = non-normed fit index; CFI = comparative fit index.

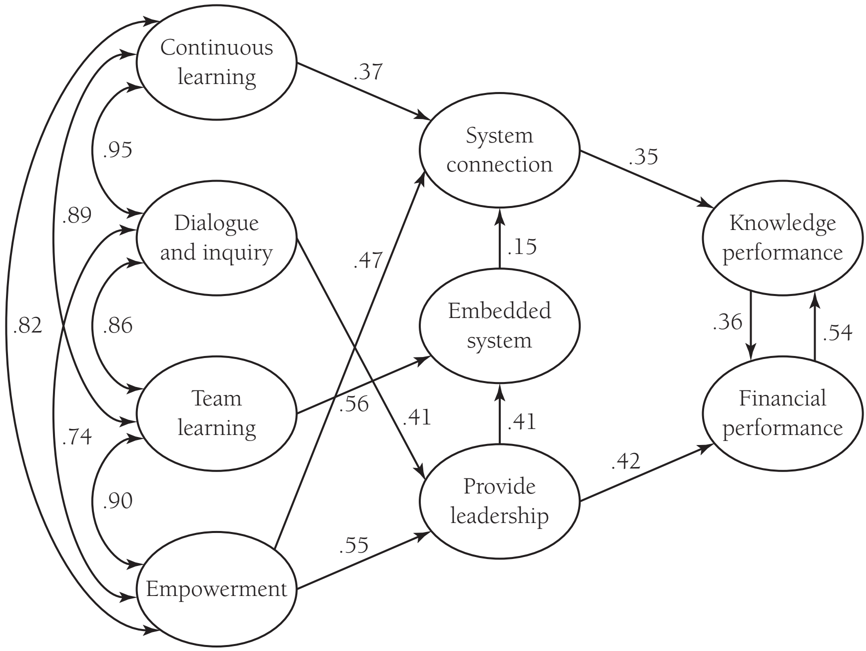
Table 5. Reliability Estimates for the Measures in the DLOQ

	Initial Measurement		*Refined Measurement*	
Scale	*Coefficient Alpha*	*Reliability Under CFA*	*Coefficient Alpha*	*Reliability Under CFA*
Continuous learning	.81	.90	.71	.84
Dialogue and inquiry	.87	.91	.78	.87
Team learning	.86	.93	.79	.87
Embedded system	.81	.89	.75	.85
System connection	.84	.90	.75	.84
Empowerment	.80	.88	.68	.83
Provide leadership	.87	.94	.83	.93
Financial performance	.74	.84	.70	.79
Knowledge performance	.77	.86	.64	.78

tau-equivalent model (commonly known as coefficient alpha) and the congeneric model (Jöreskog & Sörbom, 1989). The latter one was included because it is a more accurate estimation in CFA contexts. All of the reliability estimates were calculated on the whole sample. Under the initial measures of a learning organization, the coefficient alpha for seven proposed dimensions ranged from .80 to .87, and the reliability estimates under CFA ranged from .89 to .94. Under the refined measures of the learning organization, the coefficient alpha for seven proposed dimensions ranged from .68 to .83, and the reliability estimates under CFA ranged from .83 to .93. The reliability estimates for two outcome variables ranged from .64 to .77 and .78 to .86 under the tau-equivalent and congeneric models, respectively. When the initial and refined measures of the DLOQ were compared, it was noted that all the reliability estimates did not decrease substantially even though item numbers were reduced by half in the refined version. The results demonstrate that the measures included in the DLOQ have shown reasonable reliability estimates in initial instrument development.

Nomological Validity. In order to establish the nomological validity for the instrument, structural equation modeling (SEM) method was used to examine the relationships between the seven dimensions of the learning organization and the two outcome measures (*financial performance* and *knowledge performance*). The results of SEM suggested that the structural model illustrated in Figure 2 had a close fit to the data. Because of the high similarity, we report SEM results on the overall or total sample to provide more generalized results. Figure 2 presents the researched model and estimates of the structural coefficients. Although the overall chi-square test of the model was statistically significant [$\chi^2(307) = 1068.93$, $p < .01$], more significantly, the value of RMSEA (.06) indicated that the model-data fit was appropriate (Browne & Cudeck, 1993). The model also showed acceptable values on other comparative fit indices (GFI = .91, AGFI = .89, NNFI = .91, CFI = .92). In other words,

Figure 2. LISREL Estimates of Structural Model Coefficients for a Nomological Network Between Dimensions of Learning Organization and Performance Outcomes



more than 90 percent of the joint amount of variance and covariance of the data could be accounted for by the model being tested.

Figure 2 shows estimates of the structural coefficients for the nomological network. Each of these coefficients can be viewed as a standardized regression coefficient of one exogenous variable on its related endogenous variable when the effects of other variables were partialed out. All of the path coefficients were statistically significant and positive in direction. The results suggested that individual and group level learning activities—namely, *continuous learning, dialogue and inquiry, team learning,* and *empowerment*—had indirect significant effects on organizational outcomes. Three organizational level variables—*system connection, embedded system,* and *provide leadership for learning*—served as mediators of the relations between the individual learning activities and organizational outcomes. However, these variables influenced the organizational outcomes in different ways. Although *provide leadership for learning* was the only variable that had direct influence on *financial performance, embedded system* and *system connection* affected *financial performance* indirectly through *knowledge performance.* Also, *system connection* was directly related to the organizational outcomes. The results suggested that although learning systems were important in absorbing individual learning activities, they had indirect effects on the outcomes. *System connection* appeared to be more important than *embedded system* in determining organizational outcomes. The estimates of the path coefficients indicated that *system connection* had a strong relationship with *knowledge performance* (.35), which served as a mediator related to *financial performance* (.36). In contrast, *embedded system* had little influence on *system connection* (.15). Connecting the organization to its environment may be much more important than creating systems to capture and share learning in an ever-changing world. Perhaps, as some organizational change scholars have noted, we no longer can afford the luxury of refreezing organizations but must instead move on to the next stage.

The organizational level variables not only have different impacts on organizational outcomes but also have been influenced by individual learning in distinct ways. The efforts of connecting the organization to its environment (namely, *system connection*) largely depend on continuous learning opportunities and empowering people with a collective vision. Moreover, to create systems to capture and share learning (in other words, *embedded system*) there is at least one prerequisite condition: people are encouraged to participate in enacting that vision through collaboration and team learning. The more efforts were devoted to empowering people toward a collective vision (reflected as *empowerment* in the scale), the more the leadership was provided to steer the organization in the right direction and the organization was more capable to connect itself to the environment. This result confirms Mintzberg's (1973) seminal research on managerial roles. He suggests that leaders' influence roles lead to the ability to perform informational roles, which make possible better enactment of decisional roles.

The SEM results indicated that the squared multiple correction for the endogenous variable *financial performance* was .66 and .74 for *knowledge performance*. Put another way, when operationalized as constructs, 66 percent and 74 percent of the variation of the two organizational outcome variables were explained by the proposed structural equation model. It was not a surprise to find that more variance of the variable *knowledge performance* had been explained by the model than *financial performance* because the instrument was designed to measure learning aspects of the organization. Nevertheless, it was very encouraging to find that about two-thirds of the variance in *financial performance* could be attributed to the variables measured in the instrument. Certainly, other important variables explain variance in financial outcomes (for example, organizational size, access to raw materials, market niche, competition, trends in the industry, and so on) than those included in the present study.

Overall, the results of SEM showed that the measures of the seven dimensions of the learning organization had significant effects on organizational outcomes. A considerable amount of the variation of the organizational outcomes could be explained by the proposed nomological network. Because all of the dimensions of the learning organization are significantly related to others in the hypothesized ways, the nomological validity of the instrument is evident.

Discussion and Implications

The present study showed strong evidence of construct validity for the scale measuring dimensions of the learning organization. The study tested a factor structure of the dimensions of the learning organization and confirmed that the learning organization is a multidimensional construct. The seven-factor structure proposed by Watkins and Marsick (1993, 1996) fits the data reasonably well. This structure will provide a useful framework for other researchers to study learning dimensions and their relations with other organizational performance variables. The results also show evidence of internal consistency and the construct reliability of the dimensions of the learning organization. The DLOQ will provide a useful tool for researchers to assess dimensions of the learning organization.

Constructing a valid instrument is an ongoing process. Although evidence of convergent validity of the seven dimensions of the DLOQ has been shown, the discriminant nature of the seven dimensions needs to be fully explored in the future. Further studies are needed for the scale with larger sample sizes and different types of organizations, particularly government or nonprofit organizations. More studies are also needed to cross-validate the instrument with different organizational cultures and populations in order to establish firmly its utility and validity. Presently, most respondents are senior or middle-level managers or professional-technical employees. Studies of a broad cross section of employees in the same organization are needed, as are studies across a large number of different organizations. Finally, an important use of an instrument such as the DLOQ is to measure change over time in order to determine whether and how an active intervention to create a learning organization affects responses. Is there a typical pattern of responses among newcomers to the learning organization? Does a different pattern emerge over time?

A nomological network between dimensions of the learning organization and performance outcomes was identified and empirically tested as an additional step toward construct validation. Support for nomological validity was found from the significant relations between dimensions of the learning organization and performance outcomes and the model-data fit. The results of structural equation modeling indicate that a considerable proportion of the variance among self-reported organizational performance outcomes can be explained by the dimensions of a learning organization. Future studies are needed to establish the relationships between the construct of the learning organization and other commonly used organizational performance measures, such as return on equity and return on assets. Firm evidence of construct validity could be established only if the relationship between measures of a learning organization and those objective measures of organizational performance is found to be significant. Studies by Ellinger, Ellinger, Yang, and Howton (2002) and Holton and Kaiser (2000) have begun the process of validating these organizational performance measures against objective financial measures.

Care should be taken in generalizing the structural model identified in this study. Because of the multidimensional and complex nature of the learning organization, the nomological network identified and tested in this study might be only one of the possible networks that specify the relationships among different levels of the learning organization and performance outcomes. The nomological network derived from the learning organization literature has specified the causal relationships of dimensions of a learning organization at people and structural levels. There are rather complicated interactions among these dimensions in each of these two levels. Thus, there might be alternative structural models with good fit to the data (Bollen, 1989). Consequently, the results of structural equation modeling were used to prove the overall impact of two levels of dimensions of the learning organization on performance outcomes rather than to demonstrate specific causal effects among dimensions at each of the levels. Future studies should address the limitations inherent in this first study of the nomological network of the learning organization. Additional organizational variables such as structure, culture, and management style should be included for further study in order to examine a more comprehensive nomological network.

This study shows that there is an underlying structure that represents patterns of learning activities in the organization. This parsimonious pattern of learning and its relationship to organizational outcomes offers valuable and practical strategies for organizational researchers and practitioners who will work to create learning organizations. Clearly, empirical assessment of the learning organization is in its infancy. Substantive studies are needed to identify and confirm underlying dimensions for this complex concept.

This study is a first attempt to develop an instrument measuring the construct of the learning organization with appropriate psychometric procedures. It contributes to the literature by developing a conceptual definition of the learning organization, measuring it, providing evidence of its construct validity, and demonstrating its relationship with organizational performance outcomes in the nomological network. We hope these efforts will encourage more organizational scholars to embark on substantive research addressing the construct of the learning organization and its role in organizational development. For human resource practitioners, our work offers initial evidence that when organizations invest in learning and make system-level changes to support learning, they are more likely to thrive in a changing economy.

Although this study has provided evidence of reliability and validity for the DLOQ that measures the construct of learning organization, several limitations should be noted. First, convenient sampling strategy was used in the instrument development and validation process. Random sampling with more diverse organizations is needed to validate the instrument further.

Second, participants in this study were recruited from different organizations in order to maximize the sample size; thus, there was only one respondent for each organization. Future studies are needed to recruit a reasonable number of respondents working at different levels with diverse functions from the same organization to examine the consistency of the responses to the instrument. This will allow the researcher to establish the further evidences of instrument's reliability. Third, the criterion variables (that is, performance outcomes) used to establish nomological validity in this study were assessed based on the respondents' perceptions. The validity evidence would be much stronger had some objective measures of organizational performance been used. In fact, one recent study has moved toward such direction by establishing a relationship between LO concept and objectives measures of organizational performance (Ellinger et al., 2002). Studies using this approach are extremely necessary in establishing evidence of validity and credibility for these HRD constructs and implied interventions.

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