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Organizational Learning: Subprocess Identification, Construct Validation, and an Empirical Test of Cultural Antecedents

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Organizational learning is key to an organization's capability for continuous change and renewal. As a result, scholarly interest in identifying the antecedents of organizational learning has greatly increased over the past couple of decades. This study focuses on (1) identifying and measuring the distinct subprocesses that make up the organizational learning construct to obtain a more detailed understanding of the construct and (2) exploring the effect that organizational culture and, more particularly, four dimensions of culture—participative decision making, openness, learning orientation, and transformational leadership—have on each of the organizational learning subprocesses. The authors use two samples of subject matter experts and the responses of 631 managers to test their propositions. Their results yielded five independent but interrelated subprocesses—information acquisition, information distribution, information interpretation, knowledge integration, and organizational memory. Furthermore, their results

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indicate that the four different cultural antecedents studied have different kinds of significant relationships with each of the organizational learning subprocesses. This study contributes to the literature on organizational learning by identifying and validating the organizational learning subprocesses, and by offering a detailed picture of the relationship between key organizational antecedents to learning and the individual subprocesses of learning. In addition, since they use systematic and thorough methodological techniques to develop an instrument to test, measure, and validate those subprocesses of learning that constitute a common body of knowledge in this area, the authors' instrument could prove to be a valuable tool for future research.

Keywords: *organizational learning; knowledge management; survey research; corporate culture*

Organizational learning is key to an organization's capability for continuous change and renewal. Research indicates that organizational learning increases the effectiveness of firm actions and results in positive outcomes such as improved organizational performance and innovation (Baker & Sinkula, 1999; March, 1991). Given these positive outcomes of learning, scholarly interest in identifying the antecedents of organizational learning has greatly increased over the past couple of decades (Easterby-Smith & Lyles, 2003).

Among the factors believed to influence organizational learning, organizational culture—defined as "a system of shared values (that define what is important) and norms that define appropriate attitudes and behaviors for organizational members" (O'Reilly & Chatman, 1996: 160)—is regarded as fundamental. Organizational culture not only represents the residue of past learning processes (Schein, 1996) but also, more crucially, defines the context for future learning (Sorensen, 2002). Examining the influence of organizational culture on organizational learning is important because it helps us broaden our understanding of learning as a social phenomenon, the goal of which is "to discover what to do, when to do it, how to do it according to routines and using specific artifacts, and then how to give a reasonable account of why it was done" (Gherardi & Nicolini, 2002: 194).

Several studies in this area identify four prominent cultural variables—participative decision making, openness, learning orientation, and transformational leadership—as critical determinants of organizational learning as a whole (Antonacopoulou & Chiva, 2007; Hult, Hurley, Guinipero, & Nichols, 2000; Hurley & Hult, 1998; Slater & Narver, 1995; Yammarino & Bass, 1990). While these studies increase our understanding of the factors that lead to learning, many of these studies treat organizational learning as a one-dimensional construct. As a result, questions remain regarding how exactly these factors influence an organization's learning. Does openness, for instance, lead to organizational learning because it helps an organization acquire new information, institutionalize past lessons learned, or both? Does an organization with a transformational leader learn more or differently from an organization that uses participative decision making? If an organization currently uses participative decision making, will it derive additional benefits by adopting a learning orientation?

Our study addresses these issues. Consistent with a significant stream of previous research in this area, we view organizational learning as consisting of multiple, distinct subprocesses (Crossan, Lane, & White, 1999; Huber, 1991), and we examine how the four crucial antecedent factors that we identified earlier (participative decision making, openness, learning

orientation, and transformational leadership) influence each of the subprocesses of learning. Given the diversity of opinions in the extant literature regarding the constituent subprocesses of organizational learning (Crossan et al., 1999; Huber, 1991; Walsh & Ungson, 1991), however, we begin by identifying a common body of knowledge relating to these subprocesses. We identify six fundamental subprocesses that we subject to rigorous empirical testing, ultimately deriving five discrete but interrelated subprocesses that together constitute a higher order construct of learning in terms of both content and construct validity.

Our study contributes to the literature on organizational learning by offering a detailed picture of the relationship between key organizational antecedents to learning and the individual subprocesses of learning. Obtaining this kind of fine-grained picture is critical for understanding how the antecedent factors exert their influence and, therefore, why organizations may differ in their learning and in their eventual outcomes such as performance and innovation. By implication, our findings can help managers recognize particular subprocesses of organizational learning that need improvement, identify cultural factors that have a direct impact on the particular subprocesses, and deploy targeted cultural change strategies to address their organizations' specific learning needs. In addition, since we use multiple methods of content validation for the different subprocesses of organizational learning, we gain a deeper insight into the multidimensional nature of this construct. Finally, our use of systematic and thorough methodological techniques to develop an instrument to test, measure, and validate those subprocesses of learning that constitute a common body of knowledge in this area suggests that our instrument could prove to be a valuable tool for future research in this area.

Theory and Hypotheses

Organizational Learning Subprocesses

Even a cursory examination of the organizational learning literature indicates that although many scholars identify organizational learning as composed of multiple subprocesses, they differ both in their terminology for these subprocesses as well as in their identification of the causes, effects, and domains of these subprocesses (Miller, 1996). In order to identify a common body of knowledge regarding learning subprocesses, we searched the premier management journals (*Academy of Management Journal, Academy of Management Review, Journal of Management, Journal of Management Studies,* and *Organization Science*) for articles published between 1970 and 2009 that propose different subprocesses of organizational learning. Of these articles, we selected those that had a high impact on their fields (as measured by a citation count of at least 200 for articles published before 2000 and a lower citation count of at least 50 for articles published after 2000, to compensate for their more recent publication date).

Our literature search revealed several prominent models of organizational learning with at least some degree of overlap regarding the constituent subprocesses of learning. We drew on these models to identify six subprocesses that collectively appear to capture the entire learning cycle identified by extant work in the field. Specifically, many researchers agree that organizational learning begins with some form of *information acquisition* (Daft & Weick, 1984;

Huber, 1991; Soliman & Spooner, 2000; Walsh & Ungson, 1991). This information is then *distributed* across the organization (Huber, 1991). *Interpretation* (Crossan et al., 1999; Huber, 1991) and *integration* of the information typically follow. The process concludes as information is stored in *organizational memory* and subsequently *institutionalized* (Crossan et al., 1999; Huber, 1991; Soliman & Spooner, 2000; Walsh & Ungson, 1991). We note that although the subprocesses generally follow the sequential order described above, exceptions may occur given the interrelationships and feedback loops among the different subprocesses. In the sections that follow, we describe each of the above six subprocesses in more detail. We also briefly discuss some key interrelationships and feedback loops among these different subprocesses.

Information acquisition. Many models of learning identify information acquisition as the first step of organizational learning (Daft & Weick, 1984; Huber, 1991; Walsh & Ungson, 1991). *Information acquisition,* sometimes called *scanning,* refers to the process through which an organization obtains information from internal and external sources (Huber, 1991). In addition, organizations may acquire information through feedback from past actions that sheds light on the effectiveness of possible future actions (Duncan & Weiss, 1979) during single- or double-loop learning (Argyris & Schon, 1978). Information acquisition occurs in many different types and indicators of learning such as exploratory learning and potential absorptive capacity (Zahra & George, 2002).

Information distribution. *Information distribution* refers to the processes through which individuals, groups, or different units of the organization share data and information among themselves (Huber, 1991). Information distribution is necessary for organizational learning to occur since information that is acquired (say, by an individual) but not distributed through the organization can, at best, lead to individual-level learning (Huber, 1991). This kind of individual learning, in turn, will lead to organizational knowledge that is "fragmented and relevant only to the decision maker who produced it" (Duncan & Weiss, 1979: 89). Research on learning curves also highlights the importance of sharing or distributing information for productivity improvement (Adler, 1990).

Information interpretation. Information interpretation is the process through which organizations make sense of new information that they have acquired and disseminated (Levinthal & March, 1993; Weick, 1979). Weick describes interpretation in terms of an enactment-selection-retention model of sensemaking, wherein organizational members interpret organizational realities through a mutual negotiation of cognitive maps. Information interpretation helps reduce equivocality and thus is critical in developing the shared understanding that leads to organizational learning (Daft & Weick, 1984).

A potential feedback loop may exist between information interpretation and the subprocesses of information acquisition and distribution. Information interpretation, by playing the same role in organizations as that played by cognitive filters in individuals, may limit the type and amount of new information that organizations acquire and distribute, in turn influencing organizational interpretations of this information. Organizations geared toward exploitation, for instance, may have interpretation processes that predispose them to certain forms of

information acquisition and distribution, making it hard for them to gather, distribute, and interpret other types of information that might trigger explorative activities (Gupta, Smith, & Shalley, 2006).

Information integration. Information integration occurs when various interpretations converge to form unified understandings. Integration involves the establishment of shared observations, discussions, and understandings among individuals (Crossan et al., 1999; Daft & Weick, 1984) that leads to a common language and coordinated action (Seeley-Brown & Duguid, 1991). Organizational learning occurs and distinguishes itself from individual learning through these shared insights, knowledge, and mental models (Duncan & Weiss, 1979).

Information integration may interrelate with information acquisition, distribution, and interpretation. A smooth process of integration may make it attractive for the organization to continue with its current process of information acquisition, distribution, and interpretation and thereby persist with its current type of learning (e.g., emphasizing exploration over exploitation or vice versa). The attractiveness of the current forms of information acquisition, distribution, and interpretation, however, may also make it hard for the organization to create new kinds of unified understandings (e.g., by gathering different kinds of information or by distributing it differently in the organization) that result in a different type of learning.

Organizational memory. Learning can be transient if the organization fails to capture the information or knowledge that it generates during the process of information acquisition, distribution, and interpretation. Knowledge needs to be embedded in a repository so that it displays some persistence over time (Argote, McEvily, & Reagans, 2003). While some scholars seem to imply that organizational memory is an object (Argyris & Schon, 1978), other scholars suggest that organizational memory is a process that involves encoding, storing, and retrieving the lessons learned from an organization's history, despite the turnover of personnel (Levitt & March, 1988). The results of this process are embodied in the form of standard operating procedures, routines, and scripts (Levitt & March, 1988; Nelson & Winter, 1982). In keeping with our goal of identifying a common body of knowledge regarding the subprocesses of learning, we adopt the latter view of organizational memory as a process. That is, we view organizational memory as consisting of the mechanisms, functions, or actions organizations take to encode, store, and retrieve the lessons they have learned.

Like the subprocesses of information interpretation and integration, organizational memory may also interrelate with other subprocesses of organizational learning, particularly information interpretation. The effectiveness of organizational mechanisms or actions related to storing or retrieving past lessons may shape organizational members' interpretations about the effectiveness of past actions, thereby influencing current interpretations of new information. These interpretations, in turn, may result in actions whose outcomes trigger new routines or scripts for encoding and storing the lessons learned.

Knowledge institutionalization. An organization's knowledge is socially constructed, and the social relationships in which knowledge is embedded are key (Kogut & Zander, 1992). *Knowledge institutionalization* refers to the process of embedding learning by individuals and groups into the organizations' systems, structures, procedures, strategies, and

cultures (Crossan et al., 1999). The ultimate goal of organizational learning is to build competitive advantage by changing organizational responses or potential responses to a dynamic environment. Knowledge institutionalization contributes to this goal by converting new knowledge and learning into practice.

We note here that while we have been using the term *information* so far, we now use the term *knowledge*. We explicitly distinguish between information and knowledge based on previous work in this area. Nonaka (1994: 15-16) states that information is "a flow of messages, while knowledge is created and organized by the very flow of information anchored on the commitment and beliefs of its holders." Information is thus "a necessary medium for initiating and formalizing knowledge." Information becomes knowledge when it is processed by the actor. In this study, we view the organization as the actor of organizational learning and use the term *information* until it reaches the whole organization (i.e., becomes institutionalized as knowledge).

In summary, we identify six fundamental, distinct subprocesses of organizational learning, namely, information acquisition, information distribution, information interpretation, information integration, organizational memory, and knowledge institutionalization. These subprocesses function interdependently to constitute a complete cycle of organizational learning. As our previous review shows, each of the six subprocesses captures a distinct set of learning related activities. For example, interpretation and integration are closely related processes, but interpretation focuses on change in an individual's understanding and actions, while integration emphasizes coherent collective action (Crossan et al., 1999). Organizational memory and knowledge institutionalization both capture learning at the organizational level, but they are distinct in that memory emphasizes activities that encode and store knowledge, while institutionalization captures the utilization of knowledge.

We now examine how the four crucial antecedent factors related to organizational culture, namely, participative decision making, openness, learning orientation, and transformational leadership, influence these different subprocesses of learning. We contend that each antecedent factor may differentially influence different subprocesses. We examine these relationships in more detail below.

Participative Decision Making and the Subprocesses of Organizational Learning

Participative decision making occurs when organizational members collectively clarify problems; seek and share information, ideas, and viewpoints; plan the implementation of actions; and evaluate results (Sagie & Koslowsky, 2000). Organizations with a high level of participative decision making have members who feel they have the freedom to speak their minds about activities in their organization (Hult et al., 2000). Active participation is a critical determinant of organizational learning (Antonacopoulou & Chiva, 2007), fostering it by increasing employee involvement, perceived freedom to act, information flows, and communication (Campion, Medsker, & Higgs, 1993; Hurley & Hult, 1998). We build on this finding to suggest that participative decision making leads to learning by influencing the specific subprocesses of information acquisition, interpretation, and integration. Our reasoning follows.

Some research indicates that organizational members involved in the activities that characterize participative decision making, namely, problem identification, information seeking, and information sharing, are compelled to engage in information acquisition from inside and outside the organization that bear upon the problem at hand (Shrivastava, 1983). Other studies on participation find that interactions among members in a group with diverse ideas and viewpoints can effectively help members change attitudes and relearn previous learning (Lewin, 1951). These interactions among group members with diverse ideas and viewpoints correspond to our definition of information interpretation. Still other studies find that during participative decision making, employees engage in brainstorming and generating alternatives. The tasks of selecting among these alternatives, implementing them, and evaluating the results, in turn, propel organizations to establish methods for achieving coordination among organizational members (Harrison, 1985). This need to achieve coordination drives organizational members to engage in information integration; information integration allows members to reach a common understanding of the problem (albeit with a diversity of ideas and viewpoints about the alternatives available to resolve the problem), a prerequisite to any kind of coordinated action (Harrison, 1985; Shrivastava, 1983).

In essence, participative decision making reflects employees' perceived freedom to speak their own minds and their corresponding involvement in organizational decision-making processes (Hult et al., 2000). This increased freedom and involvement may not necessarily lead to increased information distribution, however, since information distribution depends on many other factors such as the extent to which the organizational member or unit with the new information believes that the information will be relevant to another organizational member or unit, the relative workloads of the two organizational members or units involved, and power and status differences among units or members (Huber, 1991). In a similar fashion, a multiplicity of opinions about alternative solutions to a problem may also complicate the task of routinizing or standardizing knowledge and procedures that is needed for organizational memory and knowledge institutionalization (March & Simon, 1958). We therefore hypothesize the following:

Hypothesis 1: Participative decision making will positively influence the organizational learning subprocesses of information acquisition, interpretation, and integration.

Organizational Openness and the Subprocesses of Organizational Learning

Openness captures the process of critical assessment of key assumptions about the organization and its environment (Slater & Naver, 1995). Openness encompasses open communication and sharing of information, exposure outside the company, continuous training, intellectual honesty, expectation and acceptance of conflict, and willingness to consult others (O'Reilly, 1989). We suggest that openness influences the learning subprocesses of information acquisition, interpretation, and integration.

Openness may influence information acquisition because organizations tend to "accept some information and reject other information that does not fit with the dominant model of

the environment and the organization's role therein" (Slater & Narver, 1995: 70). In a similar vein, Duncan and Weiss (1979: 95) note that "new knowledge is not likely to be accepted if it conflicts greatly with the paradigm held by the organization's members." Openness may help organizations overcome these tendencies by reducing conformity and allegiance to old ways of thinking, thus making the organization more likely to acquire information from diverse sources (Fey & Birkinshaw, 2005).

An open environment provides accessibility of information and open communication where debates and conflicts are accepted approaches to solving problems (Nevis, DiBella, & Gould, 1995). Employees in an open environment have enhanced freedom to speak their minds and feel a sense of "spirit" toward organizational activities and relationships (Hult et al., 2000). Through discussions, debates, and conflicts, openness facilitates organizational members' involvement in challenging existing assumptions and renewing their knowledge, thereby creating new interpretations of information and seeking out ways of integrating the acquired information into innovative solutions (Akgun, Keskin, Byrne, & Aren, 2007).

Similar to participative decision making, openness favors a divergence of ideas and processes (and views about their relative importance) rather than the consistency and repeatability of knowledge that is needed for distribution, organizational memory, and knowledge institutionalization (Argote et al., 2003; Crossan et al., 1999; Huber, 1991). We therefore hypothesize the following:

Hypothesis 2: Openness will positively influence the organizational learning subprocesses of information acquisition, interpretation, and integration.

Learning Orientation and Organizational Learning Subprocesses

Learning orientation encompasses "a set of organizational values that are related to the propensity of firms to create and use knowledge" (Hanvanich, Sivakumar, & Hult, 2006: 601). A learning orientation reflects the organization's commitment to learning and the adoption of learning as a basic value for future survival (Hanvanich et al., 2006).

A learning orientation may influence organizational learning by encouraging the development of individual learning within the organization, leading to an infusion of new ideas into the organization (Hurley & Hult, 1998), possibly by enhancing the capacity of the organization as a whole to acquire and distribute new information. Organizations with a strong learning orientation tend to make learning a priority (Hurley & Hult, 1998) and subsequently deploy resources to integrate diverse information; encourage the reinterpretation of existing routines and norms; and facilitate the encoding, storage, and retrieval of new information in the organizations' memories (Baker & Sinkula, 1999; Simonin & Ozsomer, 2009). At the same time, a learning orientation is also related to the establishment of mechanisms, processes, and incentives for learning that benefit the institutionalization of organizational knowledge (Simonin & Ozsomer, 2009). Thus, a learning orientation also facilitates the routinization and standardization that are needed for organizational memory and knowledge institutionalization. Since a learning orientation indicates an organization's overall posture toward

organizational learning, it should collectively influence all the subprocesses of organizational learning. We hypothesize the following:

Hypothesis 3: Learning orientation will positively influence each of the organizational learning subprocesses.

Transformational Leadership and Organizational Learning Subprocesses

A number of studies indicate that transformational leadership is critical to learning (Bass, 1985; Hult et al., 2000; Slater & Narver, 1995; Vera & Crossan, 2004; Yammarino & Bass, 1990). Bass characterizes transformational leaders as charismatic leaders who communicate a sense of where the organization is going, develop the skills and abilities of subordinates, and encourage innovative problem solving. While charisma may or may not be relevant for learning, especially in stable environments, the other three characteristics should both influence individual learning and encourage workplace social interactions that support organization-wide learning (Vera & Crossan, 2004).

More specifically, since transformational leaders encourage open and honest communication, encourage different ideas, challenge established beliefs, encourage good communication networks, and build trust, they should facilitate the acquisition, distribution, and interpretation of information (Hult et al., 2000; Slater & Naver, 1995). Furthermore, transformational leaders rally organizational resources to enable the organization to integrate, store, and institutionalize new information and knowledge effectively (Hult et al., 2000), supporting organizational memory and knowledge institutionalization. As with learning orientation, transformational leadership behaviors should therefore have generalized effects across the learning cycle. We hypothesize the following:

Hypothesis 4: Transformational leadership will positively influence each of the organizational learning subprocesses.

Our hypotheses propose some specific relationships between the antecedent factors related to organizational culture and learning subprocesses. Given the relative paucity of previous research in this specific area and the correspondingly exploratory nature of this study, we would like to make the following two points at this juncture.

First, it is unlikely that all antecedent factors will influence the subprocesses of learning equally. For example, while both participative decision making and openness may influence the learning subprocesses of information acquisition, interpretation, and integration, it is probable that either of these two factors may have a greater impact on any one of these particular subprocesses. In keeping with our study's objective of presenting a fine-grained picture of the relationships between the antecedent factors and learning subprocesses, it would certainly be worthwhile to examine these differential impacts of the antecedent factors on learning subprocesses in more detail. Given the limited extant information relating to this topic, however, we do not have any basis for proposing formal hypotheses regarding these effects. Instead, we explore them using post hoc analyses.

Second, we recognize that there may exist many potential relationships between antecedents and learning subprocesses other than those that we propose above. For example, transformational leadership, which encourages open communication in an organization, may also encourage openness in general; openness, in turn, may indirectly influence distribution, institutionalization, and memory, in addition to its direct effects on the other subprocesses of information acquisition, interpretation, and integration. Our purpose in this study is not to generate and test an exhaustive set of these relationships. Instead, we focus on those that we feel are particularly plausible, given our reading of the extant literature. Likewise, while our study focuses on critical antecedent factors related to organizational culture, we recognize that other contextual factors, such as industry, organization size, and so on, may influence learning subprocesses. We control for these latter factors in our study. We present more details in the next section.

Method

Development of the Measurement Scale for the Organizational Learning Subprocesses

The current literature lacks a standard scale for measuring the learning subprocesses simultaneously. Thus, to test our hypotheses, we created a measure to capture each of the six organizational learning subprocesses. To develop this scale, we followed steps outlined by Hinkin (1995) and DeVellis (2003) to ensure validity and reliability. We generated items from the organizational learning literature, employed two methods to test these items for content validity, and used a large sample of managers to test for construct validity.

Item Generation

Following Schwab (1980) and Hinkin (1995), we conducted an intensive review of the literature to create theoretical definitions of organizational learning and its subprocesses. Guided by these definitions, we created a set of items to capture the construct space of each subprocess. We supplemented these items with items from previously published questionnaires that, in our judgment, appeared adequate indicators for assessing the different subprocesses. At the end of this step, we had a battery of 42 prospective scale items.

Establishing the Content Validity of the Instrument

Content validity, the degree to which a measure's items are a proper sample of the theoretical content domain of a construct (Schriesheim, Powers, Scandura, Gardiner, & Lankau, 1993), is crucial for establishing whether an instrument is measuring the phenomenon of interest. We used two approaches to assess content validity: the judge panel method for calculating the content validity ratio of each item in the instrument (Lawshe, 1975) and Schriesheim et al.'s (1993) Q-sort method.

Judge panel method. Following Lawshe (1975), we compiled a judge panel for assessing whether the items we generated were an adequate sample of the theoretical content domain of the subprocesses of organizational learning. This judge panel consisted of organizational learning subject matter experts (SMEs) from academic institutions in Europe, the United States, and Canada. We generated a list of 214 potential experts based on publications in prestigious journals, as well as those who had presented organizational learning–related research at the Academy of Management meetings in 2002, 2003, and 2004.

We created an instrument that contained a definition for each subprocess, along with the 42 items sorted according to their intended subprocesses. We sent this instrument to the experts via e-mail and asked them to rate the extent to which each item captured its corresponding subprocess. The response scale ranged from 1 to 5, with higher values indicating that the judge believed the item adequately captured the definition of its associated subprocess. Space was also provided for free-form comments and suggestions to strengthen the instrument.

Thirty judges responded, yielding a response rate of 14%. We calculated the content validity ratio, CVR = $(n - N/2)/(N/2)$, of each item on the instrument, where N is the total number of respondents and n is the number of respondents who rated each item as a good indicator. To derive a conservative estimate, we used a stringent grouping criterion, considering only those items rated as 4 or 5 as good indicators. We determined the significance of each ratio based on the significance table provided by Lawshe (1975).

Fourteen of the 42 items had significant content validity ($p < .05$); four of the six subprocesses, however, had fewer than 3 adequate items. Based on the feedback from the judge panel, we refined several items, created 8 new items, and replaced items with inadequate content validity ratios. Replacement items were gathered from validated instruments from related fields (Bontis, Crossan, & Hulland, 2002; Lee & Choi, 2003; Templeton, Lewis, & Snyder, 2002). The revised instrument contained 60 items.

To ensure that the revised instrument adequately reflected the theoretical domain of organizational learning, we conducted a second round of judge panel assessment. We used the initial list of 214 experts, along with an additional 50 experts who presented organizational learning papers at Academy of Management Meeting in 2005. These additional respondents belonged to academic institutions in either Europe (11 respondents), the United States (29 respondents from 17 states), or Canada (2 respondents). We followed the same procedure used with the first judge panel and obtained 42 responses, for a response rate of 16%. Content validity ratios for items in the revised instrument revealed that 42 of the 60 items had significant content validity ($p < .05$). The proportion of significant items varied across the subprocesses, but each subprocess had at least 5 content valid items.

Q-sort method. Schriesheim et al. (1993) critiqued two aspects of Lawshe's (1975) judge panel method: First, its lack of a data reduction component, which would allow for examining item dimensionality, and second, its use of SMEs whose understanding of the focal concepts may differ from those of the target respondent group. We followed the advice of Schriesheim et al. and gathered responses from a different source (a group of non-SMEs, described below) and used the Q-sort method as a supplemental technique to verify content validity.

We constructed a new questionnaire containing definitions of the six subprocesses and the 42 items in a random order, as well as instructions on how to sort the 42 items into one of the subprocesses (Stephenson, 1953). This Q-sort questionnaire was administered to 69 respondents (53 part-time MBA students and 16 working professionals in a graduate-level human resource management program at a Midwestern university). All of these respondents were in a supervisory management role. The average age of these respondents was 30.2 years, and they had worked, on average, for 10.13 years in various organizations.

The Q-factor analysis yielded six factors that accounted for 100% of the variance. These six factors corresponded with our six theoretical dimensions, and the number of items per factor ranged between five and nine. Most items grouped with their expected theoretical dimensions, indicating an acceptable factor structure. For the few items that did not load as expected, we made further modifications so that they more closely matched their intended subprocesses. We also refined the definitions of the organizational learning subprocesses to ensure that each subprocess was clearly distinguishable from the others.

Establishing the Construct Validity of the Instrument

To establish construct validity, we examined the factor structure of our scale. We sent our final questionnaire to 6,274 business administration alumni from a Midwestern university. Our mailing yielded 631 usable responses, constituting a response rate of 10%. This rate, though modest, yielded a suitably large and diverse sample to assuage concerns about low power and lack of generalizability (Newman, 2009). Participants came from 39 industries, had worked between 18 to 38 years, and had an average of 6.63 years of experience in their current positions. Various levels of management were represented, with 30% in senior management, 33% in middle management, and 15% in nonsupervisory positions. Twenty-two percent of the respondents did not provide demographic information. We randomly divided these responses into two subsamples, one for conducting an exploratory factor analysis (EFA) and the other for conducting a confirmatory factor analysis (CFA).

Exploratory factor analysis. Using the first subsample (n = 315), we conducted an EFA with SPSS on the 42 potential scale items. We analyzed the covariance matrix using principal axis factoring, with oblique rotation (Promax) because we anticipated high intercorrelations between factors. Six factors with Eigenvalues greater than one were extracted. Five factors matched hypothesized subprocesses (see Table 1), while one did not correspond to any hypothesized subprocess. Our data did not discriminate the hypothesized subprocess of knowledge institutionalization. Items designed to indicate institutionalization loaded on a sixth factor, but randomly on other factors as well. Based on these results, we discarded the items related to the knowledge institutionalization process. We also deleted 5 items that did not load on their intended factors, 5 other items that had cross-loadings higher than .30, and 3 items that tapped overlapping content.

In conjunction with the EFA, we conducted a preliminary analysis of internal consistency for the items within each factor. Table 1 provides the rotated factor matrix, as well as reliability estimates for each subprocess. The final instrument consisted of five factors comprising

Table 1
Exploratory Factor Analysis of Organizational Learning Subprocesses

	Information Acquisition	Information Distribution	Information Interpretation	Information Integration	Organizational Memory
A1. We learn from our customers, suppliers, and/or other business associates.	.64				
A2. We constantly benchmark ourselves with our competitors.	.38				
A3. We have processes to acquire relevant information from outside our company.	.59				
A5. We develop new knowledge from existing knowledge.	.62				
A9. Our employees from different areas share experiences and/or knowledge.		.76			
A10. Lessons learned by one group are actively shared by others.		.54			
A11. Our company has processes for exchanging knowledge between individuals.		.73			
A13. Our company has effective processes to distribute knowledge throughout the organization.		.63			
A14. Our employees, as individuals, are prepared to rethink decisions when presented with new and relevant information.			.65		
A15. Our employees seek to deeply understand issues and concepts.			.46		
A16. Our employees do not hesitate to question things they do not understand.			.65		
A18. Our employees, as individuals, are interested in knowing not only what to do but also why we do things.			.78		
A21. We discuss issues until we arrive at a shared understanding.				.67	
A23. Top management integrates information from different organizational areas.				.53	
A24. Our employees meet regularly to resolve issues and concerns.				.90	
A26. We seek to achieve consensus by dialogue and reasoning.				.85	
A25. Our company stresses sharing and trying to understand management vision through communication with colleagues.				.50	
A30. We make strong efforts to preserve information.					.63
A31. We have effective mechanism to store information.					.83
A35. There is a formal data management function in the company.					.67
A36. Our company stores detailed information for guiding operations.					.63
A32. When employees need specific information, they know who will have it.					.68
A34. Company files and databases are available to provide needed information to do our work.					.82
Cronbach's alpha (α)	.69	.86	.80	.89	.87

Note: $n = 315$. Promax rotation pattern matrix shown; loadings lower than .35 were omitted. Alphanumeric designations (i.e., A1) are the variable labels within the data set and correspond to the item labels in Figure 1.

Table 2
Confirmatory Factor Analysis of Organizational Learning Factors: Goodness-of-Fit Comparisons

Model	χ^2	*df*	χ^2/df	CFI	TLI	RMSEA
1. One-factor model	1,362.67**	230	5.93	.94	.93	.13
2. Five-factor model	558.66**	220	2.54	.98	.97	.07
3. Second-order model	596.11**	225	2.65	.98	.97	.07

Note: $n = 316$; *df* = model degrees of freedom; TLI = Tucker–Lewis Index; CFI = comparative fit index; RMSEA = root mean square error of approximation.
**$p < .01$.

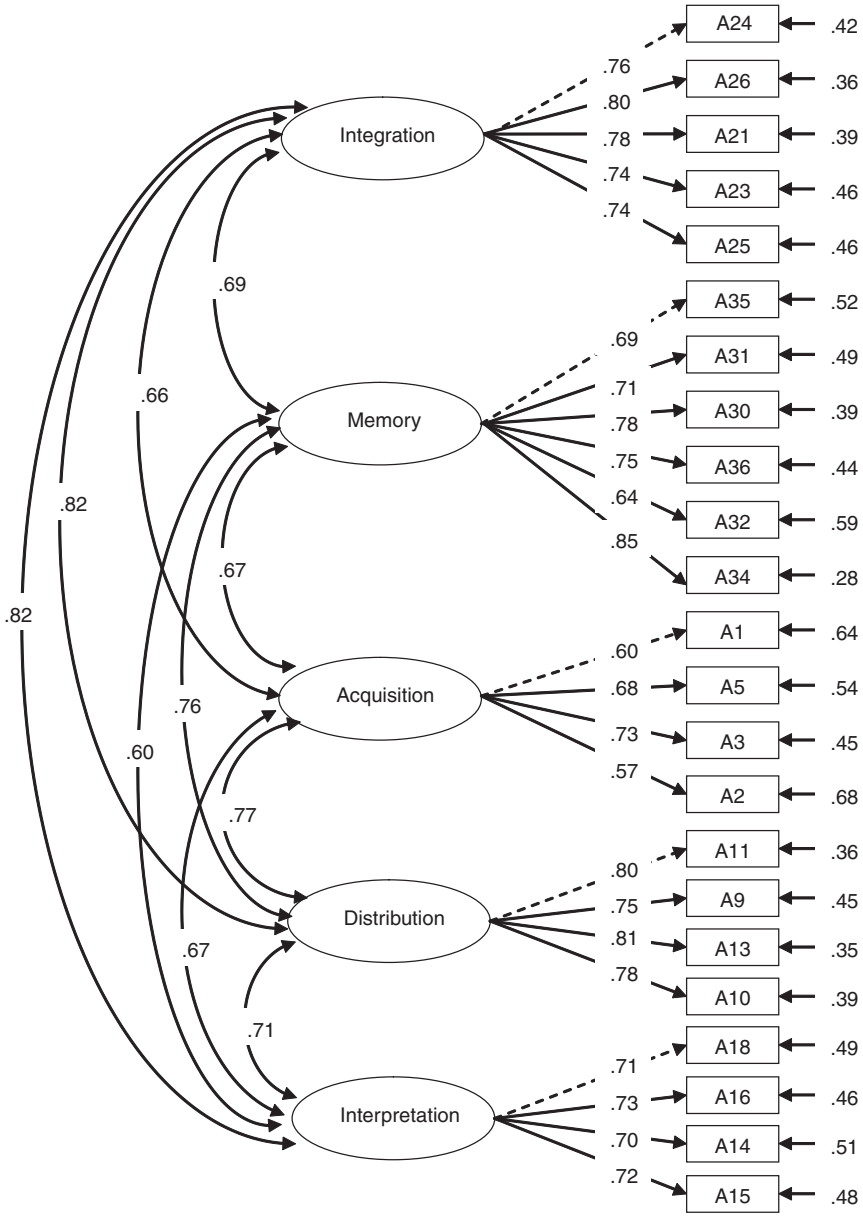
23 items. In general, Cronbach's alpha values were favorable. The alpha estimate for Information Acquisition was lower than desired (.69), but its 95% confidence interval included .70, which may suffice in the early stages of instrument development (DeVellis, 2003; Nunnally, 1978).

Confirmation of factor structure. To verify the factor structure suggested by EFA, we performed a CFA on the second half of the sample ($n = 316$). We used LISREL 8.80 (Jöreskog & Sörbom, 2001) and maximum-likelihood estimation to conduct a series of tests to verify the dimensionality of the organizational learning processes. To assess the overall fit of each model, and to compare each model's fit relative to one another, we used four common fit indices: the chi-square (χ^2) goodness-of-fit statistic, root mean square error of approximation (RMSEA), comparative fit index (CFI), and Tucker–Lewis index (TLI). Researchers have traditionally regarded RMSEA values ≤ .08, in combination with CFI and TLI values ≥ .95 to indicate good fit, with values ≥ .90 deemed as adequate (Hu & Bentler, 1999; Lance & Vandenberg, 2002). Results are shown in Table 2.

First, we tested a single-factor model in which all 23 items were designated to load on a single factor. This model tests whether the items reflect a unidimensional construct rather than multiple subdimensions (Mulaik, James, Van Alstine, Bennet, Lind, & Stillwell, 1989). A significant chi-square, together with relatively low CFI and TLI values (i.e., < .95) and a high RMSEA (.13) indicated poor fit. Next, we tested a model consisting of five latent factors representing our hypothesized subprocesses of organizational learning (see Figure 1). Items were designated to load only on their respective factors. The fit of this model was acceptable and represented a substantial improvement over the single-factor model. Moreover, individual item loadings supported the factor designations. All item loadings were significant at $p \leq .001$, with t values ranging from 7.90 to 15.65. To corroborate the alpha estimates obtained from the EFA, we generated reliability estimates and obtained values ranging from .73 to .87. Factor correlations indicated that the five factors not only had unique, nonredundant coverage but also shared a significant degree of commonality.

Based upon the commonality among the learning subprocesses (i.e., factor correlations) and owing to our notion that the five subprocesses together represent the totality of organizational learning practices, we investigated the viability of a second-order model. We modified the previously described five-factor model such that the five processes were designated as first-order representations of a second order. In this way, the individual factors (i.e., learning subprocesses) were considered to reflect a unifying, underlying factor (i.e., Organizational

Figure 1
Confirmatory Factor Analysis



Note: All factor → indicator paths are significant at $p \leq .01$, with the exception of dashed paths that were fixed for identification and scaling purposes. Model fit statistics: $\chi^2 = 558.66$ ($df = 220$), $p < .001$; root mean square error of approximation = .07, comparative fit index = .98, Tucker–Lewis index = .97.

Learning). We replaced the covariance paths among the first-order factors with loading paths from a second-order factor and obtained second-order loadings that ranged from .79 ($t = 11.13$, $p \leq .001$) to .92 ($t = 14.81$, $p \leq .001$). Using formulas provided by Medsker, Williams, and Holahan (1994: 443), we obtained values of .93 for construct reliability and .72 for variance extracted. Both of these values exceed the minimum thresholds of .70 and .50, respectively.

Common method variance. Our data were collected via self-report surveys, thus the potential for common method variance (CMV), specifically percept-percept inflation, should be addressed (Doty & Glick, 1998; Podsakoff & Organ, 1986). We conducted a series of three increasingly rigorous CMV tests: Harman's single-factor EFA, a single-factor CFA, and an unmeasured latent variable method (see Podsakoff, MacKenzie, Lee, & Podsakoff, 2003; Podsakoff & Organ, 1986). An unrotated EFA did not produce a single factor solution, nor did the first factor account for a majority of the variance, thus passing Harman's test. Our single-factor CFA, which generated relatively poor fit, provided further evidence against CMV. Finally, using an unmeasured latent variable approach, we partialed out variance due neither to substantive relationships nor to random error (Podsakoff et al., 2003; Williams, Edwards, & Vandenberg, 2003). This technique created minor, but nonsignificant, improvements in model fit, coupled with no changes in significance for item loadings (see Cheung & Rensvold, 2002). Thus, our results suggest that method-related effects did not bias our results (Chan, 2009; Spector, 2006).

To conclude this section, we offer the following thoughts as they relate to the factor structure of our organizational learning scale. First, empirical results provide strong support for our hypothesized multidimensional conceptualization of organizational learning as a construct with five discrete subprocesses. Specifically, both EFA and CFA generated five-factor solutions that matched hypothetical a priori factor designations.

Second, although they represent distinct dimensions, these subprocesses are interrelated. To account for the interrelated nature of the factors, we successfully modeled a second-order organizational learning construct. In this way, the multidimensional nature of the construct was preserved while also accounting for subprocesses as indicators of overall organizational learning practices within organizations.

Third, although our review of the literature suggested that the organizational learning construct consists of six subprocesses, our empirical testing derived five. A methodological reason for this may lie in the wording of some items. A new set of items may help create a distinct measure of knowledge institutionalization. The rigor of our procedure (revising our item wording based on judges' feedback, using Q-sort to establish factor structure prior to testing for construct validity, etc.), however, leads us to propose a more substantive reason for our finding of five subprocesses. Specifically, our results are consistent with several well-known and oft-cited works that conflate the concepts of memory and institutionalization (Crossan et al., 1999; Huber, 1991; Walsh & Ungson, 1991). In addition, organizational learning, in and of itself, can be viewed as an institutionalizing process built upon a gradual and iterative collective acceptance of new knowledge (Huysman & de Wit, 2003). Knowledge institutionalization may thus represent the procedural linchpin among and between the subprocesses that compose organizational learning. Taking this view, it is no wonder that, from an empirical standpoint, the items we designed to tap institutionalization cross-loaded on multiple processes.

Hypotheses Testing

Following the scale development process, we tested our theoretically derived hypotheses using the CFA subsample. Although the full sample would have provided greater statistical power, we did not view this as an appropriate methodological process. Relationships identified by EFA may be driven by chance or by sample idiosyncrasies; thus, the preferred method of confirming these relationships is via a separate sample (Hinkin, 1995). Returning to the full sample for our hypothesis tests would negate the precautions we took to perform the CFA.

Measures. The independent variables were assessed via previously published and validated scales. *Participative decision making* ($\alpha = .90$) was measured with a five-item scale from Hurley and Hult (1998). We measured *openness* using Hult et al.'s (2000) four-item scale for measuring "the spirit," "freedom," and general feeling of "openness" regarding activities and relationships in an organizational unit ($\alpha = .85$). *Learning orientation* ($\alpha = .86$) was measured with four items from Hurley and Hult (1998) that assess the organization's overall stance toward continuous learning and development among employees. *Transformational leadership* ($\alpha = .88$) was measured with a five-item scale from Hult et al. (2000). This scale assesses leadership behaviors using a shortened version of the Multifactor Leadership Questionnaire Form 5X (Bass & Avolio, 1991). To correspond with the other organization-level variables, the items were worded such that respondents rated the degree to which transformational leadership behaviors are part of their organizations' cultures. Responses for openness and transformational leadership were gathered on a 7-point Likert-type scale ranging from *strongly disagree* to *strongly agree*. Participants responded to participative decision making and learning orientation items on a 5-point Likert-type scale ranging from *not descriptive* to *very descriptive*.

Controls. We controlled for industry, organization size, and organization performance, as these represent other important contextual factors that may influence the occurrence of learning (Fiol & Lyles, 1985).

Industries differ in their stability, and these differences may in turn influence the rates at which organizations learn (Fiol & Lyles, 1985). Based on free-form responses, we placed each organization into one of five broad industry classifications using classification schemes from the Standard Industry Classification manual and the North American Industry Classification System. These categories were Manufacturing ($n = 65$), Services ($n = 66$), Financial and Real Estate ($n = 46$), Technology and Communication ($n = 37$), and Others ($n = 16$). Due to missing industry data, we removed 86 responses from our analysis, resulting in a final testable sample of 230 responses.

Larger organizations may have different learning needs and processes than do smaller organizations (Lawrence & Lorsch, 1967). Organization size was therefore controlled and measured by the number of employees in the firm, as reported by respondents. We also controlled for organizational performance because well-performing companies may have more slack, thereby influencing the kinds of learning subprocesses that occur within them (Voss, Sirdeshmukh, & Voss, 2008). We used a subjective indicator for organizational performance

Table 3
Descriptive Statistics and Bivariate Correlation Matrix

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11
1. Size	7.32	2.64	–										
2. Industry	2.49	1.28	−.01	–									
3. Total revenue	5.64	2.56	.76**	−.03	–								
4. Participative decision making	3.10	.81	.08	−.04	.11	–							
5. Organizational openness	3.45	.70	.07	−.03	.14*	.73**	–						
6. Learning orientation	3.31	.91	.19**	.06	.17**	.63**	.60**	–					
7. Transformational leadership	3.42	.72	.09	−.06	.12	.74**	.82**	.71**	–				
8. Information acquisition	3.90	.70	.19**	.02	.25**	.44**	.57**	.53**	.62**	–			
9. Information interpretation	3.43	.73	.22**	−.02	.25**	.65**	.66**	.61**	.69**	.55**	–		
10. Information distribution	3.35	.85	.17*	.02	.17**	.61**	.62**	.65**	.69**	.65**	.60**	–	
11. Information integration	3.40	.80	.26**	.00	.27**	.75**	.74**	.69**	.78**	.61**	.70**	.73**	–
12. Organizational memory	3.49	.77	.12	−.09	.19**	.55**	.62**	.51**	.62**	.63**	.53**	.68**	.63**

Note: $n = 230$. Size was measured as log of the actual number of employees provided.
*$p \leq .05$, two-tailed. **$p \leq .01$, two-tailed.

in which respondents provided estimates of annual firm revenues (Dess & Robinson, 1984). Reponses were based on an 11-point scale ranging from 1 (*less than $10 million*) to 11 (*greater than $20 billion*).

Analytical procedures. Table 3 presents descriptive statistics and correlations. Single-item averages were created for the multi-item scales. We normalized the organizational size variable using a logarithmic transformation.

We chose multivariate general linear modeling (MGLM) to test our hypotheses. MGLM uses an iterative weighted least squares approach to generate maximum-likelihood estimates of parameter coefficients and standard errors (Fox, 2008; Gill, 2001). Huberty and Morris (1989) outline numerous benefits of MGLM, including the ability to use categorical predictor variables and to simultaneously model multiple dependent variables. Also, by considering a set of dependent variables in multidimensional space, rather than testing multiple, single-dependent variable regressions, MGLM attenuates the likelihood of Type I error that is associated with performing multiple comparisons of the same antecedent influences and closely related dependent variables. Thus, we were able to simultaneously assess the influences of our scale-level antecedent factors on all five organizational learning subprocesses while controlling for the nominal-level industry variable. The interdependent nature of our focal constructs illustrates a subsequent benefit of MGLM. Given their closely related

nature, it is unlikely that any one exists in isolation from the others. The customary MGLM effect computation (Type III Sum of Squares) compares the results of the full model (i.e., all antecedent influences accounted for) to the full model without the particular variable of interest. For each antecedent, then, the value being tested is the incremental variability explained beyond that which is attributable to the other influences. Thus, by jointly accounting for each potential antecedent influence and establishing significance based only on the unique contribution of any one factor, we are confident that the relationships we have identified are realistic representations of the proposed relationships.

We took additional steps to assess the quality of our independent variables prior to hypothesis testing. Coefficient alpha values indicated high internal consistency; however, significant correlations among these variables necessitated a test of their distinctiveness. We performed a CFA with the 18 scale items representing the four cultural factors. Each item was designated to load only on its intended factor. This model provided adequate fit, $\chi^2 = 378.74$ ($df = 129$), $p < .001$; RMSEA = .08, CFI = .94, with standardized loadings ranging from .64 to .91 ($p \leq .001$), thus indicating adequate discriminant validity among these interrelated concepts.

Moving on to our MGLM tests, we confirmed that our data met multivariate normality assumptions via Box's M test (Box's M = 65.43, $F = 1.02$, $p = .44$). Next, we examined the effects associated with the individual antecedent influences (i.e., cultural factors). Values for Wilks's Λ indicated that each antecedent cultural factor contributed significantly to the overall model. In addition, partial eta-squared (η^2) values indicated the relative contribution of each individual influence to the overall model (see Table 4). We then confirmed the significance of the overall model for each dependent variable (i.e., learning subprocess). An omnibus F test statistic was generated for each subprocess: the values ranged from 17.62 to 64.32, and all were significant at $p \leq .001$. For each learning subprocess, the amount of variance explained by the antecedent influences ranged from 45% to 75%. A detailed report appears in Table 5.

Finally, we examined the results related to our hypotheses, using $p \leq .05$ as the standard of significance. We limit our in-text discussion to the most pertinent results and provide details in corresponding tables. Table 5 presents the results of an F test of significance related to the influence of each antecedent cultural factor to each learning subprocess. Table 6 presents parameter coefficient estimates for each significant influence. These estimates often are not reported because they cannot be assembled into a regression equation in the same manner as ordinary least squares coefficients (Huberty & Morris, 1989). However, unlike the tests reported above, which merely indicate the existence of a significant influence, these coefficients indicate the direction of the relationship (i.e., positive or negative) and the strength of the relationship (i.e., relative contribution).

Hypothesis 1 was partially supported in that participative decision making was significantly related to information interpretation and integration but not to information acquisition ($p = .08$). We speculate that one reason for this insignificant relationship may be that participative decision making may focus more on the process of decision making rather than on the process of information search. That is, participation may facilitate the process of sensemaking and establishing shared understandings by organizational members without necessarily entailing an active acquisition of information. Other contributing factors may need to be in place to encourage people to seek relevant information from inside and outside the organization so that their decisions are based on adequate information.

Table 4
Results of Multivariate Tests

	Wilks's Λ	$F(5, 215)$	p	Partial η^2	Observe power
Participative decision making	.84	7.92	< .000	.16	1.00
Organizational openness	.93	3.07	.01	.07	.87
Learning orientation	.90	4.98	< .001	.10	.98
Transformational leadership	.87	6.71	< .001	.14	1.00

Note: $n = 230$. Three control variables were included in the multivariate equation. Industry classification ($p = .02$) was significant. Firm size ($p = .30$) and firm revenue ($p = .22$) were nonsignificant.

Table 5
Test of Overall Model Significance and Individual Effects of Antecedent Cultural Factors

Antecedent Influences (cultural factors)	Dependent Variable (learning processes)	Type III Sum of Squares	F	df
Overall model	Information acquisition	49.35	17.62***	10
	Information distribution	87.90	26.48***	10
	Information interpretation	72.78	31.72***	10
	Information integration	113.75	64.32***	10
	Organizational memory	65.51	18.53***	10
Participative decision making	Information acquisition	0.85	3.03	1
	Information distribution	0.95	2.87	1
	Information interpretation	1.64	7.13**	1
	Information integration	4.49	25.40***	1
	Organizational memory	0.36	1.02	1
Organizational openness	Information acquisition	1.13	4.04*	1
	Information distribution	0.29	0.86	1
	Information interpretation	1.13	4.96*	1
	Information integration	0.85	4.81*	1
	Organizational memory	2.83	7.99**	1
Learning orientation	Information acquisition	1.39	4.96*	1
	Information distribution	5.46	16.46***	1
	Information interpretation	1.47	6.38**	1
	Information integration	2.17	12.28***	1
	Organizational memory	1.45	4.10*	1
Transformational leadership	Information acquisition	4.81	17.17***	1
	Information distribution	3.99	12.02***	1
	Information interpretation	1.91	8.31**	1
	Information integration	3.13	17.70***	1
	Organizational memory	1.38	3.90*	1

Note: $n = 230$. Control variable effects were largely nonsignificant, with the following exceptions ($p \leq .05$): firm size with information integration, firm revenue with information acquisition, and industry classification with information interpretation and information integration.
*$p \leq .05$. **$p \leq .01$. ***$p \leq .001$.

Table 6
Parameter Estimates and Relative Contributions of Significant Influences

Dependent Variable (learning processes)	Antecedent Influences (cultural factors)	β	Standard Error	Partial η^2
Information acquisition	Organizational openness	.18*	.09	.02
	Learning orientation	.12*	.05	.02
	Transformational leadership	.39***	.09	.07
Information distribution	Learning orientation	.23***	.06	.07
	Transformational leadership	.35***	.10	.05
Information interpretation	Participative decision making	.16**	.06	.03
	Organizational openness	.18*	.08	.02
	Learning orientation	.12**	.05	.03
	Transformational leadership	.24***	.08	.04
Information integration	Participative decision making	.26***	.05	.10
	Organizational openness	.16*	.07	.02
	Learning orientation	.14***	.04	.05
	Transformational leadership	.31***	.07	.08
Organizational memory	Organizational openness	.28**	.10	.04
	Learning orientation	.12*	.06	.02
	Transformational leadership	.21*	.11	.02

Note: $n = 230$. Parameters associated with control variables were largely nonsignificant and have been omitted to conserve space.
*$p \leq .05$. **$p \leq .01$. ***$p \leq .001$.

Hypothesis 2 was supported in that organizational openness was significantly related to information acquisition, interpretation, and integration. In addition, our results also indicated that openness was related to organizational memory. One reason for this significant relationship may be that behaviors associated with openness (such as active reflection by organizational members on their shared ideas) may also help facilitate a shared recognition of what information is critical and belongs in the organization's memory. Organizational memory can probably provide a common knowledge base that organizational members could use to reflect and store their reflections.

Hypotheses 3 and 4 were both fully supported in that learning orientation and transformational leadership were both significantly related to each of the learning subprocesses.

In addition to our formally stated hypotheses, we conducted a post hoc examination of differences in relative contributions among the antecedent influences. Partial η^2 serves as an effect size estimate, functions as a nonlinear analog to R^2 in regression, and is similarly interpreted as percentage of variance explained (Hochberg & Tamhane, 1987; Huberty & Morris, 1989). At the overall level (see Table 4), participative decision making ($\eta^2 = .16$) was the most influential factor in the model, followed in descending order by transformational leadership ($\eta^2 = .14$), learning orientation ($\eta^2 = .10$), and organizational openness ($\eta^2 = .07$). At the learning subprocess level, each effect size was fairly weak, and there were few substantial differences in effect magnitude for the various antecedent factors. The relationship of participative decision making with information integration generated the largest individual effect ($\eta^2 = .10$), transformational leadership was the most influential factor for acquisition ($\eta^2 = .07$) and interpretation ($\eta^2 = .04$), and learning orientation was the most

influential factor for distribution ($\eta^2 = .07$). Otherwise, the values clustered together with very little differentiation.

We also investigated mean differences across our grouping variable (industry). We included industry classification for control purposes rather than to test for hypothesized relationships; however, any identified differences, albeit post hoc, may be useful for future extensions of this research. Industry generated a significant multivariate level effect, Wilks's $\Lambda = .854$, $F(20, 714) = 1.739$, $p < .05$, and subsequent univariate comparisons identified industry differences on two learning subprocesses: interpretation, $F(4, 225) = 4.32$, $p < .01$, and integration, $F(4, 225) = 3.87$, $p < .01$. Pairwise comparisons further isolated the specific differences. For interpretation, Services had a significantly lower mean than did either Financial ($p < .05$) or Technology and Communication ($p \leq .01$). For integration, means for both Manufacturing ($p \leq .05$) and Services ($p < .05$) were significantly lower than the mean for the Financial sector. In line with existing findings that more dynamic and complex industries (such as Financial and Technology and Communication) tend to do better at organizational learning than do less complex industries (such as Services and Manufacturing; Balasubramanian & Lieberman, 2010), we suggest that the more interpretation-related learning activities in the Financial and the Technology and Communication industries may result from the higher level of new and diverse information available in those two industries that people need to decipher and use (Duncan, 1972). Higher integration in the Financial industry as compared to Manufacturing and Services may reflect the greater degree of change that financial organizations need to undergo in order to benefit from an integration of diverse opinions.

Discussion

Our study examined the nature and extent of the influence exerted by four critical organization culture–related antecedents of organizational learning. To this end, we developed and validated an instrument to measure five distinct subprocesses of organizational learning, namely, information acquisition, distribution, interpretation, integration, and organizational memory. These subprocesses compose a common body of knowledge in this area. Our results indicate that the four antecedent factors of participative decision making, organizational openness, learning orientation, and transformational leadership influence these five learning subprocesses. Overall, participative decision making and transformational leadership have the largest influence on organizational learning, followed by learning orientation and organizational openness. At the level of the organizational learning subprocesses, participative decision making directly influences interpretation and integration; openness influences acquisition, interpretation, integration, and memory; and both learning orientation and transformational leadership influence all of the subprocesses.

The results of our study suggest an important implication for future research on organizational learning. We find that different antecedent factors influence learning differently. More specifically, while some factors have a limited effect in that they influence only a few learning subprocesses, other factors influence all of the different learning subprocesses. Moreover, even if an antecedent factor influences only a few subprocesses, it does not necessarily mean that that factor has a marginal effect on learning. Participative decision making, for example,

influences only information interpretation and integration but has the largest overall effect on learning as a whole. Referring back to the questions we raised in the introduction to this article, this result indicates that although organizations with participative decision making learn, they learn differently from organizations with a transformational leader or a learning orientation. These organizations would therefore benefit from adding or strengthening transformational leadership behaviors or a learning orientation, since these antecedents would positively influence subprocesses of learning other than information interpretation and integration. Overall, our study indicates that in order to get an accurate picture of the nature and extent of the influence any antecedent factor has on learning, we need to look not only at the factor's influence on each subprocess of learning but also at overall effect sizes.

Our study also contributes to the extant literature on organizational learning subprocesses by empirically examining an equivocal issue in this area, namely, the distinctiveness of the subprocesses we identified as constituting a common body of knowledge. While some scholars dispute the notion that information interpretation is different from integration, our results support the idea that interpretation and integration are indeed two distinct and independent subprocesses (Crossan et al., 1999). Information interpretation focuses on sensemaking processes and may therefore lead to a divergence of opinions. Information integration, on the other hand, captures processes intended to bring consensus among organizational members so that organizations may take subsequent actions. Obtaining this kind of clarity on the distinctiveness of subprocesses is critical for understanding how antecedent factors actually result in learning and therefore in potentially different organizational outcomes. Referring back to a question we raised in the introduction, for example, our results indicate that openness influences learning by facilitating information acquisition (as well as interpretation, integration, and memory).

Our results have important methodological implications as well. Our study supports Schriesheim et al.'s (1993) argument that the judge panel method (Lawshe, 1975) and the Q-sort method each make unique contributions to establishing the content validity of an instrument. The judge panel method's strength lies in its initial assessment of whether the questionnaire items represent their theoretical content domains. It helps us draw the boundaries of a construct by collecting experts' consensus on each item. Across the two panel assessments, we contacted 264 potential judges for input. These experts had published or presented a wide variety of research, had varying levels of experience in the field, and utilized diverse conceptualizations of learning. This broad coverage mitigated concerns about the existence of some sort of bias among them and provided us with confidence that the breadth of knowledge represented among them would allow us to effectively capture and bound the theoretical construct space. Additionally, we compared responses between the two panels and found that, of the 42 respondents in the second round, 11 judges (26%) had provided responses during the initial wave. The composition of the second wave of respondents offered two primary benefits. First, given that nearly three quarters (74%) of the responses were new, our results indicated that the scale items were viewed as adequate by SMEs who had not been previously involved in their construction, assessment, or modification. Second, by "following up" with original respondents and allowing them to offer a second round of input, we were able to ascertain if we had addressed their original concerns effectively.

The strength of our second content validation method, the Q-sort, lies in its focus on reducing data and discerning the dimensionality of the instrument. Although the results from our Q-sort analysis did not mirror the factor structure of the final questionnaire exactly, it directed our efforts toward modifying items that may have cross-loadings due to conceptual ambiguity. The Q-sort method is also important for a practical reason. It provides researchers with a preliminary representation of the opinions of the target respondent group. Overall, the results of our study highlight the need for researchers to establish content validity using multiple rigorous methods.

As with all studies, ours has some limitations. A primary one is that we used single informants from multiple organizations. This approach allowed us to gather data from a much larger sample of firms but may have limited the depth to which we were able to interpret and isolate the levels at which organizational learning may occur within a given organization. Based on the characteristics of our sample, however, we believe that our informants were able to provide relevant and accurate responses to our research questions about learning processes and practices occurring in their organizations (see Huber & Power, 1985). By targeting respondents at different levels of organizations, we were attempting to capture learning-related activities that are truly widespread throughout organizations and not just limited to a few organizational members. Along those lines, the word "we" in the survey items was intended to create, within each respondent, a collective frame of reference in which responses account for those practices that had become commonplace within the firm, that occurred on a regular basis, and that were seen as valuable (Lichtenthaler, 2009). Future studies could attempt to obtain more robust data from multiple informants, nested within operating units and levels, across multiple organizations. This would allow for the use of multilevel modeling techniques to more accurately track antecedents and consequences associated with learning processes within each organization, as well as facilitate comparisons of organizational learning processes across organizations.

A second concern was possible CMV, which can augment true relationships among constructs by artificially inflating item-level relationships. We performed multiple post hoc tests for CMV, and our results indicated that CMV cannot be completely ruled out; however, any impact was minimal and did not bias the final results (cf. Doty & Glick, 1998, Spector, 2006). The reported analyses primarily focused on the scale development items, but we used the same tests on the entire data set and obtained similar results. Evidence suggests that items dealing with concrete or factual concepts, like the existence of organizational processes or the frequency of organizational activities, are less prone to method bias (Chan, 2009; Cote & Buckley, 1987), which may explain the lack of substantive impact on the items in our survey. Nonetheless, future research incorporating multiple data sources or multiple collection methods would provide a stronger test of the measurement scale.

The results of our study have some important implications for practice. The current environment of business is driven by knowledge-based competition, and organizational learning—represented in the ability to effectively gather, interpret, maintain, and leverage information available both within and outside the firm—is a distinguishing characteristic of organizations that are poised to establish competitive advantage (see Chakravarthy, McEvily, Doz, & Rau, 2003; Pfeffer & Sutton, 1999). Information-gathering efforts are rampant among organizations, with some estimates indicating that billions of dollars are spent annually in attempts

to generate or buy data, information, and ideas to propel innovation and enhance performance (Pfeffer & Sutton, 1999). Clearly, however, firms differ in their ability to transform and transfer this information effectively, which in turn leads to performance differences among firms. In addition, Pfeffer and Sutton point out that large between-unit performance differences, as much as 300%, exist within individual firms. These findings indicate that many firms are failing in their learning and knowledge distribution efforts. To that end, our study provides new insights on how firms can improve their organizational learning efforts. Not all antecedents to learning influence learning subprocesses in the same way. Organizations could enhance some factors, such as learning orientation and transformational leadership, to provide a generalized support for organizational learning programs. Managers could enhance other factors, such as participative decision making and openness, to target specific learning subprocesses such as information interpretation and integration. In addition, focusing on specific antecedent factors such as participative decision making may provide organizations with the biggest "bang for their buck" in terms of improving organizational learning.

Our conceptualization of organizational learning as a higher order construct, with its five constituent learning subprocesses and a validated scale for each of the subprocesses, provides organizational leaders with a valuable tool to evaluate and manage organizational learning. The relative parsimony of our instrument increases its usefulness for both research and practice. Our instrument was built on a common body of knowledge in organizational learning and has undergone rigorous methodological tests. We hope it will serve to move scholarly conversations on measurement issues relating to organizational learning forward.

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