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DEVELOPMENT OF THE ORGANIZATIONAL LEARNING CONSTRUCT AND MEASURE

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A Dissertation

Submitted to

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Doctor of Philosophy

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DEVELOPMENT OF THE ORGANIZATIONAL LEARNING

CONSTRUCT AND MEASURE

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Gary Franklin Templeton, son of John A. Templeton, Sr. and Letitia (Wyatt) McAllister, was born July 14, 1968 in Huntsville, Alabama. He graduated from J.O. Johnson High School in 1986. He entered Auburn University in January, 1988, and graduated with a Bachelor of Science degree in Finance in June, 1990. After working in industry for six months, he entered Graduate School, Auburn University, in January, 1991. He graduated with a Masters of Business Administration in 1993 and a Masters in Management Information Systems in 1994. He married Heather Dawn Carter on April 24, 1999.

DISSERTATION ABSTRACT

DEVELOPMENT OF THE ORGANIZATIONAL LEARNING CONSTRUCT AND MEASURE

Gary F. Templeton

Doctor of Philosophy, August 14, 2000
(M.M.I.S., Auburn University, 1994)
(M.B.A., Auburn University, 1993)
(B.S., Auburn University, 1990)

Directed by Charles A. Snyder

Due to the prevalence of new technologies that often dictate environmental contexts for modern firms and industries, the concept of organizational learning has received a tremendous amount of attention in management research and practice. Unfortunately, no consensus definition or measurement tool for assessing and empirically studying the concept has existed prior to this research. Based on the domain definition provided in Chapter 2, this research provides an empirically reliable and valid measure of organizational learning. Exploratory principle components factor analysis was applied to data representing 119 technology and knowledge-based firms. It

was found that organizational learning consists of eight distinct factors: awareness, communication, performance assessment, intellectual cultivation, social learning, environmental adaptability, intellectual capital management, and organizational grafting. These measures were found to be psychometrically sound with respect to reliability and validity.

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INTRODUCTION

Prominent organizational theorists have predicted that the amount of information and knowledge organizations must process will continue to increase (Huber, 1984; Drucker, 1988). This is because of the proliferation of operations and management technologies that are contributing to the turbulence of organizational environments. Several authors have responded to this new era by prescribing learning models that are useful in the design of organizations that are more responsive to turbulent environments (Bahlmann, 1990; Dodgson, 1993; March, 1991; Nonaka, 1991; Schein, 1996; Stein & Zwass, 1995). Since interest in *organizational learning* (OL) models of the firm has increased over the past several years (Templeton & Snyder, 1999), further development of their salient issues is justified.

Project Problem Area

This project represents the first attempt at establishing an instrument to measure OL through the

development of an empirically valid and reliable measure. In doing so, it represents the initial work in organizational research for developing a systematic technique for collecting, analyzing and interpreting data about OL.

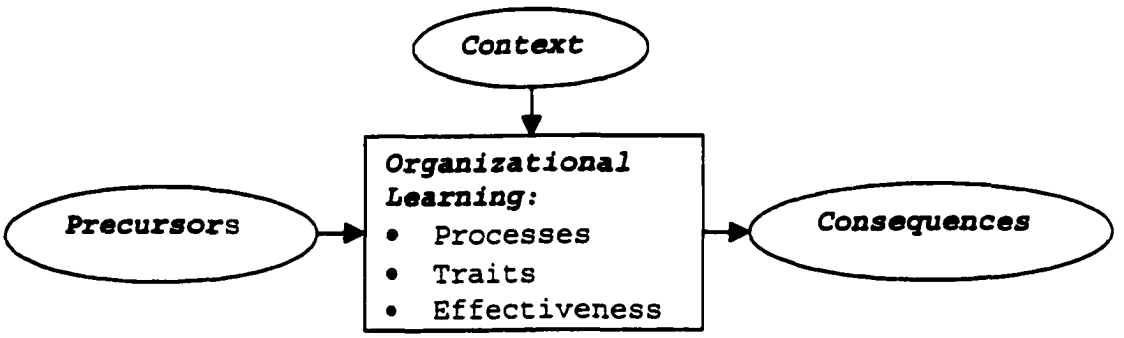
The project is significant for several reasons. First, the inability to adequately assess the extent of OL in organizations will hamper future development of understanding about knowledge and theory surrounding the topic (Templeton & Snyder, 2000). Second, the advancement of knowledge about the topic of OL is especially important given several authors' interpretations of the concept as a paradigm for organizational thought (Argyris & Schon, 1978; Bowman & Hurry, 1993; Hedberg, 1981). Third, an understanding of OL is paramount to top management, whose organizations adopt OL theory for two primary purposes: 1) as a response to environmental demands and changes, and 2) to proactively achieve some desired consequence (Templeton & Snyder, 2000). Fourth, the topic is timely, since there currently is no agreed upon definition of OL (Schein, 1996a), nor an adequate measure to assess the extent to which OL takes place among individuals in the firm.

This research primarily aims to fill a void in organizational research caused by the varying and consequentially diverging definitions of OL. Critical to the evolution of the study of organizations and the management of knowledge is the development of better measures of variables with which management and researchers work. Development of measures of OL should help managers and researchers gain experience with a psychometrically appropriate measure. This experience can result in 1) greater understanding about the OL measure, 2) the uncovering of variables that are components of the construct's nomological network, and 3) the realization that OL represents a sound measure of organizational performance.

Scope of Overall Research Project. This research is the first step in a larger plan of inquiry on organizational learning and its nomological network of constructs. As depicted in Figure 1, the overall research project involved an investigation of organizational learning among its precursors, contexts, and consequences. The ultimate goal of this research was to arrive at well-defined, valid, and reliable measurement instruments to assess variables of

interest within each topical category. Toward this end, the overall research project involved content analysis of the literature, instrument development, and reporting of the findings for each of the important topical areas.

Figure 1: The Organizational Learning Nomological Network
[Source: Templeton & Snyder, 2000]



Scope of Dissertation Project. Due to the preponderance of work required to complete the overall research plan, the dissertation focused on the organizational learning concept. The methodology required for this research involved reporting the results of a content analysis and instrument development effort that hinged on the development of a comprehensive definition of organizational learning. The major components of this dissertation are designed to 1) yield a better comprehension of the OL concept, 2) further the measurement of the OL concept, or 3) establish a sound methodological basis for further study.

Consistent with the instrument development inquiries made in the work of Lewis (1993), the purpose of this research was to answer three questions about the OL construct: 1) What is the domain of OL?, 2) How can OL be measured?, and 3) To what extent do organizational units engage in OL? The Lewis (1993) methodology addressed the major points of inquiry in the study by dedicating one instrument development stage to each research question. In sum, these stages are an attempt at operationalizing theoretical constructs into an acceptable survey instrument for future use and reevaluation. The remainder of the chapter overviews salient issues encountered during the course of the research, such as methodology, theory, and organization.

Methodological Issues

The study utilized traditional and non-traditional methods for developing a measure for the construct of interest. Traditional methods employed included the suggested procedure for developing marketing measures proposed by Churchill (1979), whose method has been utilized in various studies on MIS (Grover, 1993; Lewis et al., 1995; Rainer & Harrison, 1993; Sethi & King, 1994).

Novel approaches were employed to arrive at a definition of OL and to ensure methodological quality associated with instrument development. First, it was found that the application of ontological specification (Templeton & Snyder, 1997), borrowed from the field of artificial intelligence, was a robust and convenient method for discovering and organizing concepts related to defining OL. Second, Grover's (2000) sixteen ideal survey attributes for evaluating surveys in organizational studies were used for quality assurance. The methods were integrated into an omnibus method for developing a valid and reliable measure of OL that can be used to advance knowledge about the modern organization and its environment. The significance of this methodology is that it represents an attempt at creating an integrated, structured approach for defining and measuring OL constructs.

Theoretical Assumptions

Instrument development was guided by four underlying assumptions. First, in defining OL, it was important to distinguish between involvement-process learning and content learning. According to Shani and Lau (1996),

involvement-process learning emphasizes "the process of interaction and thinking" (p. 2, M2-9). Content learning uses "knowledge, facts, and theory only, which serve as the database for analysis and reasoning" (Shani & Lau, 1996, p. 2, M2-9). They believed that process learning is more important because 1) content often becomes outdated, 2) real learning (changes in attitudes and behavior) is affected by doing more than knowing, and 3) knowing how to learn facilitates more effective learning. For these reasons, this research focused on the presence of OL by defining its salient process-related issues.

Second, an accepted definition should help IS researchers and managers think about ways of supporting OL processes with advanced technologies. To this end, this research assumed that OL is not only a social-interaction process, but also a mechanism for describing the ongoing interaction between the technological, individual, and organizational levels of analysis.

Third, in an attempt at providing maximum economic efficiency during reuse, the instrument was developed under the assumption that the most important (change-critical) OL occurs in top management. According to theory, perceptions about the existence of OL in the firm require knowledge

about the whole array (incremental to radical) of change initiatives in the organization (Argyris and Schon, 1978). For many subconstructs, it cannot be expected that operations-level or staff employees should have knowledge about even the most overt of change initiatives.

The fourth assumption implies that the learning process and its effectiveness are at least as important as information content and organizational outcomes in the determination of organizational success. Historically, studies have used demographics and learning outcomes as surrogate representations of organizational learning (see Chapter 2). For the first time, this research considers the intellectual processes of individuals learning on behalf of the organization.

Dissertation Organization

The research is organized in an effort to enhance the reader's understanding of the organizational learning topic, culminating in an instrument development exercise. Five chapters compose the dissertation, including this introduction, a literature review, a description of the methodology, the results, and discussion and conclusions.

The chapters are ordered according to their logical sequence in developing the topic of OL.

LITERATURE REVIEW

Beginning with the teachings of Adam Smith (1776), the tacit concept of organizational learning has existed in highly competitive organizations. The explicit term 'organizational learning' has been the subject of a great deal of academic research since the term was coined by Cyert and March (1963). Despite its heavy influence in the annals of academia and practice, the concept remains stagnant in terms of utility because no empirically validated measurement instrument has yet been developed. Compounding this problem is the fact that there currently exists no consensus definition as to what it means for an organization to learn.

The absence of an adequate definition and measure for the organizational learning concept has been cited in the literature as a problem that hampers further understanding about how organizations and members work in the modern information society (Bedeian, 1986; Sinkula, 1994). To help alleviate barriers towards achieving an adequate definition and measure of OL, this chapter provides a methodological discussion and framework for addressing and

solving these problems. This topic of discussion is important, because of the tremendous implications organizational learning has for impacting desired organizational outcomes (Templeton & Snyder, 2000).

The chapter discusses issues related to defining the concept for further operationalization. Next, the chapter addresses OL measurement issues, such as use of an appropriate OL perspective, level of analysis, and known groups analysis. Finally, a summary and conclusions are provided. First, it is important to understand the purposes for advancing the OL concept as they relate to organizational research and managerial practice.

Purposes for Advancing the Organizational Learning Concept

In 1986, Bedeian noted that there are few empirical studies on OL and no consensus as to how organizations learn. However, by 1990, Senge cited an increasing interest in organizational learning based upon an increase in 1) its recognition by prestigious institutions and 2) the number of conferences devoted to the topic. Schein (1996a) stated that the more intensive attention paid to OL is attributed to public and private organizations as well

as to industries that are striving to be efficient and competitive enough to survive.

Ward (1996) cited three reasons for advancing academic research on OL: 1) the OL paradigm "wants to emerge in the world," 2) researchers need "a process by which multiple experimentation can yield understanding" (p. 20), and 3) learning disabilities are prevalent in organizations. Mahoney (1995) suggested that the inclusion of OL can help improve understanding of other organizational research concerns: "By combining behavioral, cognitive, and economic approaches, we can do better in organization science research" (p. 98).

Several authors have cited reasons for the increasing interest in the study of OL by practicing organizations. Dodgson (1993) noted three reasons: 1) it is gaining popularity with large firms which seek to be more adaptable and responsive to change, 2) the influences of technological change, and 3) it has "broad analytical value," (p. 376) receiving attention in a broad set of disciplines. He said that OL is often operationalized as firms learn how competitors learn.

Emery and Trist (1965) and Huber (1984) believed that aspects of the postindustrial society include greater

availability of knowledge and the presence of environmental complexity and turbulence. These factors are expected to affect organizational decision making (Huber & Daft, 1987). Huber (1984) noted that to meet the environmental demands of post-industrial organizations, three organizational processes that depend on OL competence have to be enhanced: decision making, innovation, and information acquisition and distribution.

Drucker (1992) took an even more purposeful view of OL in the organization, citing that the reason organizations are formed is for the integration of 'specialized knowledges' into a common set of tasks. For these reasons, organizations are investing in the attainment of OL competence through the study of literature and of the behavior of other organizations. Other authors relate OL competence to the value or competitiveness of the organization. Dodgson (1993) and Levinthal and March (1993) placed a high competitive value on OL for organizations while Mahoney (1995) perceived OL as the most critical core competence of organizations.

By yielding a valid and reliable measure of OL, the research should make possible important follow-up research relevant to organizations with more modern, organismic

structures. Only through the development of an adequate measure of organizational learning can researchers answer important questions about modern organizations. Samples of such questions are:

1. What are important precursors to OL?
2. What are important consequences of OL?
3. What are important facilitators of OL?
4. Does learning impact traditional organizational performance measures?
5. What are traits of good organizational learners?
6. Are good organizational learners more likely to be promoted?
7. What can be done to improve one's organizational learning ability?
8. Can deutero learning (learning to learn) occur through various management treatments?
9. Are organizational learning skills dependent upon time in the organization or number of learning opportunities (i.e., repetition) experienced by the subject?

Furthering understanding about the concept will require the development of metrically sound constructs in the nomological network of issues surrounding OL.

Purposes for Measuring Organizational Learning

This research was driven primarily by the fact that there has been no attempt at developing an instrument for measuring the highly visible OL concept, despite the long tradition of conceptual research dedicated to the topic. Although OL has significant implications in both management practice and research, the popular topic of OL remains relatively underdeveloped. This research has strong implications for the development of two distinct categories of inquiry about modern organizations: management practice and organizational research.

Implications for Managers. The lack of an assessment tool for OL prevents real progress in research in very critical areas of organizational performance. For managers, there are three specific problem areas related to performance that are addressed by the availability of an adequate measure of OL.

First, understanding the organizational learning concept is paramount to organizations seeking strategic advantages in their competitive setting. Bowman and Hurry (1993) view organizational learning as one mode of decision-making during strategy development[1]. They view

organizational learning as the process- and more future-oriented style of decision-making, whereby organizational knowledge accumulates through trial-and-error experimentation and evolutionary and incremental learning-by-doing processes.

Second, the operationalization and use of a valid instrument could lead to the identification of important experience and knowledge about the process and subprocesses of OL. Barney (1992) stated that "in the analysis of competitive advantage, process issues must always be integrated with content issues" (p. 56). According to Levinthal and March (1993), although learning improves organizational performance, understanding the mechanisms of learning leads to understanding about the limits of improvements. Furthermore, they stated that an understanding of how learning capabilities (learning processes and intelligence) and limitations lead to strategic advantage is important. This implies that experience gained from using a measure of OL can help management understand the strategic management process, because it depends on a search for organizational intelligence. This experience can help alleviate three

problems of organizational decision making in strategic management: ignorance, conflict, and ambiguity.

Third, managers should have a more adequate measure for organizational performance than is provided by traditional measures. Kiernan (1993) said that the next era of measuring organizational competitive advantage should involve measures that assess the ability of organizations to change effectively and continuously. He predicted that investment in the operationalization of these concepts should result in greater competitive viability. Problems with current measures of performance are a lack of reflection of core competencies that are independent of current performance (Cohen & Levinthal, 1990). Cohen & Levinthal pointed out that because firms focus on current performance, financial controls cannot be used to measure the value of sustained learning and therefore cannot capture the damage to the firm's skills attributed to outsourcing.

Implications for Researchers. Several researchers have expressed a need for developing the OL construct purely for the advancement of knowledge about the concept. Bedeian (1986) observed that there are few empirical studies on OL

and no consensus as to how organizations learn. Other researchers noted that both of these deficiencies in the OL literature can be greatly alleviated by the employment of an acceptable measurement instrument. Sinkula (1994) expected empirical analyses to offer insight into the OL process over time. However, testing propositions based on the OL concept first requires the construct to be defined and a measure to be validated.

Several authors have expressed an interest in discovering what peripheral subtopics surrounding the study of OL might be of primary importance in advancing the topic. Sinkula (1994) posited that research on how organizations process information is more important than research on information use. In his view, organizational memory (OM), an important subprocess of OL (Huber, 1991), is of primary importance in the research development of OL and work on the OM construct "must progress" (p. 42). OM refers to the availability and maintenance of organizational knowledge stores, and is important because it influences positive member behavior (Miner & Robinson, 1994). Dodgson (1993) paralleled Sinkula's process emphasis, noting that in organization theory and psychology, it has been more important to study the process

of learning. While those authors expressed an interest in emphasizing process over content concerns, two authors stressed the integration of research areas in OL. Mahoney (1995) called for a merger in process and content OL research, and Dodgson (1993) suggested that integrating the various approaches to learning would be interesting.

Development of various OL variables would have special meaning in the management information systems (MIS) field for two reasons: 1) OL is an emerging view of organizational information processing and change, and 2) MIS has been found to significantly enhance information processing and organizational change. Since the conception of MIS as an academic discipline at the University of Minnesota in 1968, the field has been perceived as an underdeveloped academic discipline (Sethi & King, 1994; Straub, 1989). Reasons for a lack of cohesiveness in the field include the inadequate development of constructs due to a lack of valid and reliable measurement instruments (Straub, 1989). Such development is important in contributing to the nomological network of concepts, which are especially important in new fields such as MIS. So that research can be better supported theoretically, Cronbach (1971) and others proposed methods for the

development of constructs and instruments. Significant progress in developing the nomological network of MIS-related concepts was attempted here through the process of operationalization, a broad set of efforts aimed at developing empirically supported *constructs* from theoretically derived *concepts*.

The previous discussion points to the need for a process known as the *operationalization* of the theoretical constructs that represent the organizational learning concept. Methodologies for operationalizing concepts are significantly important because of their potential for advancing science. The concept of operationalization, its rationale, and a methodology for developing a valid and reliable OL instrument are discussed in subsequent sections.

Operationalization

Operationalization is the cyclical pattern by which researchers apply greater structure to a body of knowledge (i.e., construct of meaning) as they increase their understanding about the subject matter. Operationalization is the process of advancing understanding about concepts from *theoretical* beliefs to an *operational* understanding

that is useful in practice. Thus, there are two domains of analysis about theoretical constructs: theoretical and operational. Each of these domains is discussed in the following section.

Theoretical domain. Concepts under consideration for development in the theoretical domain derive from paradigms or orientations utilized for viewing the world theoretically. Using these orientations, scholars derive theories about some part or realm of the world so that thought can be organized for better describing and understanding. Distinguished from practice, theory describes how things work, and yields explanations about how phenomena relate to one another. From these descriptions, researchers develop more precise schema (frameworks and models) for coding concepts for greater facilitation of learning and memory by audiences composed of students and practitioners interested in the concept. These more precise prescriptions for order are used to develop hypothesis statements that explicitly suggest that specific variables are or are not related.

When hypotheses are confirmed empirically, underlying theory is considered to be scientifically valid (to the

extent allowed by the quality of the methodology employed for scientific inquiry). Before the vital step of hypothesis testing can take place, the individual concepts used in the theoretical domain must eventually become metrically acceptable (i.e., statistically valid and reliable) constructs. Thus, concepts and constructs are the same idea, but usage depends on the domain (theoretical or operational) of understanding about the subject matter. Hypothesis testing is very weak in the theoretical domain, necessitating the advancement of included concepts to more concrete, metrically accepted representations found in the operational domain. The advancement of concepts from the theoretical to the operational domain is the goal of operationalization.

Three themes in the theoretical realm of organizational learning theory were discovered in the literature. The following sections define each theoretical theme, and explain its implications for this research.

Theoretical Theme 1: The Interaction Between Collective and Individual Learning

Understanding the interaction between individual and organizational learning behaviors are important in defining

the theoretical domain of OL. As argued by Miller (1996), individual learning translates to the organizational level when individuals act on behalf of the organization. The distinction is important because organizational theorists often borrow developments in individual learning (prominently found in the psychology literature). Dodgson (1993) described three points of distinction between collective and individual learning.

The first distinction is the *knowledge base* used to analyze the form and focus of accumulated knowledge. OL has been described as an organization's *transformation* of itself through the development of the knowledge, insight (Argyris & Schon, 1978; Hedberg, 1981), skills (Rothwell, 1993), collective awareness (Friedlander, 1983), understanding (Senge & Sterman, 1993), and mental models (De Geus, 1988; Stata, 1989) of its human resources[2]. This aspect of the individual-organization relationship can best be described in the context of the organizational memory subconstruct. Argyris and Schon (1978) explained that members create organizational memory (OM) by sharing beliefs, assumptions, and norms: "Their work as learning agents is unfinished until the results of their inquiry - their discoveries, inventions, and evaluations - are

recorded in the media of OM" (Argyris & Schon, 1978, p. 20). As a collectively held point of reference, OM dictates individual and organizational action: "It follows both that there is no OL without individual learning, and that individual learning is a necessary but insufficient condition for OL" (Argyris & Schon, 1978, p. 20). Thus, serving as repositories of OM, individuals play an important role in the OL endeavor.

The second area of distinction is *organization-specific competencies*, the capabilities brought about by collective nature of the organizational entity. For instance, while defining OL, several authors borrow from the stimulus-response (S-R) paradigm found in human psychology (Cyert & March, 1963; Fiol & Lyles, 1985). The view is useful because it integrates new understanding with changes in behavior. These definitions usually depict OL as the development of understanding about the relationship between actions, consequences, and future actions. However, process models of OL that are more loosely coupled, and less reflexive and automatic, have recently come into favor (Miller, 1996; Templeton & Snyder, 1999). Less strict models purport to be more productive in new

knowledge creation because of non-process-related aspects of OL, such as its knowledge base and core operations.

Dodgson's third distinction between individual and organizational learning is the *routines* associated with organizational action. The primary difference lies in the coordination mechanisms for knowledge, information, and communication flows that are necessary in the core functional routines. Coordination among members and subunits is especially important, since collective learning assumes uniformity in learning capabilities among participants. Effective management of OL calls for observations about cause-effect relationships between individual actions and the environment (Lee, Courtney & O'Keefe, 1992) as well as between member actions.

Theoretical Theme 2: The Two Distinct Modes of Organizational Learning

Researchers commonly segment OL into two modes of behavior[3], providing impetus for the suggestion of Lukas et al. (1996): "OL can be viewed as at least a two-dimensional construct" (p. 241). This attribute of OL theory characterizes organizations as attempting one of two degrees of organizational change. Classically, these two

dimensions are called *'single-loop learning' (SLL) and 'double-loop learning' (DLL)*, derived from the work of Argyris and Schon (1978). Since this nomenclature is most popular, it is used here.

Single-Loop Learning. *SLL* can be defined as the OL mode of action that accompanies routine changes in the organization's basic assumptions, roles, values, and structure (Argyris & Schon, 1978). Single-loop learning asks a one-dimensional question to elicit a one-dimensional answer (Argyris, 1994). Occurring most often[4], SLL relies heavily upon internal error correction that is focused on process or organizational outcomes. SLL involves preprogrammed and incremental reactions to historical assessments that are compared against static norms and standards of conduct.

Double-Loop Learning. When radical departures from the norm and reevaluations of the firm's culture (assumptions, roles, values, etc.) are in effect, the firm is said to operate in the *double-loop learning (DLL)*[5] mode of action. *DLL* involves organizational inquiries that resolve incompatible organizational norms by setting new priorities

and weightings of norms, or by restructuring the norms themselves together with associated strategies and assumptions. DLL is proactive in that it allows for the organizational adoption of creative ideas for the purpose of proaction. One key distinction from SLL is that DLL involves the development of ad hoc cognitive strategies and attitudes.

Theoretical Theme 3: The Role of Knowledge Structures

Several authors have proposed protocols for *structuring* organizational information, the raw material and desired outcome of the learning process. The purpose of designing valuable knowledge structures is to facilitate the ease, validity, reliability, and effectiveness of information processing. There are three primary concerns to consider when designing valuable knowledge structures.

First, the *nature* of information has been posited as an important facet of organizational knowledge structures. Cavaleri (1994) inferred that 'soft' systems thinking is a required precursor to OL success and that 'hard' systems thinking deters OL. This view is supported by the theory that soft knowledge is more flexible in form. Management can shape soft knowledge to add value to the firm in

varying ways. For instance, strategic planning uses 'soft' knowledge as a foundation for future experience gains.

Second, Sinkula (1994)[6] and Zachman (1987)[7] identified taxonomies for classifying all of the organization's potential knowledge *content*. Senge (1990) limited his taxonomy to those organizational disciplines that add the most value in learning organizations. In addition, Senge (1990) segmented his five organizational disciplines into three knowledge levels[8]. While these conceptualizations can be useful in structuring organizational knowledge, the application of these structures implies neither learning activity nor effectiveness.

Third, authors have addressed the importance the *sources* of organizational knowledge. Dixon (1992) listed markets, external consultants, acquisitions, and joint ventures as valid *external sources* of information. He cited the organization's founders, trial and error experiences, innovation development, and critical reflection as useful *internal sources* of information. Dixon believes that like OL, organizational knowledge structures derive from social processes, creating differences among firms. Knowledge structures can impact the organization's perspective on innovation, because

complex information stores can increase the amount of work required for information processing, an integral precursor to innovativeness.

In sum, the literature suggests three important theoretical themes about the presence of OL in modern organizations. OL is predicated upon the actions of organizational members, varies between incremental (SLL) and radical (DLL) change, and accompanies the organizational consumption of information content. Thus, the validity of the actions and knowledge of organizational members heavily influence OL.

Operational Domain. The operational domain is the collection of understandings about organizational learning that are empirically supported. In the operational domain, researchers observe two types of variables that might be used in hypothesis testing about OL: manifest and latent. Manifest variables are readily observable measures assumed to directly represent a more abstract, latent variable. Organizational scientists have used a myriad of more conveniently available manifest variables (revenue growth rate, stock price volatility, etc.) to represent the existence of organizational learning. Unfortunately, no

empirically supported instrument for assessing the actual theoretical definition of OL exists in the literature, forcing the use of low-quality surrogate measures. There are two themes that can help promote the quality of OL measures. Described in the ensuing sections, these themes provide the theoretical foundations for defining what it means for an organization to learn.

Operational Theme 1: The Domain Definition of OL Includes Huber's Four Subconstructs of OL

Although no consensus exists, the most popularly accepted definition of OL is the multidimensional scheme espoused by George Huber (1991). The scheme includes four distinct phases of organizational learning: knowledge acquisition, information distribution, information interpretation, and organizational memory.

It is universally acknowledged that *knowledge acquisition* is a key component of learning. Goldhar and Lei (1995) and Kiernan (1993) emphasize knowledge acquisition and distribution in their definitions of OL. According to Goldhar and Lei, critical aspects of organizational learning are lateral communication, openness, small project teams, and experimentation.

Kiernan (1993) lists the learning processes of organizations as feedback, data-gathering and performance measurement.

Information distribution is the communication between organizational actors, or transfer of acquired data to organizational structures or data stores. Cavaleri (1994) illustrated the significance of information distribution, proposing that OL is driven by 1) information exchange among members, 2) group discussion and interpretation of observed meanings and 3) time which allows for personal reflection. He stated "OL is a process of continuously reframing the meaning of experience and imprinting these innovations in insight in both the social and technical systems of organizations" (Cavaleri, 1994, p. 266). Thus, organizational knowledge inevitably is either forgotten or embedded in memory through organizational structures. However, before knowledge reaches the value-added state of being embedded in structure, it must be distributed appropriately.

The third component of Huber's OL phases is *information interpretation*, the mechanism by which the organization deciphers and structures acquired and distributed information. McGill, Slocum and Lei (1992)

emphasized information interpretation in their definition of OL, describing it as gaining understanding from experiences. Sinkula (1994) and Sackman (1991) described OL as sense making, and Friedlander (1983) implied that it includes decision-making: "...the crucial element in learning is that the organism be consciously aware of differences and alternatives and have consciously chosen one of these alternatives" (p. 194).

Organizational memory emphasizes the manipulation of cognitive forms, as opposed to the more explicit structures that are managed during *structural change*. For example, Senge and Sterman (1993) espoused a definition of OL as the process of changing shared understanding. Garvin (1993) and Lukas et al. (1996) also emphasized the utilization of cognitive memory in their definitions of OL. That is, they described OL as a process of manipulating cognitive structures such as data, knowledge, information, and experience. Garvin proposed five skills[9] of learning organizations that relate to retrieval from organizational memory. Lukas et al. defined learning by knowledge development as "the extent of experience acquisition, dissemination, and storage among all members of a channel" (p. 242). OM is strongly paralleled in form by a more

popular process in studies on organizational research: structural change. The only difference between the concepts is the subject of manipulation. The next section espouses the inclusion of structural change in the domain definition of OL.

Operational Theme 2: The Domain Definition of OL Includes the Structural Change Process

Many researchers extend Huber's strictly cognitive view of OL. Ongoing structural change is commonly described as an integral part of the construct. Often referred to as 'organizational change' or 'adaptation' within the OL literature, structural change extends the cognitive view of OL. For instance, Ventriss and Luke (1988) integrate change responses with knowledge acquisition, interpretation and memory: "learning is primarily a normative category of cognitive inquiry that examines the tacit assumption of the organization's epistemological belief system and, as such, is incidental to the issues concerning efficiency, adaptation, and maintenance" (p. 792). Bedeian (1986) described some structural change mechanisms: 1) borrowing from other organizations (through reverse engineering), 2)

implementing incremental changes from feedback mechanisms, 3) original innovation, and 4) through blind variations (simple luck). Levitt and March (1988), claim that "Organizations are seen as learning by encoding inferences from history into routines (organization-structural memory) that guide behavior" (p. 320). Hedberg, Nystrom and Starbuck (1976) conceptualized OL as a process of institutionalizing continuous self-design. Thus, *extent of structural change* is integral to organizational learning, and parallels Theoretical Theme 2, which describes organizations as operating in one of two distinct modes of change, referred to as single- and double-loop change[10] in the OL literature.

Dodgson (1993) described the significance of structural change in learning organizations: "firms build, supplement and organize knowledge and routines around their activities and within their cultures, and adapt and develop organizational efficiency by improving the use of the broad skills of their workforces" (p. 377). His definition assumes that 1) learning has generally positive consequences (although outcomes may be negative), 2) OL is influenced by individual learning,

and 3) learning occurs throughout all firm activities (and at different speeds and levels).

Adaptation, the ability of firms to make incremental adjustments, is a concept that has been described as an output of OL. Lukas et al. (1996) implied that learning by adaptation is not dependent on an internally routinized learning scheme, but of the organizational environment. They stated that learning by adaptation is "the extent to which members believe that their channel identifies and responds to environmental changes" (Lukas et al., 1996, p. 242). Dodgson (1993) points out that psychologists view learning as a high degree of adaptation, whereby learning can influence the probability for survival in a changing environment. Nonaka (1991) described the relationship between organizational memory and structural change, claiming that the processes of learning organizations include new knowledge creation, dissemination, and embodiment in technology (including processes). Schein (1996b) believed that organizations must be able to learn by 1) creating new organizational forms and processes and 2) technically innovate. He believes OL also includes 1) the invention of new forms, 2) adoption, 3) diffusion to

other parts of the organization, 4) diffusion to other industry organizations.

The use of structural change in the domain definition of OL is important, because it integrates the two forms of organizational memory: structural and cognitive. These themes make possible generation of item stems and questions that will compose the OL measure, and impact the future of OL research. Just as the meaningfulness of concepts such as OL and their latent variables are assessed in the theoretical domain, value judgements are made about those concepts in the operational domain using quality measures about the reliability and validity of the instrument.

General Recommendations for Measuring Organizational Learning

Several authors have made recommendations for measuring OL. Slater and Narver (1994) suggest that OL measurement be done by the use of surrogates (e.g., the number and innovativeness of new products introduced by a marketing channel) as a starting point. Lukas et al. (1996) contended that using measures of individual learning would not be generalizeable to the organizational level of

analysis. They state: "The assessment of learning by adaptation, assumption sharing, and developing a knowledge base on different cognitive levels requires additional (distinct) measures" (Lukas et al., 1996, p. 242). Schein (1996b) stated that communities may learn in different ways, and the development of appropriate learning tools (i.e., measures, since measurement instruments are applied for learning enhancement) for each community is important. This suggests that different OL measurement instruments should be developed for the various contexts of learning.

Other researchers have stressed the importance of learning context and other contextual concepts. Miller (1996) suggested that identifying modes of behavior helps researchers hypothesize and test the relationship between learning processes and their contexts and outcomes. It also helps distinguish between the various sources, facilitators and performance implications of OL. Sinkula (1994) addressed the importance of focusing on peripheral concepts of learning: "Multi-item scales that accurately portray other relevant constructs, such as passive acquisition, exploration versus exploration objectives, and information equivocality should be operationalized with the utmost care" (p. 42). Schein (1996a) espoused culture as

the most important peripheral concept related to OL, but warned that attempting to measure culture is very difficult. These observations have been made about learning at the organizational level of analysis.

Known Groups Analysis. Cronbach and Meehl (1955) asserted that one method for investigating construct validity is known groups analysis. The underlying assumption is that through investigation about the meaning of the construct, our understanding leads us to believe that groups defined by a derived criterion will differ. Known groups analysis is a method for testing these differences directly, whereby subscale (i.e., knowledge acquisition, information distribution, information interpretation, and organizational memory) means are found to differ across groups that are expected to differ (Carmines & Zeller, 1979).

The OL literature provides a theoretical basis leading to the belief that certain traits describing various groups or individual respondents should influence differences in levels of OL measurement. These traits can be segmented into individual and organizational demographic variables.

Scale Expectations. Scale means for the OL instrument should differ based on the extent to which the firm(s) performs theoretical learning behaviors, rather than the expected ability for the entity to adapt to the environment. However, relatively maladaptive firms in turbulent environments should shrink in size, influence, and participation in the industry. As a consequence, we should see a predominance of learning organizations among remaining firm participants in turbulent environments. Thus, firms in high technology and knowledge-based industries should score higher on the OL instrument than those participating in traditional, low technology industries.

In addition, we should see differences based on the mode of learning (SLL/DLL/deutero) in which entities are engaged. March (1991) explained the commonalties associated with learning behavior within SLL and DLL. He explained that SLL, the exploitation of old certainties is more common than DLL, the exploration of new possibilities. Generally, firms choose the generally conservative SLL mode most of the time. The reason is that two important facets of OL processing can be more readily monitored during SLL: reliability and validity. 'Reliable' learning processes

are valuable because they exploit common understandings built on experience by making interpretations public, stable and shared. 'Valid' learning processes allow organizations to understand, predict and control their environments.

Subscale Expectations. The aforementioned suggestions yield a priori evidence that there are many factors that determine the expected level of organizational learning among firms and their members. These factors may be used to test the discriminate validity of the OL instrument, by testing for these differences. Likewise, several organizational scientists have addressed potential differences in subscales of OL, based on their observations of organizations in general. These observations may explain differences found in subscales across all subjects.

The subscales in question are single- and double-loop and deutero learning, three modes of organizational learning. Argyris and Schon (1978) found that relative to individuals, organizations do well with single-loop learning, but have problems with double-loop learning. They observed no instances of deutero learning in

organizations at that time, concluding that organizations generally fail at this mode of higher-order learning.

Ashton (1988) supported the notion that subscales naturally differ among all subjects in a case study. He believed that, ideally, Argyris and Schon's (1978) OL components (governing values, organization objectives, strategy, action, effects, match/mismatch) interact through normal double- and single-loop learning, but that that these components did not loop in his analysis of business schools. In other words, in the 1988 Ashton study, OL subscales did exist, but not deutero learning, the most powerful form of OL that relates to firm intelligence. The Ashton study illustrates not only a perception of naturally varying OL subscales, but also alludes to the significance of deutero learning (i.e., learning how to learn). The differences are a result of very little organizational learning itself; organizations have yet to be confronted with environments that competitively necessitate certain modes of learning.

Development of a Domain Definition for Organizational Learning

In the long tradition of research on *organizational learning* (OL), a myriad of models, definitions, descriptions, and frameworks has been developed in order to explain the phenomenon. In addition, a great deal of theoretical development and empirical research has been done on individual-level learning in the field of psychology. Unfortunately, this wealth of collective experience has resulted in a great deal of vagueness that threatens the future development of the topic of OL. As stated by Schein (1996a), "we have not yet settled on a good definition of what it might mean for an organization to learn" (p. 235). This impacts organizational research in that often, researchers are left with their own interpretation about the meaning of OL when writing, reviewing, and selecting for publication, writings on the topic.

The genesis for any research area is precipitated by a need to benefit society by improving either practice, or the practical understanding of the subject area. In this case, it is imperative that instruments for assessing organizational learning among various realms of

organizational endeavor (behavior, practice, culture, etc.) be developed. However, standardized tools serving such a purpose cannot be developed unless a consensus definition of the OL construct is first developed. Only then will empirical testing in the various proposed organizational contexts enable further understanding. Toward that end, this chapter builds on decades of theoretical discourse on the concept by utilizing a methodology aimed at deriving meaning from an accumulated assortment of definitions about organizational learning. A sample of fifty-eight definitions of organizational learning was extracted from the literature in an attempt at constructing a consensus definition.

The chapter reviews the history of attempting to define organizational learning, a concept that has suffered from many debilitating characteristics that serve as barriers to definitional consensus making. The domain of organizational learning was then investigated using an interpretative scheme derived from the sample of definitions. Three distinct perspectives on the OL concept are revealed and described. Finally, the prospect of building a consensus definition is discussed, and recommendations for further use are described.

First, it is important to reflect on why, in the long history of research on this topic, there has evolved no agreement as to its definition. This history is important because it highlights the problematic barriers that have plagued potential advances in the study of OL.

Historical Barriers to Defining Organizational Learning

While there currently is no agreed-upon model or definition of OL (Lukas et al., 1996), several have attempted to classify thought on the subject. Even within disciplines, the history of research on OL is marked by rare agreement about the definition of learning (Fiol and Lyles, 1985). A review of organizational learning literature suggests many reasons for a lack of agreement about the definition of OL: style preferences, level of analysis, heterogeneity of opinion on definition, multi-dimensionality, lack of empirical work, the emergent nature of learning behavior, and differing multidisciplinary perspectives. The following sections describe these barriers to advancing toward a consensus definition of organizational learning.

Context-Dependent Style Preferences. Due to stylistic differences, defining and measuring learning within just one abstraction level has been a very arduous task. For example, Corsini (1987) viewed individual learning as involving five learned capabilities that are subject to development: verbal knowledge (declarative knowledge), intellectual skills (procedural knowledge), cognitive strategies (perceiving, encoding, retrieving and thinking, problem-solving, and cognitive process control), attitudes and motor skills. Each of these generic dimensions has very distinct meanings for different individual learners, based on capability and opportunity within each area. In other words, all individuals learn differently, according to preferred style. This is also true for organizations, of which Dodgson (1993) stated that learning is socially constructed (and inherently reliant upon individual-level conflict) and therefore specific to particular firms and group cultures.

The confounding effects upon which context has had on learning have been recently discussed in the literature. Nevis et al. (1995) proposed 17, and Templeton and Snyder (2000) found 11 distinct contexts of organizational learning. These organizational contexts are said to

influence the styles used for OL. For instance, organizations situated in turbulent environments are likely to learn in a more reactive mode (Templeton and Snyder, 1999). A learning system in a different context can adapt using different mechanisms that result in the same performance (Levinthal and March, 1993). As stated by Ventriss (1990), "OL as an approach for designing organizational structures must distinguish between different kinds of learning appropriate to their settings" (p. 795).

Level of Analysis. Researchers have found that the complexities associated with *level of analysis* have greatly hampered the development of an agreed upon definition of the concept. This is because of indications that during OL, learning occurs at many levels in the organization. There are four problems associated with level of analysis that have hampered the development of an adequate domain definition for OL.

First, the organizational level of analysis is merely one distinguishable entity that can be said to experience learning. According to Huber (1991), a learning entity can be a human, animal, group, organization, industry or

society. Threatening to complicate matters worse is a recent proposition by Schein (1996a) that industry consortia better facilitate OL. The most commonly researched levels of analysis for learning are the individual, team and organization (Berg, 1993). Dodgson (1993) noted that both individual and collective learning have received considerable attention in organization research. Given the presence of so many potentially learning subjects in the organizational unit of analysis, a great deal of confusion has been generated concerning the roles of each unit involved.

Second, generalizing components of individual learning to the organizational level of analysis is difficult. As Corsini's (1987) definition of learning suggests, the facets of individual learning are clearly not designed for organizational life. This causes a possible cumulative tradition of research to be lost in hopes of maintaining the integrity of the construct definition. However, some attributes of individual learning are directly generalizeable to the organizational level of analysis. For instance, Miller (1996) included individual level cognitive and behavioral elements in his OL definition.

Third, inter-unit interaction during organizational learning confounds the clarity of level of analysis (Dodgson, 1993). Leonard-Barton (1992) implied that all levels of analysis are important in defining the OL construct. She argued that a multidimensional set of core capabilities (systems, structures, and individual) within an organization are intertwined, and each are bases for OL. Because of the significant role of each of these entities, studying learning at the organizational level of analysis has traditionally been complex.

The fourth problem with level of analysis is that of parallel learning entities; learning occurs at various organizational levels simultaneously (Bedeian, 1986). In fact most if not all acts of organizational transformation (an intentional organizational change that necessitates OL) require acts of individual learning (Pedler et al., 1989). Combining the third and fourth listed items results in an additional threat associated with level of analysis, the notion that distinct entities *interact simultaneously* during organizational learning. Such a state can lead to a great deal of member role ambiguity.

Heterogeneity of Opinion. Although, Fiol and Lyles (1985) have observed some instances of agreement within disciplines as to the definition of learning, Miller (1996) believed the OL definition remains obscure because the process has been described so differently in the literature. For example, Shrivastava (1983) noticed three common conceptualizations about OL: 1) learning as organization adaptation, 2) learning as assumption sharing and 3) learning as the development of a knowledge base. With so many views of the subject, it has been difficult to reach an agreement about its definition. The variety of opinion about the nature of the OL concept has further hampered the development of a consensus definition.

Multi-Dimensionality. In describing the essence of OL, many authors have proposed various dimensions of the construct. For instance, organizational learning *behavior* has been delineated in the work of Huber (1991), who among others, believes learning exists in four distinct phases[11], which he delineates into more specific organizational behaviors. Huber (1991) also offers a set of dimensions describing OL *effectiveness*. He has

proposed four qualities of effective learning: existence, breadth, elaborateness and thoroughness.

Many theorists espouse schemes that include two *modes* of processing in learning. These modes generally relate to the extent of organizational change generated as a result of OL. For example, Senge (1990) distinguished between adaptive and generative, Dodgson (1993) between tactical and strategic, and Fiol and Lyles' (1985) lower and higher level learning, respectively. The classic nomenclature for the dual modality of learning belongs to Argyris and Schon (1978), whose single-loop and double-loop learning describe distinct organizational cognitions that are enacted for different degrees of organizational change. March (1991) explained that lower-level learning is the exploitation of old certainties and higher-level learning is the exploration of new possibilities. Dodgson (1993) described these modes as two extremes of a continuum, varying between conservative and unreliable. Either way, these descriptions support the proposal of Lukas et al. (1996), who described OL as a two-dimensional construct.

Lack of Empirical Work. The difficulty in defining OL is also partly attributed to the lack of empirical work done on the subject. To date, the preponderance of work on OL is of a conceptual nature, with very little empirical testing being done. Whether a lack of empirical work is a result of no reliable and valid construct measure, or vice versa, a consensus definition has not been attempted in the literature. Nonetheless, neither an adequate measure, nor agreed-upon definition of OL exists in the literature. Whether this signifies a lack of significance attributed to the subject, or a prevailing belief that OL cannot be measured empirically, the advancement of OL research hinges on the availability of adequate measures, which in turn depend on the development of a consensus or operational definition.

Emergence. Huber (1991) and others point out that OL is highly emergent by nature. This means it is not necessarily an intentional set of activities, a concept that has a tradition in organizational, human and animal learning. Mahoney (1995) observed that most OL is emergent although some is planned. In his view, future knowledge cannot be predicted at times, and because of the emergence

aspect of learning, "theories about genuine learning cannot be deterministic" (p. 96). Taking a different perspective, Popper (1979) viewed learning as neither deterministic nor random, but as a discovery process. Each of these views suggests that subjects are not always aware of valid and important learning behavior. The emergence aspect has made judgements about learning behavior relatively abstract and difficult to assess.

Differing Perspectives. Heavily multidisciplinary, organizational learning is viewed differently between and within separate academic fields. A sample of 58 definitions of organizational learning was indiscriminately analyzed for content, and three distinct perspectives of the concept were found. The least explanatory is the *demographic* perspective. This view uses easily obtainable data to assess the extent of learning. Demographics are usually proxy correlates, such as firm *age* and *size*. The most explanatory view is the *process* perspective, which uses action-oriented terms (acquisition, interpretation, distribution, etc.) to explain learning behavior. This is the most theoretically pure manner by which authors have described the concept. Finally, authors have defined OL

based on the *outcomes* desired from the OL experience. Usually, positive outcomes can be classified as either effectiveness in OL or organizational performance.

Each of the aforementioned problems adds to the challenge of constructing and testing a highly accepted instrument. Furthermore, the complexity of the concept reduces its potential for widespread adoption. Clearly, an omnibus, simple, and straightforward definition and measure is warranted. Since diversity of opinion is one stimulant to collective learning (Templeton & Snyder, 2000), the problems of definitional heterogeneity and differing perspectives on OL can be perceived as an opportunity for greater learning by the various academic societies interested in the concept. While the tradition of organizational learning research suffers from a lack of agreement about definition, it remains a goal of this research to arrive at a definition that is well-suited for the vast array of modern organizational forms. But before a consensus definition can be espoused, the domain definition of organizational learning must first be established. The following section briefly describes the methodology employed to empirically arrive at a consensus definition of OL.

The Cumulative Tradition of Defining OL

One methodological aid in defining and decomposing constructs of interest is the identification of dimensions found in the literature (Lewis, Snyder, & Rainer, 1995). Used here, the *ontological specification* (Templeton & Snyder, 1999) technique is a useful method for identifying and describing relationships between the various dimensions of constructs of interest. The technique was used to extract a myriad of definitions of OL from the literature. Then, the definitions were used to identify a pattern of subconstructs used in the sample of definitions. The subconstructs were then used to form a consensus definition of OL for each perspective.

Fifty-eight definitions of organizational learning were extracted from various books and research articles that spanned from 1963 to 1996. Often, definitions have included multiple ontology-resident concepts and therefore are referenced throughout the ontology. Applying the ontological specification technique to the definitions of OL yielded three distinct perspectives, and 12 underlying subconstructs of OL. Table 1 associates each reference definition with attributes of OL that derived from each perspective in the literature. In the end, the seven

Table 1: Attributes of OL Supported by the Literature

Perspective:		Dem		Process					Outcome				
Multi-Dimensional Framework[12]	Author: / Contribution:	Individual	Organizational and Societal	Knowledge Acquisition	Information Distribution	Information Interpretation	Organizational Memory	Structural Change	Deutero Learning	- Intelligence	- Information Content Validity	Control	Organizational Consequences
✔	Argyris & Schon (1978)			✔		✔	✔				✔	✔	✔
	Argyris & Schon (1996)			✔									
	Bahlmann (1990)		✔										
	Bedeian (1986)			✔				✔	✔				
	Bell & Scott-Kemmis (1990)			✔									
	Berg (1993)				✔	✔							
	Bouwen & Fry (1991)			✔									
	Bowman & Hurry (1993)			✔		✔	✔						
	Cavaleri (1994)				✔	✔							
	Chalofsky (1996)												✔
	Cohen & Levinthal (1990)			✔									
	Cook & Yanow (1993)												✔
	Cyert & March (1963)												✔
	Daft & Huber (1987)		✔										
	Daft & Weick (1984)		✔										
	De Geus (1988)										✔		
	Dixon (1992)			✔							✔		
✔	Dodgson (1991)						✔	✔					✔
✔	Dodgson (1993)	✔	✔			✔		✔					✔
✔	Fiol & Lyles (1985)						✔	✔			✔		
	Foy (1980)	✔											
	Friedlander (1983)					✔							✔
	Gardner (1983)									✔			
	Garvin (1993)			✔	✔	✔							
	Goldbar & Lei (1995)		✔	✔	✔		✔		✔			✔	
	Hannabuss (1984)											✔	
	Hedberg (1981)			✔		✔	✔				✔	✔	
	Hedberg, Nystrom & Starbuck (1976)			✔			✔	✔					
	Hobday (1990)			✔									
✔	Huber (1991)	✔		✔	✔	✔	✔	✔			✔		✔
	Kiernan (1993)		✔	✔	✔	✔	✔						
✔	Lee, Courtney & O'Keefe (1992)												

Table 1: Attributes of OL Supported by the Literature (continued)

Multi-Dimensional Framework	Author: / Contribution:	Dem: Individual	Dem: Organizational and Societal	Process: Knowledge Acquisition	Process: Information Distribution	Process: Information Interpretation	Process: Organizational Memory	Process: Structural Change	Outcome: Deutero Learning	Outcome: - Intelligence	Outcome: - Information Content Validity	Outcome: Control	Outcome: Organizational Consequences
✔	Leonard-Barton (1992)												
✔	Levinthal & March (1993)							✔		✔			
✔	Levitt & March (1988)			✔			✔						
✔	Lukas et al. (1996)			✔	✔	✔	✔	✔					
	Lyles (1988)						✔	✔					
	Mahoney (1995)			✔				✔	✔	✔	✔		
✔	March (1991)					✔							
✔	March et al. (1991)								✔			✔	
	McGill, Slocum & Lei (1992)						✔						
✔	Miller (1996)			✔		✔							
	Nonaka (1991)			✔	✔		✔	✔					
	Pucik (1988)		✔										
	Rothwell (1993)											✔	✔
	Sackman (1991)					✔							
	Schein (1996a)	✔											
	Schein (1996b)					✔	✔	✔					
✔	Senge (1990)										✔		
	Senge & Sterman (1993)					✔		✔					✔
	Sinkula (1994)		✔	✔		✔	✔						✔
	Slater & Narver (1995)			✔							✔		
	Spender (1989)			✔									
	Stata (1989)						✔						
	Van de Ven (1986)			✔									
	Ventriss (1990)							✔		✔			
	Ventriss & Luke (1988)			✔		✔	✔	✔					
	Walsh & Ungson's (1991)						✔				✔		
14	**Totals**	4	8	25	8	18	19	15	4	4	10	6	11

problematic issues described earlier were resolved, resulting in the formulation of a consensus definition of organizational learning.

Defining the Domain of Organizational Learning

A *domain definition* of a concept is the specific meaning of special interest in a given research context. In the case of organizational learning, the domain definition is very important because it largely determines the future of research in the field. Descriptions, definitions, antecdotes, case studies, causal and process models, measurements, and empirical testing each depend on the assumed definition of the concept. In short, an adequate domain definition can be extremely useful in furthering a topic of interest to academic societies. It is one goal of this research to influence further research on OL by providing a consensus definition - one that agrees with all or most previous research to date. Three distinct perspectives on the definitional meaning of organizational learning were found in the literature. The following sections explain each perspective in great detail.

The Three Perspectives for Defining OL. In the long tradition of organizational research, organizational learning has often been defined as a *multi-dimensional* set of constructs. For this study, the ontological specification technique yielded three distinct perspectives of OL that are useful in assessing its presence in organizations: the *demographic*, *process*, and *outcome* perspectives. Tables 2 and 3 illustrate evidence of support in the OL literature, and define the components of these views, respectively. Table 2 provides short descriptions of attributes of each view of OL. Table 3 shows the expected direction of relationships between OL and demographic variables for the individual, organizational, industry, and national levels of analysis. In order to yield a greater understanding of past and future research, the following sections describe each of these perspectives of OL.

The Demographic Perspective. Demographic traits of learning organizations help researchers determine the structural formations and organizational-level contexts that exist in support of organizational learning effectiveness. Table 3 depicts several categories of

demographic variables, based on unit of analysis: individual, organizational, industry, and national. This section presents specific organizational traits that either strongly represent, or impact various levels of organizational learning.

Table 2: Attributes of OL Defined

View	OL Attribute	Generic Description
Demographic	Individual	Descriptive data about organizational members
	Organizational and societal	Descriptive data about the organization or its context
Process	Knowledge Acquisition	Obtaining organizational information
	Information Distribution	Transmitting acquired knowledge to organizational units
	Information Interpretation	Determining the meaning of acquired information
	Organizational Memory	Transforming organizational information (tacit and explicit) stores to an ideal state
	Structural Change	Transforming of the organizational structure to an ideal state
Outcome	Intelligence	Adaptability to the learning context
	Information Content Validity	Usefulness of information or knowledge processed for the learning context
	Deutero Learning	Learned content consists of the learning methodology and process itself
	Control	Elicited power over self or external environment
	Org. Consequences	Results (intended or unintended) of the learning process

Defining the Demographics

The OL literature provides a theoretical basis leading to the belief that certain traits describing various groups or individual respondents should influence differences in

levels of OL measurement. These traits can be segmented into ***individual*** and ***organizational demographic*** variables.

Table 3: Nature of Variables Expected to Influence OL

Variable Level of Analysis	**Variables with Potential Responses** [expected direction of relationship]
Individual Demographics	Management Subculture • Engineers • Executives • Operators
	Functional Area • R&D * • etc.
	Gender • Male • Female
Organizational Demographics	Size (employees) • continuous scale [-]
	Firm Age (years) • continuous scale [-]
	Rate of Expansion • continuous scale [+]
	Proliferation of Product Offerings • continuous scale [+]
	Environmental Intrusion • continuous scale [+]
	Structural Complexity • continuous scale [-]
Industry Demographics	Age (years) • continuous scale [-]
	Environmental Turbulence • continuous scale [+]
National Demographics	National Culture • Japanese * • U.S. • etc.

* expected superior trait within discontinuous variables

Individual Demographics. Individual demographics are expected to have an impact on levels of organizational learning. Concerning management subculture, Schein (1996a) suggested that perceived levels of OL would differ among members of the organization's various subgroups. He

posited the existence of three distinct ***management subcultures*** (*engineers, executives, and operators*). These subcultures learn in different ways, suggesting that subscale means will vary among the groups. Addressing differences between functionally coordinated groups, Huber (1991) and Dodgson (1993) espoused *R&D* as a distinct source of organizational learning. This implies that differences in subscale means should be expected among the various functional areas of the firm. Foy (1980) made various assertions regarding how ***gender*** may impact learning style. For example, he believed that *females* are encouraged in life to use and explore their intuition, while ***males*** are discouraged from using it beginning at an early age. Thus, it should be expected that levels of subscale means will differ, due to gender-based learning style differences.

Organizational and Societal Demographics. The research on OL suggests several categories of organizational characteristics that should influence levels of OL. Each of these categories describes the context of the organizational actor during studies on OL.

OL is also expected to fluctuate based on several organizational characteristics. Two basic organizational

demographics suggested to influence OL are ***organization size*** and ***age***. It is expected that small, young organizations are better learners for many reasons (Daft & Weick, 1984). One reason is that top management decision-making in small, young organizations is not constrained by the rigid and outdated cultures found in mature, stable firms. Sinkula (1994) offered another explanation. He explained that as organizations age and grow, the market information supply is more passively acquired. He proposed that "In old organizations, increasing the supply of market information will have little affect on (OL processing)" (p. 41). Also, "In young organizations, increasing the supply of market information will result in increased [OL processing]" (Sinkula, 1994, p. 41).

Goldhar and Lei (1995) suggested that certain competitive capabilities are related to organizational learning. They implied that good learning organizations can be found in those with a high ***rate of expansion*** (i.e., market opportunities) and ***proliferation of product offerings***. We should expect to see positive correlations between these organizational skills and OL.

There are also various structural properties found in good learning organizations. For example, ***environmental***

intrusion, the central paradigmatic tenet of organizational learning theory, should be related to organizational learning (Daft & Weick, 1984). Another organizational characteristic that strongly influences OL is ***structural complexity***. Bahlmann (1990) believed that learning only occurs in a simple organizational structure. This is because simple organizational structures greatly facilitate member communication, a behavior integral to organizational learning.

At a slightly higher level of analysis, Daft and Huber (1987) proposed industry differences in organizational learning. They stated that the highest levels of organizational information processing occur when an industry is young. Their rationale is that new industries are characterized by a ***rapidly changing environment*** or is undergoing ***rapid technology development***. Participants in such industries readily accept new information and change, and are uninhibited by their own past experiences.

Concerning national culture, Pucik (1988) and Dogson (1993) noted that the Japanese place particular attention to learning relative to other countries. It can by inferred from this suggestion that ***national culture*** can be

used to differentiate between successful and unsuccessful organizational learners.

Rationale for Advancing the Demographic Perspective

The case for expending a great deal of effort advancing the demographics perspective of OL is very weak. The variables described are primarily objective, convenient proxies for the OL concept. These variables do not assess organizational learning itself but instead serve as surrogate measures. Therefore, the variables mentioned in this section should be used as interesting correlates of OL, as cited in the literature.

The Process Perspective. The process perspective views organizational members as being involved in a set of behavioral patterns that represent organizational learning. Organizational learning processes involve the systematic routines, formal or informal, that are acted out by organizational members toward the end of organizational information processing. Assigning specific behaviors to the OL effort has very powerful implications towards explaining organizational effectiveness.

Defining the Processes

Four phases of OL processing have been proposed by Huber (1991) and represent the prominent taxonomy for decomposing acts of organizational learning (Bowman & Hurry, 1993; Cavaleri, 1994; Drew & Davidson, 1993; Fichman & Kemerer, 1997; Glynn, 1996; Inkpen, 1996; Kim, 1993; MacKenzie, 1994; Mahoney, 1995; Miller, 1993; Miller, 1996; Miller & Chen, 1994; Miner & Robinson, 1994; Nevis, DiBella & Gould, 1995; Pennings, Barkema & Douma, 1994; Robey & Sahay, 1996; Sinkula, 1994; Stein & Zwass, 1995; Vandenbosch & Higgins, 1995; Walsh & Ungson, 1991). These phases are ***knowledge acquisition***, ***information distribution***, ***information interpretation***, and ***organizational memory (OM)***. As suggested in Table 1, Huber's (1991) behavioral decomposition has been the most cited scheme of OL since its publication, and has been validated in organization research by the construction of useful models (Templeton & Snyder, 1999) intended to explain organizational behavior.

It was also found that ***structural change*** exists as a component of many OL definitions, which points to a deficiency in the original work of Huber[13]. This is due to a discrepancy in the literature as to the meaning of organizational memory. Authors have proposed definitions

of OM that consider computer-based systems, business processes, organizational structure, and humans as potential data stores. In this vein, one construct that is absent from the Huber scheme of organizational memory is a subscription to the idea that knowledge can be embedded in an organization's ongoing processes or other structures. One form of structural memory, as Spender (1989) points out, is routines that guide member behavior. Dodgson (1993) points out the strength of relying on this type of memory. He contends that since routines are independent of the individuals who operate within them, they can survive considerable turnover. Thus, the structural change concept is included in the proposed process-based definition of OL.

It is important to differentiate between the *organizational memory* and *structural change* concepts. Organizational memory relates to the management of very tacit organizational structures, such as ideals, standards, and the entity's collective sources of data, information, knowledge, experience, and creativity. Structural change is the administration of organizational structures, including all ongoing organizational structures, such as technologies[14], processes, subunits, or relationships. Clearly, the difference lies in

definition, although Table 1 shows that both conceptualizations of change appear in the literature.

Several theorists provide support for the notion that learning includes structural change, or adaptation. Dodgson (1993) proposes that the realization of a change in organizational effectiveness signifies change: "learning can be seen to have occurred when organizations perform in changed and better ways" (p. 378). He explained that organizational theory "often assumes learning to be stimulated by the need for organizational adjustment in response to some rather ill-defined external stimulus" (Dodgson, 1993, p. 378). He notes that management and innovation literature sees learning as "a purposive quest to retain and improve competitiveness, productivity, and innovativeness in uncertain technological and market circumstances" (p. 378). This implies that adaptation may be equally important at the organizational level. Huber (1991) stated: "An entity learns if, through its processing of information, the range of its potential behaviors is changed" (p. 88). Cook and Yanow (1993) believe that individual-level consciousness does not have to be attributed to the organization for learning to occur, but learning is realized when organizations act as total

units in changing environmental conditions. While this attributes learning to changes in organizational structure, other researchers view it as the realization of changes in organizational effectiveness.

The process of converting intellectual elements into more concrete form can be described as *knowledge embedding*, where by tacit knowledge is transformed into explicit knowledge. The knowledge embedding process can be observed in many traditional organizational functions, such as in research and development, incremental and radical change programs, system development, and organizational development exercises. The successful completion of such actions begins with tacit, OM-resident data, and may result in new or modified explicit structures.

Rationale for Advancing the Process Perspective

This dissertation subscribes to the notion that organizational learning can best be viewed as a process, or coordinated set of behavioral patterns. This is important, because if OL can be understood as a concrete process, then such behavior can be learned, or improved upon, by individual actors in the firm. Such implications

positively impact the significance of the topic. For example, for years, it has been generally agreed upon in educational practice that the intelligence quotient (IQ) measures the natural cognitive ability one possesses at a given stage of life. Many assume that the IQ is predetermined, that it cannot be stimulated by external treatments. A process-based view of learning suggests that as a well-defined behavior, individuals can adopt the tenets of organizational learning theory. There are many process-based views of learning available in the literature. The technology control model developed by Templeton and Snyder (1999) provides validation for the utility of the process-based view of OL.

The Outcome Perspective. As stated by Dodgson[15] (1993), learning includes both processes and outcomes. Furthermore, Chalofsky (1996) claimed that the modern paradigm for learning involves learning as outcomes. Organizational learning outcome variables involve the consequences and efficacy of organizational learning processing.

Defining the Outcomes

Organizational learning has also been defined as one or more organizational outcomes. However, it is important to differentiate between organizational outcomes and consequences of organizational learning. As described in the following sections, *deutero learning* and *organizational control* are two organizational outcomes that have been commonly used to describe organizational learning. A plethora of *organizational consequences* is described as the third category of organizational outcome.

Deutero Learning. In addition to the popular bipolar learning modes (i.e., SLL & DLL), Argyris & Schon (1978) depicted a third mode of learning called ***deutero learning***, or the process of learning how to learn. Bedeian (1986) described deutero learning as the organization's capacity for learning. According to many organizational theorists, deutero learning is one of the most strategically potent processes that is subject to managerial control (Goldhar & Lei, 1995). As March et al. (1991) and Templeton and Snyder (1999) suggest, deutero learning is important in the organizational management of technology. Self-learning competency has also been sited as a vital component of

individual effectiveness (Shani & Lau, 1996). Edward Schein (1996b) noted that organizations have not yet learned the OL process, implying that deutero learning is scarce in practice.

Deutero learning is important because it implies that management can manipulate organizational *learning* processes to improve the ***intelligence***[16] of organizations (Levinthal & March, 1993). Thus, learning processes are instruments of the intelligence of organizations. Organizations can use superior intelligence for directing resource conversion activities and sustaining competitive advantage (Mahoney, 1995). Organizational intelligence is strongly dependent upon the acquisition and cultivation of human resource intelligence[17], and vice versa[18]. This has powerful implications in organizational and educational practice, and represents a shift away from learning environments to learning processes.

Several researchers have emphasized the importance of ***information content validity*** in the learning process of organizations (Levinthal & March, 1993; Fiol & Lyles, 1985; Dixon, 1992). Huber (1991) points out that entities can incorrectly learn as well as learn things that are incorrect. Mahoney (1995) stated that competence in OL

(i.e., intelligence) involves both knowledge content and the rate of learning. These theorists have implied that organizational learning competency is related to both process and content. Information content validity is the appropriateness of the information content that is processed during organizational learning. Subject matter should at least consist of data, information, or experiences that pertain to the attainment of organizational goals.

Defining valid information content is vital towards the achievement of organizational intelligence. According to proponents of deutero learning, appropriate information content is the learning process itself. In this vein, organizations should engage in the science of learning. Perhaps the most cited and utilized OL content model in practice is that of Peter Senge (1990), who presents categories of knowledge which serve as component technologies for building and innovating a learning organization. The Senge view includes five distinct 'disciplines' of organizational study: personal mastery, mental models, building shared vision, team learning and systems thinking (the integrative 'fifth discipline').

Of course, the quality of information content is strongly related to internal and external sources of knowledge.

Control. Templeton and Snyder (1999) asserted that organizational control is very similar to the notion of organizational learning. Implications are that borrowing from the more developed area and subfields of organizational control can help advance research and understanding about organizational learning. This connection has been corroborated by March et al. (1991), who suggested that the three primary modes (single-loop, double-loop and deutero) of organizational learning behavior suggest strong connotations about the similarity between learning and control. The literature suggests three primary similarities between the two theories. First, both theories serve as information processing models of the firm. Second, both viewpoints espouse the existence of two basic modes of organizational operation, based on radical and incremental change. Third, as with control, OL has been described at various levels, or units, of analysis. In order to better understand control as an important consequence of organizational learning, readers

should refer to Templeton and Snyder (1999) for a more complete description.

Organizational Consequences. It is well accepted that OL is necessary to remain competitive (Schein, 1996) and upgrade capabilities (Mahoney, 1995) in the increasingly turbulent business environment. In that spirit, Templeton and Snyder (2000) provided a taxonomy describing several consequences to organizational learning. Organizations are motivated to successfully 'learn' based on perceived desired outcomes, which can be segmented into two categories: responses to environmental turbulence, and responses to competitive necessity[19]. These outcome categories are sought through SLL and DLL processing modes, respectively.

It should be noted here that organizational effectiveness is not always the anticipated result of OL (Huber, 1991). For instance, factual knowledge may not result from the learning experience. It should also be noted that even seemingly effective OL can cause negative organizational consequences. Miller (1996) believed that OL can do more harm than good by working in the favor of one organizational objective over another.

Rationale for Advancing the Outcome Perspective

Despite one's view as to whether or not outcomes should be considered in the operationalization of OL, many of the concepts that might be proposed as outcome-related learning subconstructs are underdeveloped in the literature. Consequentially, they should be more difficult to measure. For example, Argyris and Schon (1978) viewed OL as *gaining new insights*. The operationalization of the concept of *insights* is subject to extensive debate, unless it can be incorporated into the framework of various reference disciplines, such as psychology, cognitive sciences, or even the visionary aspects of organizational change. This is because these disciplines are more developed and tested than some of the tacit explanations proposed in the OL literature. Nonetheless, development of constructs in the outcome perspective is extremely important towards the end of determining the value of the organizational learning concept. The discovery of relationships between process and outcome-based variables should be of primary importance to organizational learning theorists, researchers, and practitioners.

A Consensus Domain Definition

In this discussion, the chapter has described the issues that have hampered the development of a consensus definition of OL. First, it is most worthwhile to advance research on OL using its process-oriented perspective. This viewpoint has implications for describing some very important aspects of modern organizational life. A process orientation should help explain the two extremes of organizational information processing: SLL and DLL. In addition, a process view should help managers understand and control organizational learning processes to enhance deutero learning. Improving deutero learning is at the heart of increasing organizational intelligence, previously thought to be structurally preordained. The process-based view of OL also has implications for improving organizational control, a concept similar to learning.

A second conclusion resulting from this discussion is the appropriateness of using the Huber (1991) taxonomy for defining the domain of OL. The Huber model is heavily cited by the literature, and where not referenced, its constructs are heavily supported in meaning. By employing the process perspective, the Huberian definition should allow for an assessment of the bimodal dimensions: SLL and

DLL. It implies that high scores of OL relate to DLL, whereas low scores represent SLL information processing. In addition, if managers can learn to increase OL assessment scores, the organization can control its level of intelligence. The Huberian scheme should also allow managers to identify specific subscales of interest or concern, based on assessment scores.

The third conclusion found in this analysis of the domain of OL concerns level of analysis. Given the interaction between various levels of analysis during OL, what unit should be settled upon as the subject of analysis? In other words, is it individuals whose behaviors represent the OL processing in organizations? An affirmative answer to this question means that an operational definition of OL should describe the behaviors of individuals acting independently from organizational goals. Since this is not a viable path of reasoning, researchers should not subscribe to the idea that individual behavior alone represents OL. Individual members often behave independently of organizational concerns. Alternatively, is OL the behavior of individuals acting on behalf of the entire organization? In this case, assessing OL in the firm is a matter of asking qualified

individuals (those knowledgeable about the entire organization) to serve as proxies for the organizational entity. It is concluded that knowledgeable members about the organization are best qualified to assess the learning behavior that occurs at the various levels of analysis. OL relies upon member behavior performed on behalf of the organization.

The preceding literature reveals several important dimensions of the OL construct that are useful in further development of the field. Employing Senge's systems thinking discipline, the review outlined various precursors to, and consequences of, the OL concept. Most importantly, it revealed a number of traditional and contemporary subconstructs that might be found to correlate as distinct dimensions of the OL processing scale. It is now important to discuss previous views on measuring organizational learning.

Chapter Summary. The long tradition of research on OL suffers from a lack of agreement about what it means for an organization to learn. Researchers have used their own interpretations to make judgments that impact progress in this significantly important body of research. In turn,

progress has been hampered to the point where very little empirical testing is done on OL, despite the continued popularity of the concept. Many important questions need to be investigated in order to properly assess the significance of OL theory. The implications for managers and researchers alike are of historical significance, given the profound economic impact of the precursors to OL theory, such as the topics of quality and institutional change.

This chapter provides a better understanding about the history and current state of research with respect to defining the OL concept. Until this time, there has been no agreed-upon definition of OL, although there have been many attempts at classifying thought on the topic. This deficiency has hampered the evolution and development of the topic towards a reliable and valid measurement instrument.

The first part of this chapter addresses theoretical and operational barriers that preclude the operationalization of the OL concept into an acceptable measure. Addressing these issues is paramount to the goal of establishing a consensus domain definition for, and hence creating adequate measures of, OL. The establishment

of an empirically reliable and valid measure should greatly expedite needed research on the topic so the field of organizational science can be advanced more quickly.

This chapter uncovers three important theoretical themes and two operational themes that have been found apparent in the OL literature. Recurring themes in the theoretical domain are 1) the interaction between the individual and the organization during OL processing, 2) the two extremes of OL (SLL and DLL), and 3) the importance of structuring organizational information content. All of these issues point to the significance of strategically significant organizational actors who enact learning on behalf of the organizational interest.

Operational themes found in the OL literature are 1) the acceptance of Huber's (1991) four subconstructs of OL processing, and 2) the acceptance of structural change as a part of OL. The two operational themes yield five distinct subject areas for generating items for subsequently creating an initial sample pool of questions that theoretically represent the OL concept.

In addition to definitional concerns, this chapter also reviewed various recommendations addressing measurement issues. Researchers suggested 1) several

surrogate measures for OL (Slater & Narver, 1994), 2) that generalizing learning from the individual to organizational level of analysis is not appropriate, (Lukas et al., 1996), distinct learning measures are appropriate for each learning community (Schein, 1996b), and the importance of assessing learning context. Contextual variables are important because they are expected to influence levels of OL processing (Templeton & Snyder, 2000). Expectations for scale and subscale behavior were then discussed.

The five aforementioned themes found in the OL literature must be understood before a content-validated definition of OL can be constructed. Chapter 3 pursues further operationalization of OL using a sample of 58 definitions of the term found in the literature.

Three important issues leading to the development of an adequate domain definition for organizational learning were also addressed. First, of the three perspectives of organizational learning derived from the literature, the process-based view was selected due to its potential for explaining organizational behavior and effectiveness. Second, the Huberian view of OL was extended and used in the domain definition. *Structural change* was added to Huber's (1991) four-part taxonomy of OL, since it was found

to be a significant component of organizational learning in the literature. Third, the level of analysis issue was addressed, using various recommendations found in the literature. It was concluded that by name, OL exists at the organizational level of analysis, but is enacted by organizational members. Therefore, a definition of organizational learning should include collective actions of members performed on behalf of the organizational interest. A process-based definition, intended to guide further development of a valid and reliable measure of OL, is provided in Chapter 4.

Chapter Footnotes

[1]The other three themes are resource allocation, sense making, and strategic positioning. The themes are distinguished among two dimensions: type of decision making (content or process themes) and type of analysis (more or less future oriented).

[2]Miller (1996) warned that organizational memory should be related to organizational action or decision making. Otherwise, it is not relevant to organizational interests, but that of individuals.

[3]Dodgson (1992), called these modes 'strategic' and 'tactical', since the process of learning varies between unreliable and conservative. Senge (1990b) distinguished between 'generative' and 'adaptive' learning, and Fiol and Lyles (1985) referred to the phenomena as 'higher-' and 'lower-level' learning. In his stimulus-response model of OL, Hedberg (1981) segmented the extent of learning into three levels: 'minor', 'moderate', and 'major.'

[4]Templeton and Snyder (1999) propose that SLL occurs during roughly 97% of the organizational life cycle. Organizations exist in the DLL mode the remaining 3 percent of the time.

[5]Luthans (1995) believed that double-loop learning "has emerged as the latest widely accepted view of organization theory" (p. 481), competing with *radical humanism* and *chaos theories*. He perceived that a problem with many organizations who changed in the 1980's was that they were performing single-loop/reactive and not double-loop/proactive learning.

[6]Sinkula's hierarchy of market knowledge includes *dictionary* ("What is?"), *episodic* ("What has been?"), *endorsed* ("What is the espoused way of doing things?"), *axiomatic* ("Why things are done the way they are?"), *augmented* ("How should things be done?"), and *deutero* ("How does the organization create knowledge and learn?").

[7]Zachman's taxonomy was based on six question categories about the organizational system: *what*, *how*, *where*, *why*, *when*, and *who*.

[8]Senge's five disciplines for learning organizations are *systems thinking*, *personal mastery*, *mental models*, *building shared vision*, and *team learning*. Senge's three knowledge levels are *practices* (what you do), *principles* (guiding ideas and insights), and *essences* (the state of being of those with high levels of mastery in the discipline).

[9]Garvin's (1993) five organizational learning skills involve learning from experiences and history, learning from the experiences and practices of others, and transferring knowledge quickly and efficiently throughout the organization.

[10]These two modes of change are contained within the two modes of learning, single- and double-loop learning that are described in the section: "Theme 5: There are Three Distinct Modes of Organizational Learning"

[11]These phases are knowledge acquisition, information distribution, information interpretation, and organizational memory, and will be described in greater detail as an integral part of the cumulative tradition of defining OL.

[12]Definition provided from multi-dimensional framework, as opposed to textual description, where marked.

[13]There is a differentiation made here between organizational memory and structural change. While organizational memory involves change, it is restricted to the cognitive aspects (dealing with data, information, knowledge, experience, etc.) of organizational behavior. Structural change alternatively captures traditional

organizational change initiatives, dealing with structural aspects (hardware, policy, hierarchy, etc.) of the firm.

[14]Orlikowski (1992) defined *technology* as tasks, techniques, knowledge, and tools.

[15]Dodgson (1993) concluded that several research fields depict OL as the realization of outcomes. He interpreted economists' view learning either as simple quantifiable improvements in activities, or as some form of abstract and vaguely-defined positive outcome. He believed that management and business literature considers learning sustainable comparative competitive efficiency and that the innovation literature views learning as promoting comparative innovative efficiency.

[16]Here, we refer to 'intelligence' as the organization's capacity for learning, adaptability, and information processing as opposed to traditional meanings of 'business intelligence' that refer to clandestine activities related to the focused information gathering about one's competitive rival(s)

[17]See Gardner (1983), who has proposed seven human intelligences, two of which are emphasized in most individual learning activities: the verbal/linguistic and the logical/mathematical. The five non-traditional

intelligences are: spatial, musical, kinesthetic, interpersonal and intrapersonal.

[18]Senge and Sterman (1993) defined OL as leading to the enhancement of individual and team learning capacities (i.e., member intelligence) and to the development of relatively more systemic shared understandings among organization members.

[19]According to Templeton and Snyder (2000), responding to environmental turbulence can involve either behavioral and technological change, or both. Organizations responding to competitive necessity enact learning in pursuit of competitive advantage, new organizational technologies, enhanced organizational knowledge base, and organizational effectiveness.

METHODOLOGY

The study utilized traditional and non-traditional methods for developing a measure for organizational learning, the construct of interest. A comprehensive methodology derived from the works of Lewis (1993), Churchill (1979), and Malhotra & Grover (1998) involve three phases of development: content analysis of the OL literature, instrument development, and computation of a statistical profile of OL implementation. Table 4 depicts their contributions to the current methodology.

Lewis (1993) successfully employed three methodology stages in his dissertation that serves as a framework for organizing the current overall research methodology. Each stage investigates a particular question about the concept being operationalized:

RQ1: What is the domain of OL?

RQ2: How can OL be measured?

RQ3: To what extent do functional areas, organizations, and industries engage in OL?

Table 4: Research Methodology Composition

Stage, Research Question (Lewis, 1993)	**Phase** (Churchill, 1979)	**Step**	**Procedure**	**Ideal Survey Attribute (ISA-n)** (Malhotra & Grover, 1998)	**Deliverable**
Content Analysis: <u>RQ1</u>: *What is the domain of OL?*	I	Define Content Domain	Literature review		Domain definition
			Operationally define		Operational definition
		Criteria Creation	Ontological specification		Item stems
Instrument Development: <u>RQ2</u>: *How can OL be measured?*	II	Questionnaire Creation	Face validity check (n=3)	2,5	Instrument items
	III, IV	Pre-Test	Original instrument (n=9)	10	
	III, IV	Pilot Test	Small sample admin. (n=24)	7	
	III, IV	Item Screening	Lawshe procedure (n=20)		
	III, IV	Administer Questionnaire	Full administration (n=119)	3,12,13,14,17	
		Instrument Evaluation	EPCFA Scree plot Known groups analysis	4,6, 9,11, 15,16	Validity assessment
			Cronbach's Alpha	8	Reliability assessment
Statistical Profile: <u>RQ3</u>: *To what extent do organizations conduct OL?*		OL Profile	Factor scoring Descriptive statistics Norming data analysis		Profile data: - industry - size/age

Traditional methods for developing marketing measures proposed by Churchill (1979) have been utilized in various studies on MIS (Grover, 1993; Lederer & Sethi, 1992; Lewis et al., 1995; Rainer & Harrison, 1993; Sethi & King, 1991; Sethi & King, 1994). Each of the four instrument development phases enumerated by Churchill focus on satisfying validity and reliability concerns about the OL measurement instrument through iterative development and testing. These phases include 1) construct domain specification, 2) generation of items, 3) data collection, and 4) measure purification.

The successful tradition of the Churchill method is greatly augmented here through consideration of Malhotra and Grover's (1998) *Ideal Survey Attributes* (ISA). Inherent within the first two research questions are qualitative concerns about survey instruments that necessitate the use of the ISAs. These attributes, denoted as ISA-*n* in this research, are displayed in Table 5. Convenient in the context of the Churchill methods, the ISA items address key success factors in instrument development and quality improvement. Given this background, the chapter refers to each of the attributes as they apply during the operationalization of each research stage.

Table 5: Malhotra and Grover's (1998) Ideal Survey Attributes

	General
ISA-1	Is the unit of analysis clearly defined for the study?
ISA-2	Does the instrumentation consistently reflect that unit of analysis?
ISA-3	Is the respondent(s) chosen appropriate for the research question?
ISA-4	Is any form of triangulation used to cross validate results?
	Measurement Error
ISA-5	Are multi-item variables used?
ISA-6	Is content validity assessed?
ISA-7	Is field-based pretesting of measures performed?
ISA-8	Is reliability assessed?
ISA-9	Is construct validity assessed?
ISA-10	Is pilot data used for purifying measures?
ISA-11	Are confirmatory methods used?
	Sampling Error
ISA-12	Is the sample frame defined and justified?
ISA-13	Is random sampling used from the sample frame?
ISA-14	Is the response rate over 20%?
ISA-15	Is non-response bias estimated?
	Internal Validity Error
ISA-16	Are attempts made to establish internal validity of the findings?
	Statistical Conclusion Error
ISA-17	Is statistical power sufficient?

Stage I: Content Analysis of the OL Literature

Content analysis involves any of several research techniques used to describe and systematically analyze the content of written, spoken, or image communication (Churchill, 1979). It is used to derive meaning from the observations of others about the theoretical concept under study. Content analysis can be used to extract information, such as determining the author of an anonymous

letter or historical artifact. For the purpose of finding the domain of a concept, the procedure involves the objective and systematic extraction of attributes from written communications (Carney, 1972) that culminates in an analysis of the extracted parts (Budd et al., 1967).

Content analysis was employed in this research to find out what patterns emerge that can help define OL dimensions. Content analysis, derived from literature review, was used to 1) support existing theory defining OL subconstructs (e.g., Huber's four OL subprocesses) and 2) extend theory by uncovering additional important measures related to OL[1]. The selected literature included academic and practitioner articles and books concerned with OL in several disciplines. Databases accessed for articles and books that meet the search criterion stated were ABIC at Auburn University, AL and SUMMIT at Syracuse University, NY. Articles and books were chosen if the phrase *organizational learning* was found in the title, or was a keyword of the article. Bibliographies of the selected articles were sought and reviewed to further explore important concepts.

There were several reasons that no explicit attempt was made to restrict the search for sources of OL

definitions. First, OL is a cross-disciplinary topic, so there is no reason to restrict the search topically. Nonetheless, the databases utilized predominantly business themes. Second, there is no cumulative tradition in empirically measuring OL. All of the work done on the topic has been in the conceptual, theoretical phase of the research continuum. Third, no date restriction was placed on articles found in the search. This is because no empirical work to advance an instrument of OL has been done that might cause knowledge about the topic to be outdated.

All articles were processed using the *ontological specification* procedure described by Templeton and Snyder (1997). This procedure included four steps: 1) selection of the topic area, 2) delineation of concepts that describe the overall construct, 3) transfer to a reusable medium, and 4) use of concepts in labeling source information. This involved the establishment of several search attributes (refer to Table 1 in Chapter 2) related to OL that amounted to several passes through the literature. One result was a collection of fifty-eight explicit definitions of OL, found in the literature (see Chapter 3).

The definitions were decomposed and used to support and extend existing theory about the OL processes in firms.

The content analysis procedures subsequently elicited an omnibus, operational definition of OL. An operational definition is a description of the way researchers observe and measure a variable. Although operational definitions are always imperfect, they are important in establishing replicable criteria for generating a sample of representative survey items. The combination of these items serves as an economical representation of the true definition of the concept.

The proposed definition was validated in Chapter 2 and presented in Chapter 4. Arrival at an agreed upon operational definition for OL is important, because it serves three purposes that relate to the goals of the study:

1) the operational definition specifies the construct domain, which satisfies RQ1
2) it yields an understanding about the appropriate unit of analysis[2]
3) criteria are established based on the operational definition (that incorporates level of analysis) so

that identifying occurrences of OL can be made and replicated via survey instrument.

These criteria were used to generate the original instrument items that provide a basis for Stage II: instrument development.

Stage II: Instrument Development

Stage II involved instrument development based on the domain definition of OL produced in Stage I. As the following description shows, the methodology for completing Stage II involved several attempts at establishing content validity throughout the instrument development process.

Step 1: Initial Questionnaire Development. During initial questionnaire design, questions were derived from each item stem found to represent a distinct characteristic of OL (see Table 6, Chapter 4). The question items represented one respondent's perceptions about the presence of *specific behaviors* found to be important in OL from the literature content analysis. Thus the questionnaire was designed to elicit the

respondent's professional judgment about the presence of OL in the firm.

As with the construction of the operational definition, and consistent with ISA-2, item design was done with consideration of unit of analysis. Consistent with the operational definition of OL, subjects were asked to serve as proxies for their organization in responding to each item. Scale response categories were: 1) strongly disagree, 2) moderately disagree, 3) undecided, 4) moderately agree, and 5) strongly agree.

Three MIS faculty members evaluated the items in the initial questionnaire development stage. Items were edited, based on their feedback, to improve clarity, conciseness, and readability. Finally, each item was checked to ensure it represented its originally intended meaning.

In addition to questions about the content domain, demographic information about the organization and respondent were included in the initial questionnaire. Individual variables commonly of interest in organization studies that use individuals as proxy respondents are *job function* and *top management experience* (Lewis et al.,

1995). Organizational demographic variables included *industry* and *firm size* (Lewis et al., 1995).

Step 2: Pretest of the Initial Questionnaire. This step of instrument development addresses ISA-7, concerned with whether or not field-based pretesting of measures is performed. Pretesting[3] is a trial run on a highly controlled sample to gain evidence about the empirical appropriateness of the original instrument before the final questionnaire is administered. This step begins the cyclical process of data collection and instrument purification that continues throughout Stage II.

Three categories of respondents for the pretest were selected, based on desired expertise: MIS practitioners (representative of the sample frame), survey instrumentation experts, and organizational behavior (a key reference discipline for OL) theorists. Appendix B shows that the nine respondents were diverse with respect to position and perspective (academic or practitioner) about the topic. As with all respondents used in Stage II, pretest subjects were checked for consistency with respect to the unit of analysis and basic familiarity with the OL topic.

Each pretest respondent was contacted by telephone before questionnaire distribution, and the conversation was scripted. Each potential subject was given a brief project explanation and asked if he/she would take and critique the questionnaire. All subjects agreed and were provided the questionnaire by facsimile. The questionnaire included the Survey Evaluation Form (SEF) shown in Appendix A. The SEF provided an opportunity to critique matters important for good scale design, such as questionnaire format, content, understandability, terminology, and ease and speed of completion (Lewis, 1993). In addition, the respondents were asked to identify specific questions they felt should be added or deleted from the questionnaire. Finally, the respondents were also asked to make suggestions for enhancement. Participants submitted their responses by either mail or facsimile. All responses were reviewed and revisions made based on the feedback.

Step 3: Pilot Test. To satisfy ISA-7 and ISA-10, pilot testing using field-based data was administered to appraise and further purify the pretested questionnaire. The purpose was to allow last-minute corrections and adjustments using experience gained from administering a

"dress-rehearsal" questionnaire version to a small sample.

A cover letter and the pretested questionnaire were administered to the 24 IT management professionals listed in Appendix C. The cover letter explained the purpose of the research, asked for completion of the questionnaire, asked respondents to provide suggestions for improvement, and allowed respondents to suggest additional attributes they felt were missing. This step utilized an electronic form interface with a web-based form processor (see Response-o-matic at http://www.response-o-matic.com) for data collection. Again, the questionnaire was revised based on the feedback.

Step 4: Item Screening. The purpose of this step was to ask experts on the OL topic to ensure that items edited in previous steps remained representative of their intended meaning. The procedure involves the selection and use of a content evaluation panel composed of a group of individuals knowledgeable about the concept. Lawshe (1975) developed a quantitative procedure for assessing content validity, designed to determine whether each questionnaire item adequately represents the content

domain. In this case, individuals contained on a list of authors who had published at least two articles on the organizational learning concept were asked via telephone, facsimile, or email to serve on the panel. A cover letter included the purpose of the study and this content validity assessment process. The result was a panel of 20 experts on the topic, listed in Appendix D.

Panelists were asked to assess each of the 46 question items, be rating each as either 1) Not Relevant, 2) Important (But Not Essential), or 3) Essential to the OL concept. In accordance with Lawshe, a content validity ration (CVR) was computed from the responses at of the expert panel for each item from the formula:

$$CVR = (n' - N/2)/(N/2)$$

where,

n' is the frequency count of the number of panelists rating the item from 2-3

N = the total number of respondents

This procedure utilizes a majority vote for indicating content validity for the item.

Step 5: Administer Final Version of Questionnaire. The fifth step involved the administration of the questionnaire to the target sample, the identification and use of which was done in consideration of ISA 3, 12, 13, 14, & 17 quality concerns. The target group was selected, then the final version of the questionnaire mailed, and response quality assessed.

The target population was selected with ISA-3 and ISA-12 in mind. The target group was limited to the top managers of high-tech and knowledge-based firms in Huntsville, Alabama, a research and science-based community. Companies were chosen due to the expectation that organizational learning is more likely to exist in knowledge-based or information technology-dependent firms[4]. The *1999-2000 Industrial Directory* for the Chamber of Commerce of Huntsville/Madison County was used for selection. Of the 1,259 firms contained in the directory, 447 were selected as the target group for the study based on the selection criteria. Since 64 members of the target group were found to have invalid contact information, the final sample frame consisted of 383 companies.

The cover letter asked the heads of these commercial organizations to serve as proxy respondents for their

entire organization. The selection of all members of specific industries made the eventual sample randomly selected, satisfying ISA-13.

Step 6: Instrument Evaluation. Psychometric properties of the instrument were addressed, including content validity (ISA 6 & 16), construct validity (ISA-9), triangulation (ISA-4), factorial validity (ISA-11), and reliability (ISA-8). Validity is a measure of whether or not the instrument measures what it is supposed to, or, the extent to which it is free of systematic error. Reliability measures the consistency of an instrument from one sample to the next; the extent to which it is free of random error. The assessment of 1) content (subjectively judged) and construct (empirically judged) validity and 2) reliability properties were conducted as two distinct categories of testing in this step. All procedures described for Steps 6 used Statistical Product and Service Solutions (SPSS).

Content Validity

A measure has content validity when its items accurately represent the thing (the "universe") being measured. Cronbach (1971) and Kerlinger (1986) defined

content validity as the adequacy in which the instrument-contained sample of questions represents the population of questions on the concept. It is usually not a statistical property, but rather a matter of expert judgment. Content validity in this research was optimized through the iterative refinement process prescribed by Churchill (1979) and Cronbach (1971). Its reliance on expert judgment, rather than the less economical sampling, distinguishes the process. Three MIS professors reviewed the original questionnaire draft for face validity. In the pretest and pilot test, managers reviewed the instrument. Next, the Lawshe procedure for statistically calculating content validity for each questionnaire item was employed, utilizing a panel of experts on OL. In all four steps, qualified reviewers assessed the content of the instrument and their suggestions were implemented.

Construct Validity

In adherence to ISA-9, construct validity was assessed. Construct validity is the extent to which the instrument accurately measures the construct of interest. Carmines & Zeller (1979) explained that construct validity is the representativeness or sampling adequacy of the

construct domain. It is concerned with the extent to which a measure relates to other measures consistent with hypotheses about the construct that are derived from theory. Construct validity tests determine whether the measure reflects true dimensions of the concept or is tampered by methodological problems (Cronbach & Meehl, 1955). It is demonstrated by utilizing an appropriate operational definition of the concept being measured (Kerlinger, 1986; Stone, 1978).

As these descriptions imply, there are several tests for construct validity. Since each is relatively weak, they were augmented through a strategy of triangulation. Triangulation involves using more than one method to observe or test the same phenomenon. For instance, using multiple methods to attain the same results is the triangulation research strategy. The strategy was used for multivariate or univariate tests, and is the subject of ISA-4, concerned with using triangulation to cross-validate results. Legitimate methods for assuring construct validity include 1) observing logical factors through factor analysis (Allen & Yen, 1979), 2) known groups analysis, and 3) reliability tests (Kerlinger, 1986).

Factor Analysis. Factor analysis is any of several methods of analysis that enable researchers to reduce a large number of variables to a smaller number of variables (i.e., factors or latent variables) (Harman, 1976). Factor analysis is also used to provide empirical validation for grouping variables with similar theoretical meanings (Kim & Mueller, 1982). Factor analysis was used in this research to empirically select the most important items that represent OL. The grouping of items using this method resulted in the satisfaction of ISA-5, that the factors include multiple items.

Factor analysis involves finding patterns among the variations in several related variables. A cluster of highly intercorrelated variables is a factor. When factors are hypothesized to exist, the procedure is referred to as confirmatory factor analysis. Although the current study involves potentially four hypothesized factors, exploratory (non-hypothetical) methods are used to derive factors from the data. The factors were used to group characteristics of OL for greater definitional clarity. There exists no theory that validates the coexistence of all four factors in a cohesive model. The methodological procedures used herein therefore involved exploratory methods.

First, two tests were employed to assess the appropriateness of the application of factor analysis methods to the data: the Kaiser-Meyer-Olkin test[5], and the Bartlett sphericity test[6]. Next, exploratory principal components factor analysis (EPCFA) was conducted on the sample data using SPSS. There are two widely accepted methods for determining the content and number of factors using EPCFA: 1) using the eigenvalue criteria, and 2) the scree test. EPCFA was used to extract factors with eigenvalues of 1 or greater (Nunnally, 1978; Overall & Klett, 1972; Straub, 1989). An eigenvalue is a statistic used in factor analysis to indicate how much of the variation in the original group of variables is accounted for by a particular factor. For each empirically derived factor, an eigenvalue greater than one is required (Nunnally, 1978). A scree plot was then used to further examine the number of factors to be included in the final solution. The scree test is a graphical, heuristical determination that uses a graph of eigenvalues and associated factors. The sequential application of these two procedures resulted in the inclusion of eight factors in the measure of OL.

Several rotation techniques were tested on the original 31 items. The rotated factor solutions were judged on simplicity (Harman, 1976; Sethi & King, 1991), interpretability (Kachigan, 1982; Lederer & Sethi, 1992), and the percent of variance explained (Bernstein, 1988; Straub, 1989). Simplicity relates to an individual factor's structure, or how it has certain simple properties. For example, simplicity would call for the minimization of the number of common factors, and that each variable (item) should load on only one common factor (Kim & Mueller, 1982). The rotation method that best satisfied these criteria was equamax, a combination of two orthogonal rotation strategies: quartimax (which simplifies the variables) and varimax (simplifies the factors). The strength of orthogonal rotation methods like equamax is that the results are more likely to be replicated in future studies.

Known Groups Analysis. Known groups analysis is a method for investigating construct validity (Cronbach & Meehl, 1955). Based on the researcher's understanding of the construct, hypotheses may be generated as to how defined groups differ in terms of the measurement. The known-

groups criterion for construct validity signifies that construct and subscale means should differ across groups that are theoretically expected to do so. Industry classification, age, and size are attributes known to differentiate respondents and influence OL scale or subscale scores (see Table 3, Chapter 2).

Reliability

Reliability, or consistency, is a requirement for construct validity (Nunnally, 1967), and also assesses the consistency of an instrument in measuring the concept across different samples. Reliability tests satisfy ISA-8, and are used to assess the extent to which random error (i.e., variation, or unreliability) exists in the instrument. This is error without qualification, so it is not related to bias. It is the consistency or stability of a measurement from one sample to the next. However, when repeated measurements of the same sample (with identical levels of the measure for both tests) give identical or very similar results, the measurement instrument is said to be reliable. A standard procedure for assessing reliability is Cronbach's reliability coefficient alpha, a

statistic ranging from 0 (when the measure is completely unreliable), to 1.0 (when it is perfectly reliable).

Stage III: Statistical Profile

Stage III satisfies Research Question 3 by providing a statistical profile of the population of interest. Norming data was further pursued to investigate how OL subconstructs[7] vary between respondent position and industry.

Chapter Summary

The methodology employed in this research was an integration of three successful instrument development frameworks used in past organizational and innovation research (Churchill, 1979; Lewis, 1993; Malhotra & Grover, 1998). The content and construct validity tests were done to facilitate greater internal and external validity (generalizability) of the measure and subscales. All but one of Malhotra and Grover's '*ideal survey attributes*' were considered in the research methodology. ISA-11 was not applicable since confirmatory methods were not used in this exploratory study. The application of sixteen other ISA's in this research assures that adequate rigor was employed

towards the development of a quality measure of organizational learning.

Chapter Footnotes

[1]Precursors, consequences, and theoretical contexts of OL extracted during the content analysis process are articulated in Templeton & Snyder (1999).

[2]Since organizations cannot perceive phenomena, top management may be (and commonly are) surveyed as its proxy (Malhotra & Grover, 1998). Responses by top managers representing their particular span of control (corporations, functions, departments, etc.) will serve as cases for the study.

[3]In the context of this study, which focuses on instrument development, the term *pretesting* should not be confused with the longitudinal pretest-posttest concerns in experimental designs, which occurs at a more advanced stage of empiricism.

[4]Firms were selected based on products provided, as determined by SIC code. Example products for chosen firms are architecture, engineering, computer hardware, networking, and design, aerospace manufacturing, etc.

[5]The Kaiser-Meyer-Olkin Measure compares the magnitude of observed correlation coefficients to
partial correlation coefficient

[6]The Bartlett Test of Sphericity tests the hypothesis that the correlation matrix is an identity matrix

[7]Factor scores are determined by summing the scores on specific items for each factor (Churchill, 1979).

RESULTS

The purpose of this section is to report on the results of the deployment of the methodology depicted in Table 4 in Chapter 3. The chapter is organized into three sections, each dedicated to reporting the results of the methodological steps intended to answer one research question. In that vein, the sections are 1) results of content analysis, 2) results of instrument development, and 3) results of statistical profile.

Results of Content Analysis

Based on the conclusions of the literature review (Chapter 2) and the operationalization techniques described in the methodology (Chapter 3), the operational definition of OL employed in this research is:

> *…the **knowledge acquisition**, **information distribution**, **information interpretation**, **organizational memory** performed by organizational members on behalf of the organization.*

Table 6 depicts the 46 criteria and associated item stems for OL that resulted from the content analysis of OL.

Table 6: Original Organizational Learning Subconstructs, Criteria, and Item Stems

Subconstruct	*Criterion*	*Item Code*	*Item Stems* (n = 46)
Knowledge Acquisition	Congenital learning	KA-a	• *New member learning* *
		KA-b	• *Member learning from organizational creation* *
	Experiential learning	KA-c	• *Organizational experiments*
		KA-d	• *Organizational self appraisal*
		KA-e	• *Experimenting organizations*
		KA-f	• *Unintentional or unsystematic learning*
		KA-g	• *Experience-based learning curves*
	Vicarious learning	KA-h	• *Imitating competitors* *
		KA-I	• *Imitating inter-industrial organizational practices* *
		KA-j	• *Imitating alliance organizational practices* *
		KA-k	• *Corporate intelligence* *
		KA-l	• *Boundary spanning* *
	Grafting	KA-m	• *New member adoption* *
		KA-n	• *Organizational form adoption* *
		KA-o	• *Intellectual adoption* *
	Searching and Noticing	KA-p	• *Scanning*
		KA-q	• *Focused search*
		KA-r	• *Performance monitoring*
		KA-s	• *Noticing*
Information Distribution	Knowledge logistics *	ID-a	• *Knowledge source understanding* *
		ID-b	• *Knowledge content understanding* *
	Knowledge dissemination *	ID-c	• *Information need understanding* *
		ID-d	• *Sharing* *
		ID-e	• *Education and training* *
		ID-f	• *Technology-based dissemination* *
		ID-g	• *Integrating disparate knowledge* *
Information Interpretation	Cognitive maps & framing	II-a	• *Reframing* *
		II-b	• *Interpretation homogeneity* *
		II-c	• *Cognitive map influence* *
		II-d	• *Language framing* *
	Media richness	II-e	• *Communications media capability* *
		II-f	• *Media richness* *
		II-g	• *Media choice* *
	Information overload	II-h	• *Exceeding information processing limitations* *
		II-i	• *Overload resolution* *
	Unlearning	II-j	• *Informational unlearning* *
		II-k	• *Behavioral unlearning* *
		II-l	• *Structural unlearning* *

Table 6: Original Organizational Learning Subconstructs, Criteria, and Item Stems (continued)

Org. Memory	Storing & retrieving information	OM-a OM-b OM-c OM-d	• • • •	*Storing* * *Retrieving* * *Data management* * *Human resources turnover strat.* *
	Computer-based OM	OM-e OM-f	• •	*Electronic storage* * *Electronic documentation* *
	Human knowledge bases *	OM-g	•	*Human knowledge bases* *
	Other knowledge bases *	OM-h	•	*Human knowledge bases* *

* extension of Huber's (1991) typology

Results of Instrument Development

The original draft of the questionnaire that resulted from Step 1 included a total of 46 questions, each derived from an item stem contained in Table 6. After further refinement in Steps 2 and 3, the Lawshe item screening procedure (Step 4) produced the results found in Table 7. A statistical significance test of CVR at the 0.05 level was made using Lawshe's significance table (Table 8), which embodies a statistical significance procedure that accepts items with a mean that is more than fifty percent of the panelists rated the item as either "Essential" or "Important."

As a result of this procedure, 31 items were found to be significantly content valid, and each remained on the final version of the questionnaire. The 15

Table 7: Lawshe Procedure Results (* = significant)

Knowledge Acquisition	**CVR**	**n**
KA-a. New employees ignore the knowledge of existing employees.	.11	18
KA-b. The company is still highly influenced by the vision of the founder(s).	.11	18
KA-c. Management uses feedback from company experiments (e.g., trials of new methods & surveys).	1.00*	18
KA-d. Management monitors important organizational performance variables.	.88*	17
KA-e. Employees are discouraged from recommending new work ideas.	.89*	18
KA-f. Employees learn about the company's recent developments through informal means (e.g., news stories and gossip).	1.00*	17
KA-g. Overall, the company is losing personnel experience.	.06	17
KA-h. The company imitates competitors (i.e., products, strategies, and practices).	.11	18
KA-i. Management ignores the practices of organizations outside our industry.	.29	17
KA-j. Management learns from the company's partners (e.g., customers, suppliers, allies).	.65*	17
KA-k. Management ignores the strategies of competitors' top management.	.76*	17
KA-l. Managers ignore information about industry events.	.07	15
KA-m. The company hires highly specialized or knowledgeable personnel.	.89*	18
KA-n. The company acquires subunits (e.g., organizations, functions, departments) based on short-term financial gain.	.53*	17
KA-o. When internal capabilities are deficient, we acquire them from the outside.	.67*	18
KA-p. Management monitors the fit between company strategy and competitive environment.	.44	18
KA-q. Management proactively addresses problems.	1.00*	18
KA-r. The company collects data on all facets of performance.	.67*	18
KA-s. Management learns new things about the company by direct observation.	.88*	17
Information Distribution		
ID-a. When employees need specific information, they know who will have it.	.89*	18
ID-b. Employees have difficulty finding needed work-related information.	.44	18
ID-c. Employees are keenly aware of where their knowledge can serve the company.	.88*	16
ID-d. Employees keep information (e.g., numbers, plans, ideas) from other employees.	.56*	18
ID-e. Employees make extensive use of IS to support their work.	1.00*	17
ID-f. Management assigns employees to other parts of the organization for cross training.	1.00*	18
ID-g. Top management integrates information from different organizational areas.	1.00*	18

Table 7: Lawshe Procedure Results (continued)

Information Interpretation		
II-a. Managers consistently scan and update their views of the competitive environment.	.06	17
II-b. Employees' interpretations about company events differ widely.	.44	18
II-c. Management encourages the use of frameworks and models to assist in decision-making.	.78*	18
II-d. Employees are encouraged to communicate clearly.	.65*	17
II-e. The communications tools used in the company are deficient.	.13	16
II-f. The company's communications tools (telephone, e-mail, etc.) are capable of rich information content.	.38	16
II-g. Employees have a large variety of communications tools (telephone, e-mail, Internet, etc.) from which to choose.	.67*	18
II-h. There is too much information available in the company.	.47	15
II-i. Before final decisions are made, options are evaluated rigorously.	.44	18
II-j. Management removes obsolete information from employee access.	.89*	18
II-k. Our employees resist changing to new ways of doing things.	.88*	17
II-l. The company is slow to react to technological change.	.56*	18
Organizational Memory		
OM-a. The company stores detailed information for guiding operations.	.76*	17
OM-b. Employees retrieve archived information when making decisions.	1.00*	18
OM-c. There is a formal data management function in the company.	.53*	17
OM-d. The company maintains a certain mix of skills among its pool of employees.	.67*	18
OM-e. The company makes extensive use of electronic storage (databases, data warehousing, scanned documents).	.76*	17
OM-f. Employees use electronic means to communicate.	1.00*	18
OM-g. The company develops experts from within.	.67*	18
OM-h. The company makes extensive use of information from other firms (suppliers, partners, customers, etc.).	.38	16

Table 8: CVR critical value with corresponding item sample sizes [source: Lawshe, 1975]

n	CVR Critical Value
15	0.49
16	0.476
17	0.462
18	0.448
19	0.434
20	0.420

CVR = content validity ration
n = number of item responses from the 18 subject panel

insignificant items were dropped from the study, resulting in the final version of the questionnaire shown in Appendix E.

Table 9 reports the resulting descriptive statistics from the response group of Step 5, the administration of the final version of the questionnaire.

Table 9: Descriptive Statistics

	N	Min	Max	Mean	SD
Respondent number of years with current company	92	0.5	34	9.39	8.00
Respondent number of years in current position	92	0.167	34	6.44	6.67
Company number of employees at this location	92	1	3000	107.35	388.10
Company age of operations in this location.	90	1	46	12.83	9.59

At the completion of the facsimile and mail phases of data collection, 119 of 383 sample frame members responded, representing a 31.1% response rate. This satisfies ISA-14, that the response rate should be over 20%. Each sample frame member was offered a summary of the results of the study for their completed response. In order to estimate non-response bias (ISA-15), the chi-square test for differences between the respondent group and the sample frame. Using the four industry categories (IT, research, knowledge application, and engineering/design) employed in known groups analysis, the chi-square test resulted in a p-

value of .451, implying no significant difference between the target and respondent groups.

ISA-17 is concerned with the sufficiency of statistical power in reducing statistical conclusion error, or the accuracy of conclusions about covariation made on the basis of statistical evidence. Grover (2000) states that statistical conclusion error is dependent upon the statistical power of a test (its ability to detect effects of a specific size given the particular variances and sample sizes of the study). In this study, there was a ratio of 3.83 (119/31), which translates to adequate statistical power for studies employing exploratory factor analysis (Lewis et al., 1995).

Step 6: Instrument Evaluation

As reported in the methodology chapter, two types of validity were assessed in this research: content and construct validity. Due to the rigor established in Steps 1 - 4 in Stage II (Instrument Development), the level of content validity for this instrument was adequate for empirical testing. Content validity was verified in the quantitative results found in construct validity testing.

Before construct validity could be assessed using the response data, two tests to determine whether or not factor analysis can be applied to the data were performed. The Kaiser-Meyer-Olkin test (=0.78) exceeded 0.70, which is in the *middling* range (Hair et al., 1995). The Bartlett sphericity test (F=1998.18, df = 465, p=0.00) was significant at the 0.001 level. Thus, the revised item pool response data is amenable to factor analysis.

Factor Analysis. Factors were statistically formed using each item's factor loading, a measure of internal consistency between items in a factor. An item was assigned to a factor if its factor loading exceeded .50 for any factor. Factors that had no loadings exceeding .50 were dropped from further analysis. As a result, a total of 3 items were dropped from further analysis: II-j ("*informational unlearning*"), KA-c ("*organizational experiments*"), & KA-e ("*experimenting organizations*"). This is an approximation of good practices for exploratory research posed by Straub (1989), who used the standard of .50, and Sethi & King (1991) and Lederer & Sethi (1992), who used .35. The remaining 28-item solution explained 68.4% of the systematic covariance among the items. No

items loaded on multiple factors. Finally, factor labels were given to the empirically derived subscales of OL. The equamax (with Kaiser normalization) rotation method yielded the factor loadings and other characteristics of the underlying dimensions of OL found in Table 10.

The first factor was labeled *awareness*, and accounted for 10.6 percent of the overall covariance. The five items contained in the awareness factor had loadings ranging from .55 to .69, and represent the extent to which organizational members are aware of the sources of key organizational information and its applicability to existing problem areas. The internal consistency reliability coefficient for this factor was .86.

The second factor, labeled *communication*, accounted for 9.5 percent of covariance. Factor loadings ranged from .51 to .84 among the three items, which represented the extent of communication and that exists between organizational members. This factor includes consideration for the use of, and accessibility to, communications technologies. The internal consistency reliability coefficient for this factor was .85.

Table 10: Characteristics of Underlying Dimensions of OL

		Loading	Alpha	% Variance Explained
Item	**Awareness**		0.86	10.6
ID-a	When employees need specific information, they know who will have it.	.69		
KA-d	Management monitors important organizational performance variables.	.69		
KA-q	Management proactively addresses problems.	.60		
ID-g	Top management integrates information from different organizational areas.	.58		
ID-c	Employees are keenly aware of where their knowledge can serve the company.	.55		
	Communication		0.85	9.5
OM-f	Employees use electronic means to communicate.	.84		
II-g	Employees have a large variety of communications tools (telephone, e-mail, Internet, etc.) from which to choose.	.79		
II-d	Employees are encouraged to communicate clearly.	.51		
	Performance Assessment		0.76	9.4
KA-r	The company collects data on all facets of performance.	.81		
OM-a	The company stores detailed information for guiding operations.	.78		
OM-c	There is a formal data management function in the company.	.63		
II-c	Management encourages the use of frameworks and models to assist in decision-making.	.58		
	Intellectual Cultivation		0.69	8.8
OM-g	The company develops experts from within.	.68		
KA-j	Management learns from the company's partners (e.g., customers, suppliers, allies).	.66		
ID-f	Management assigns employees to other parts of the organization for cross training.	.61		
KA-s	Management learns new things about the company by direct observation.	.51		

Table 10: Characteristics of Underlying Dimensions of OL (continued)

		Loading	Alpha	% Variance Explained
	Environmental Adaptability		0.74	8.1
ID-e	Employees make extensive use of IS to support their work.	.66		
OM-e	The company makes extensive use of electronic storage (e.g., databases, data warehousing, scanned documents).	.65		
II-l	The company is slow to react to technological change. (-)	.65		
OM-b	Employees retrieve archived information when making decisions.	.60		
	Social Learning		0.66	8.1
ID-d	Employees keep information (e.g., numbers, plans, ideas) from other employees. (-)	.74		
II-k	Our employees resist changing to new ways of doing things. (-)	.73		
KA-f	Employees learn about the company's recent developments through informal means (e.g., news stories and gossip). (-)	.63		
	Intellectual Capital Management		0.52	7.4
KA-n	The company acquires subunits (e.g., organizations, functions, departments) based on short-term financial gain. (-)	.68		
OM-d	The company maintains a certain mix of skills among its pool of employees.	.60		
KA-m	The company hires highly specialized or knowledgeable personnel.	.56		
	Organizational Grafting		0.46	6.5
KA-k	Management ignores the strategies of competitor's top management. (-)	.82		
KA-o	When internal capabilities are deficient, we acquire them from the outside.	.56		

The third factor was labeled *performance assessment*, and accounted for 9.4 percent of the total covariance. Factor loadings ranged from .58 to .81 among the four items, which represented the comparison of process- and outcome-related performance to organizational goals. The internal consistency reliability coefficient for performance assessment was .76.

The fourth factor, *intellectual cultivation*, accounted for 8.8 percent of overall covariance. The factor loadings of this construct ranged from .51 to .68 among the four items, which represented the development of experience, expertise, and skill among existing employees. The internal consistency reliability coefficient for intellectual cultivation was .69.

The fifth factor was *environmental adaptability*, which accounted for 8.1 percent of total covariance. The four items contained in this factor had loadings ranging from .60 to .66, and represented mostly technology-related items pertaining to organizational responses to environmental change. The internal consistency reliability coefficient of this construct was .74.

The sixth factor, *social learning*, accounted for 8.1 percent of total covariance. Factor loadings in the three-

item construct ranged from .63 to .74. The items represented the extent to which organizational members learn through social channels about organizational concerns. The internal consistency reliability coefficient for social learning was .66.

The seventh factor was *intellectual capital management*, and accounted for 7.4 percent of covariance. The loadings for the three items in this factor ranged from .56 to .68. The intellectual capital management construct represents the extent to which the organization manages knowledge, skill, and other intellectual capital for long-term strategic gain. The internal consistency reliability coefficient for this factor was .52.

The eighth factor was *organizational grafting*, which accounted for 7.4 percent of total covariance. The two items contained in organizational grafting had loadings of .56 and .82. This construct represents the extent to which the organization capitalizes on the knowledge, practices, and internal capabilities of other organizations. The internal consistency reliability coefficient for organizational grafting is .46.

The above eight factors represent an operational definition of OL, and provide empirical evidence that the

measure has adequate construct validity. Further support of construct validity is shown in Table 11, which depicts the interitem correlation matrix.

Known Groups Analysis. The results of the known groups analysis tests suggest very little relationship between OL and organization age and size. Table 12 shows that only the intellectual cultivation subconstruct is significantly correlated with both age of operations and membership size. The only other significant correlation is between intellectual capital management and size. This shows very little association between OL and entity age and size among high-tech and knowledge-based companies. These results suggest that propositions about the relationship between organizational learning and firm age and size have been generated by researchers with conceptualizations about OL that emphasize the OM component. They generally suggest that subconstructs that are heavily grounded in intellectual capital management are related to firm age and size, but not other OL-resident subconstructs.

Table 11: Interitem Correlation Matrix

	KA-c	KA-d	KA-e	KA-f	KA-j	KA-k	KA-m	KA-n	KA-o	KA-q	KA-r	KA-s	ID-a	ID-c	ID-d	ID-e
KA-c	1.00															
KA-d	0.17	1.00														
KA-e	0.28	0.23	1.00													
KA-f	0.36	0.14	0.30	1.00												
KA-j	0.41	0.22	0.30	0.18	1.00											
KA-k	0.29	0.21	0.09	0.28	0.14	1.00										
KA-m	0.21	0.17	0.38	0.22	0.14	0.30	1.00									
KA-n	0.08	-0.02	0.33	0.13	0.03	-0.05	0.14	1.00								
KA-o	0.27	0.27	0.21	0.09	0.32	0.30	0.23	-0.15	1.00							
KA-q	0.33	0.63	0.42	0.29	0.47	0.16	0.30	0.07	0.44	1.00						
KA-r	0.40	0.32	0.05	0.23	0.06	0.21	0.30	-0.09	0.09	0.20	1.00					
KA-s	0.44	0.18	0.42	0.32	0.47	0.23	0.38	0.18	0.16	0.36	0.15	1.00				
ID-a	0.20	0.49	0.29	0.15	0.42	0.08	0.29	0.09	0.27	0.55	0.18	0.40	1.00			
ID-c	0.36	0.58	0.29	0.14	0.44	0.24	0.27	0.11	0.38	0.56	0.11	0.36	0.47	1.00		
ID-d	0.24	0.06	0.31	0.35	-0.03	0.11	0.24	0.24	-0.12	0.10	0.05	0.23	-0.04	0.14	1.00	
ID-e	0.26	0.48	0.13	0.17	0.25	0.17	0.25	-0.08	0.28	0.40	0.34	0.17	0.32	0.55	0.01	1.00
ID-f	0.45	0.31	0.24	0.16	0.41	0.00	0.01	-0.11	0.27	0.44	0.34	0.32	0.34	0.49	-0.14	0.39
ID-g	0.31	0.56	0.32	0.37	0.46	0.19	0.22	0.00	0.44	0.63	0.28	0.33	0.59	0.50	0.06	0.56
II-c	0.46	0.19	0.25	0.28	0.10	0.20	0.34	-0.13	0.07	0.22	0.53	0.24	0.04	0.22	0.28	0.31
II-d	0.37	0.43	0.43	0.22	0.49	0.17	0.40	0.21	0.39	0.62	0.17	0.54	0.64	0.57	0.14	0.39
II-g	0.22	0.40	0.47	0.26	0.28	0.20	0.39	0.09	0.37	0.51	0.18	0.32	0.33	0.33	0.19	0.44
II-j	0.16	0.24	0.04	-0.09	0.31	-0.04	0.03	0.02	0.15	0.37	0.18	0.21	0.39	0.29	-0.35	0.24
II-k	0.18	0.09	0.45	0.36	0.12	0.15	0.25	0.07	-0.09	0.16	0.10	0.25	0.07	0.19	0.48	0.08
II-l	0.30	0.20	0.35	0.28	0.15	0.29	0.28	0.12	0.16	0.26	0.17	0.26	0.11	0.37	0.29	0.36
OM-a	0.26	0.22	0.06	0.13	0.05	0.25	0.28	-0.19	0.09	0.14	0.52	0.12	0.03	0.16	0.05	0.32
OM-b	0.20	0.45	0.05	0.16	0.32	0.15	0.07	-0.17	0.29	0.53	0.14	0.19	0.41	0.46	-0.10	0.56
OM-c	0.45	0.42	0.13	0.18	0.14	0.29	0.25	-0.09	0.11	0.29	0.47	0.39	0.22	0.31	0.07	0.41
OM-d	0.42	0.12	0.40	0.27	0.22	0.22	0.48	0.21	0.22	0.37	0.11	0.53	0.21	0.32	0.29	0.15
OM-e	0.24	0.15	0.20	0.24	0.03	0.27	0.39	-0.03	0.16	0.19	0.47	0.20	0.04	0.30	0.12	0.54
OM-f	0.21	0.37	0.33	0.18	0.32	0.10	0.31	0.06	0.35	0.44	0.19	0.23	0.33	0.34	0.17	0.51
OM-g	0.20	0.11	0.43	0.09	0.37	-0.04	0.23	0.02	0.22	0.24	0.10	0.40	0.14	0.17	0.05	0.18

Table 11: Interitem Correlation Matrix (continued)

	ID-f	ID-g	II-c	II-d	II-g	II-j	II-k	II-l	OM-a	OM-b	OM-c	OM-d	OM-e	OM-f	OM-g
KA-c															
KA-d															
KA-e															
KA-f															
KA-i															
KA-j															
KA-m															
KA-n															
KA-o															
KA-q															
KA-r															
KA-s															
ID-a															
ID-c															
ID-d															
ID-e															
ID-f	1.00														
ID-g	0.50	1.00													
II-c	0.23	0.23	1.00												
II-d	0.33	0.63	0.25	1.00											
II-g	0.12	0.57	0.24	0.57	1.00										
II-j	0.47	0.29	-0.03	0.29	0.04	1.00									
II-k	0.07	0.03	0.32	0.15	0.12	-0.21	1.00								
II-l	0.15	0.24	0.16	0.22	0.35	-0.04	0.37	1.00							
OM-a	0.24	0.21	0.34	0.05	0.22	0.06	0.01	0.02	1.00						
OM-b	0.36	0.49	0.20	0.34	0.34	0.26	-0.04	0.31	0.12	1.00					
OM-c	0.30	0.31	0.23	0.26	0.21	0.22	0.18	0.22	0.57	0.24	1.00				
OM-d	0.23	0.26	0.22	0.46	0.33	0.05	0.27	0.40	0.18	0.14	0.41	1.00			
OM-e	0.30	0.24	0.45	0.17	0.32	0.09	0.19	0.34	0.37	0.39	0.36	0.26	1.00		
OM-f	0.09	0.55	0.31	0.60	0.78	-0.01	0.08	0.25	0.27	0.36	0.22	0.34	0.26	1.00	
OM-g	0.25	0.21	0.12	0.31	0.19	0.16	0.16	0.22	0.10	0.19	0.21	0.23	0.24	0.18	1.00

Table 12: Correlations Between OL Subconstructs and Age and Size of Local Operations

Correlations		AGELOC	EMPLOC
Pearson Correlation	AWARE	-0.12	-0.20
	COMM	-0.05	-0.05
	CULT	-0.22	-0.36
	ENV	-0.15	0.06
	GRAFT	-0.06	0.04
	ICM	-0.10	-0.31
	PERF	0.03	0.01
	SOCIAL	-0.18	-0.01
Sig. (2-tailed)	AWARE	0.26	0.06
	COMM	0.63	0.65
	CULT	0.04	0.00
	ENV	0.17	0.54
	GRAFT	0.56	0.69
	ICM	0.35	0.00
	PERF	0.75	0.94
	SOCIAL	0.09	0.91

Reliability

Reliability was determined by calculating Cronbach's alpha for each statistically determined factor (Churchill, 1979; Lederer & Sethi, 1992). Cronbach's alpha utilizes correlations between two administrations, versions, or halves of the same instrument. A large alpha coefficient means the instrument scale represents the true population score (Churchill, 1979). Table 10 depicts the alphas associated with each factor derived from the factor analysis. Cronbach's alpha statistic of 0.5 to 0.6 is sufficient in the exploratory research, but 0.8 is inevitably more desirable (Nunnally, 1978). Only organizational grafting (alpha = .46) had an internal reliability score indicating the need for concern. The

other seven factors had alphas greater than .5, six were greater than .6, five greater than .7, and two greater than .8.

Overall, the instrument is partially adequately reliable for use in future trials. According to Spector (1992), a Cronbach's alpha of 0.7 is the optimum level that maximizes reliability and minimizes subconstruct item size (for response time efficiency). Using that gauge, it is shown that two subconstructs can be reduced in length, three are of adequate size, and three need further research to improve reliability.

Results of Statistical Profile

Table 13 depicts the descriptive statistics (mean and standard deviation) for each item, using the sample data resulting from the final questionnaire administration. This statistical profile depicts the prevailing levels of OL that exist in technology- and knowledge-based firms. Descriptive statistics serve as 1) a quantitative depiction of current OL, and 2) norms for future use (Churchill, 1979).

Table 14 depicts the norming data (subconstruct means and standard deviations) for six categories of

Table 13: Statistical Profile

Questionnaire Item	Mean	SD
II-g	4.64	0.77
KA-e	4.51	1.02
OM-f	4.50	0.81
II-d	4.45	0.77
OM-g	4.20	0.85
OM-d	4.12	0.95
KA-m	4.10	1.15
KA-j	4.08	0.88
II-l	4.03	1.07
KA-q	4.02	0.94
ID-d	3.99	0.97
OM-e	3.97	1.22
KA-s	3.96	0.85
ID-a	3.91	0.89
KA-k	3.90	1.12
II-k	3.89	1.12
KA-d	3.87	0.99
ID-c	3.87	0.95
ID-g	3.86	0.94
KA-n	3.82	1.19
KA-f	3.81	1.12
ID-e	3.76	1.18
KA-o	3.73	1.11
OM-a	3.72	1.00
OM-c	3.67	1.14
KA-c	3.63	1.13
OM-b	3.55	1.03
ID-f	3.51	1.10
II-c	3.47	1.02
KA-r	3.34	1.11
II-j	3.30	1.07

respondents: CEO, CIO, functional manager, project manager, other, and no response. Among the four well-defined respondent categories, the CEO perceived higher levels of organizational learning, scoring highest among six of the eight subconstructs. The CIO faired worst, scoring lowest on four of the eight subconstructs. Functional managers scored highest in the area of

intellectual capital management, but lowest in *performance*. Project managers scored highest for the *communications* subconstruct. The data show that subconstruct perceptions vary among management groups.

Finally, norming data was investigated in order to learn how OL subconstructs vary between industry groups. Table 15 depicts subconstruct norms for six industry classifications. Information technology scored highest on *performance*, but lowest on *intellectual cultivation*. Engineering and design companies scored highest, ranking first in four of eight categories. Knowledge-based companies scored highest in two categories, but lowest in six. Research companies scored highest in two categories, *awareness* and *intellectual capital management*, but lowest in *performance*.

The data show that the CEO consistently scores high for all OL subconstructs, and the CIO consistently scores low. This is perhaps due to differences in ideals about the treatment of organizational knowledge between executive and engineering management cultures (Schein, 1996).

Table 14: Norms for OL Subconstructs Based on Respondent Position

	CEO (n=52)		CIO (n=12)		Functional Manager (n=9)		Project Manager (n=13)		Other (n=8)		NR (n=25)		Total (n=119)	
JOBPOS	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
AWARE	4.14	0.49	3.50	0.91	3.58	0.86	3.89	0.46	3.58	1.06	3.84	0.98	3.90	0.76
COMM	4.72	0.34	3.94	1.38	4.59	0.68	4.79	0.22	4.50	0.62	4.28	0.74	4.53	0.69
CULT	4.17	0.46	3.56	0.64	3.72	0.69	3.71	0.72	3.25	1.15	4.05	0.59	3.94	0.67
ENV	3.97	0.71	3.15	1.00	3.53	1.03	3.79	0.87	3.78	1.06	4.01	0.78	3.83	0.85
GRAFT	3.98	0.85	3.29	1.01	3.61	1.11	3.62	0.71	3.81	0.96	3.90	0.88	3.82	0.90
ICM	4.06	0.57	3.78	1.12	4.30	0.56	4.03	0.44	3.50	1.64	4.09	0.79	4.01	0.79
PERF	3.71	0.74	3.13	1.05	3.03	0.91	3.63	0.86	3.59	0.74	3.56	0.74	3.55	0.81
SOCIAL	3.97	0.68	3.64	1.04	3.85	0.77	3.92	0.75	3.33	1.04	4.04	0.97	3.90	0.83

Table 15: Norms for OL Subconstructs Based on Industry Classification

	IT (n=28)		Engineering and Design (n=13)		Knowledge-based Applications (n=19)		Research (n=13)		Other (n=20)		NR (n=26)		Total (n=119)	
SICCLASS	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
AWARE	3.99	0.68	4.02	0.44	3.66	0.80	4.05	0.63	3.97	0.76	3.82	0.97	3.90	0.76
COMM	4.65	0.48	4.79	0.29	4.40	0.90	4.77	0.32	4.48	0.90	4.28	0.72	4.53	0.69
CULT	3.92	0.61	3.98	0.59	3.99	0.64	3.96	0.55	3.81	0.89	3.98	0.68	3.94	0.67
ENV	4.00	0.60	4.08	0.62	3.33	1.12	3.96	0.71	3.60	0.97	4.00	0.77	3.83	0.85
GRAFT	3.91	0.86	3.96	0.99	3.50	1.07	3.58	0.79	3.83	0.88	3.98	0.82	3.82	0.90
ICM	4.15	0.53	4.26	0.47	3.89	0.83	4.33	0.43	3.63	0.98	3.96	0.98	4.01	0.79
PERF	3.64	0.94	3.60	0.75	3.64	0.88	3.42	0.68	3.43	0.83	3.52	0.74	3.55	0.81
SOCIAL	3.82	0.74	4.13	0.59	3.72	1.03	4.00	0.75	3.95	0.71	3.90	1.00	3.90	0.83

Chapter Summary

Dedicated managers often seek alternative organizational forms in order to facilitate the ongoing environmental demands for change. Successful forms, like the popular organizational learning paradigm, can help organizations assimilate new technologies, achieve competitive advantage, and process knowledge better in the pursuit of ongoing realignment with today's high-technology, competitive environments.

This research offers three important contributions to the prevalent body of knowledge about the organizational learning concept: 1) a consensus definition, 2) an empirically reliable and valid measure, and 3) expected norms for benchmarking. It was found that the organizational learning instrument developed in this study, is a valid and reliable measure of the construct. These contributions are important if this renowned paradigm is to develop into a respected field of study and better support the organizational endeavor.

Although the psychometric properties of the instrument were found to be acceptable for exploratory purposes, more empirical testing is necessary in order to improve upon the final 28-item instrument. The results on reliability and

validity are mixed. Some subconstructs are adequate for further use, some need refinement in the form of the generation of new items, and items can be deleted from others. Overall, the validity and reliability of the instrument is adequate for exploratory research.

DISCUSSION AND CONCLUSIONS

Prominent organizational theorists have predicted that the amount of information and knowledge organizations must process will continue to increase (Huber, 1984; Drucker, 1988). This is because of the proliferation of operations and management technologies that are supporting organizational processes and influencing the turbulence of organizational environments. Several authors have prescribed organizational designs that are more responsive in turbulent environments. Interest in one such design, the *organizational learning* model of the firm, has increased over the past several years (Bahlmann, 1990; Dodgson, 1993; March, 1991; Nonaka, 1991; Schein, 1996; Stein & Zwass, 1995; Templeton & Snyder, 1999). Due to its popularity, further development of the salient issues of OL is justified.

This project represents the first attempt at developing an instrument to assess OL-related behaviors through the development of an empirically valid and reliable construct and measure. In doing so, it represents

the initial work in organizational research for developing a systematic technique for collecting, analyzing and interpreting data about OL.

The project should be significant for several reasons. First, the inability to adequately assess the extent of OL in organizations will hamper future development of understanding about knowledge and theory surrounding the topic. Second, the advancement of knowledge about the topic of OL is especially important given several author's interpretations of the concept as a paradigm for organizational thought. Third, an understanding of OL is paramount to top management, whose organizations adopt OL theory for two primary purposes: 1) as a response to environmental demands and changes, and 2) to proactively achieve some desired consequence (Templeton & Snyder, 2000). Fourth, the topic is timely, since there currently is no agreed upon definition of OL, nor an adequate measure to assess the extent to which OL takes place among individuals in the firm.

This research primarily aims to fill a void in organizational research caused by the varying and consequentially diverging definitions of OL. Critical to the evolution of the study of organizations and the

management of knowledge is the development of better measures of variables with which management and academia works. Development of measures of OL should help managers and researchers gain experience with a psychometrically appropriate measure. This experience can result in 1) greater understanding about the OL measure, 2) the uncovering of variables that are components of the construct's nomological network, and 3) the realization that OL represents a sound measure of organizational performance.

The first significant contribution of this study was a consensus definition of the organizational learning concept. An extensive literature review resulted in the discovery of fifty-eight definitions of OL. Three views of OL were apparent in the definitions: the demographic, process, and outcome perspectives. The process-related view of OL was explored further due to its implications for explaining more organizational phenomena. The following process-related definition of the OL concept resulted from this analysis:

The knowledge acquisition, information distribution, information interpretation, organizational memory, and structural change enacted by members on behalf of the organization

The second major contribution, an empirically derived measure of organizational learning, was the primary conclusion of the research. The results show that OL is a multi-dimensional construct consisting of eight distinct parts. The eight underlying dimensions of organizational learning were found using factor analysis methods applied to the final survey data:

- the extent to which organizational members are aware of the sources of key organizational information and its applicability to existing problem areas (*awareness*)
- the extent of communication and that exists between organizational members (*communication*)
- the comparison of process- and outcome-related performance to organizational goals (*performance assessment*)
- the development of experience, expertise, and skill among existing employees (*intellectual cultivation*)

- technology-related items pertaining to organizational responses to environmental change (*social learning*)
- the extent to which organizational members learn through social channels about organizational concerns (*environmental adaptability*)
- the extent to which the organization manages knowledge, skill, and other intellectual capital for long-term strategic gain (*intellectual capital management*)
- the extent to which the organization capitalizes on the knowledge, practices, and internal capabilities of other organizations (*organizational grafting*).

A third major contribution was the establishment of norming data, showing construct and subconstruct means and standard deviations based on the position of the respondent, and organizational industry classification. Levels and variances of OL and its subconstructs were found to vary based on both criteria. This data can be used to benchmark organizational assessment results using the OL instrument. Organizations scoring above these standards can be considered *learning organizations*. Organizations

scoring below these levels should dedicate more management resources towards the areas indicated in the factor scores.

The measurement instrument in this study should undergo further empirical research in order to improve its efficacy in organizational research. Based on the eight factors extracted from the sample data, new items should be derived from the literature and tested in the presence of the items promoted in this research. The new items should be generated within the definitional meaning of the underlying constructs containing a low number (2-3) of items. By the same token, items can be dropped from factors with a large number (4-5) of items. According to Spector (1992), the Spearman-Brown prophecy formula can be used to find the optimum number of items that will provide a minimum level of internal consistency. If done carefully, such modifications to the instrument can improve instrument quality. Finally, the addition of new subconstructs to the OL instrument should be contemplated in future research, based on modern constructions of the concept.

The instrument could be used in a longitudinal study to investigate differences in levels of OL over time, between industries, between sectors (private and public),

and between organizational subunits (R&D, operations, finance, etc.). In addition, the relationship between OL and its proposed precursors, contexts, and consequences (Templeton & Snyder, 2000) would contribute highly to the current body of knowledge on OL.

The most important contribution of this research is the potential for establishing an appraisal of the OL concept. In this vein, it is of paramount importance to determine the relationship between OL and organizational effectiveness and other outcome measures. The link between OL and organizational sustainability and prosperity has been commonly suggested, and can be inferred from its popularity in established academic journals in a broad range of reference disciplines. This relationship can be empirically tested using the myriad of objective financial data on corporations provided in the Security and Exchange Commission's (SEC) EDGAR database. Researchers should test the relationship between OL and quality-based measures such as time to market, total cycle time, defects per unit, and technology transfer rates. Finally, researchers should test the relationship between OL and measures of success related to knowledge management concerns, such as creativity, innovativeness, and strategic planning and

decision-making success. Given these potential areas of inquiry, it is easy to gauge the potential impact of this research on the economic progress of modern organizations and societies.

This project contributes to the cumulative tradition and provides direction for future research on the OL concept. The instrument can serve as a diagnostic tool to determine the success of OL implementation in practice. In academia, the instrument can be adapted to the classroom setting to assess the extent of learning among students acting as learning entities. In addition, the understanding of how information technology architectures support the activities implied in the derived factors is important in designing effective modern organizational structures and cultures.

CUMULATIVE BIBLIOGRAPHY

Allen, M.J. & Yen, W.M. (1979). Introduction to measurement theory. Montery: Brooks-Cole.

Argyris, C. (1994). Good communication that blocks learning. Harvard Business Review, 72(4), 77-85.

Argyris, C. & Schon, D.A. (1978). Organizational learning: A theory of action perspective. Reading, MA: Addison-Wesley.

Argyris, C., & Schon, D. A. (1996). Organizational learning II. Reading, MA: Addison-Wesley.

Ashton, D. (1988). Are business schools good learning organizations? Institutional values and their effects in management education. Personnel Review, 17(4), 9-14.

Bahlmann, T. (1990). The learning organization in a turbulent environment. Human Systems Management, 9(4), 249-256.

Barney, Jay B. (1991). Firm resources and sustained competitive advantage. Journal of Management, 17(1), 99-120.

Bedeian, A. G. (1986). Contemporary challenges in the study of organizations. Journal of Management, 12(2), 185-201.

Bell, M., & Scott-Kemmis, D. (1990). The mythology of learning-by-doing in World War II airframe and ship production. Science Policy Research Unit, University of Sussex.

Berg, D. (1993). Expanding perceptions, possibilities and profits. Journal for Quality and Participation. 16(7)December, 6-10.

Bernstein, I.H. (1988). Applied multivariate analysis. New York: Springer-Verlag.

Bouwen, R. & Fry, R. (1991). Organizational innovation and learning: Four patterns of dialog between the dominant logic and the new logic. International Studies of Management and Organizations, 21(4), 37-51.

Bowman, E. H. & Hurry, D. (1993). Strategy through the option lens: An integrated view of resource investments and the incremental-choice process. Academy of Management Review, 18(4), 760-782.

Budd, R., Thorp, R. & Donohew, L. (1967). Content analysis of communications. New York: Macmillan.

Carney, T.F. (1972). Content analysis. London: B.T. Batsford, Ltd.

Carmines, E.G., & Zeller, R.A. (1979). Reliability and validity assessment. Newbury Park, California: Sage Publications.

Carney, T.F. (1972). Content analysis. London: B.T. Batsford, Ltd.

Cavaleri, S. A. (1994). 'Soft' systems thinking: A pre-condition for organizational learning. Human Systems Management, 13(4), 259-267.

Chalofsky, N. E. (1996). A new paradigm for learning in organizations. Human Resource Development Quarterly, 7(3), 287-293.

Churchill, G. A., Jr. (1979). A paradigm for developing better measures of marketing constructs. Journal of Marketing Research, 16(1), 64-73.

Cohen, W. & Levinthal, D. (1990). Absorptive capacity: A new perspective on learning and innovation. Administrative Science Quarterly, 35(1), 128-152.

Cook, S. D. N., & Yanow, D. (1993). Culture and organizational learning. Journal of Management Inquiry, 2(4), 373-390.

Corsini, R. (1987). Concise encyclopedia of psychology. New York: Wiley.

Cronbach, L.J. (1971). Test validation. In R.L. Thorndike (Ed.), Educational measurement, 2nd ed. (pp. 443-507). Washington, DC: American Council on Education.

Cronbach, L. J., & Meehl, P.E. (1955). Construct validity in psychological tests. Psychological Bulletin, 52, 281-302.

Cyert, R. M. & March, J.G. (1963). A behavioral theory of the firm. Englewood Cliffs, NJ: Prentice Hall.

Daft, R.L. & Huber, G.P. (1987). How organizations learn: A communications framework. In N. Ditomaso & S.B. Bacharach (Eds.), Research in the sociology of organizations (pp. 1-36). Greenwich, CT: JAI Press.

Daft, R.L., & Weick, K.E. (1984). Toward a model of organizations as interpretation systems. Academy of Management Review, 9(2), 284-295.

De Geus, A.P. (1988). Planning as learning. Harvard Business Review, 66(3), 70-74.

Dixon, N. M. (1992). Organizational learning: A review of the literature with implications for HRD professionals. Human Resource Development Quarterly, 3, 29-49.

Dodgson, M. (1993). Organizational learning: A review of some literatures. Organization Studies. 14(3), 375-394.

Drew, S.A.W. & Davidson, A. (1993). Simulation-based leadership: Development and team learning. Journal of Management Development. 12(8), 39-52.

Drucker, P.F. (1988). The coming of the new organization. Harvard Business Review, 66(1), 45-53.

Drucker, P.F. (1992). The new society of organizations. Harvard Business Review, 71(5), 95-104.

Emery, F.E. & Trist, E.L. (1965). The causal texture of organizational environments. Human Relations, 16, 20-26.

Fichman, R.G. & Kemerer, C.F. (1997). The assimilation of software process innovations: An organizational learning perspective. Management Science, 43(10), 1345-63.

Fiol, C. M. & Lyles, M. A. (1985). Organizational learning. Academy of Management Review, 10(4), 803-813.

Foy, N. (1980). The yin and yang of organizations. New York: Morrow.

Friedlander, F. (1983). Patterns of individual and organizational learning. In S. Srivastva & Associates (Ed.), The executive mind: New insights on managerial thought and action (pp. 192-220). San Francisco: Jossey-Bass.

Gardner, H. (1983). Frames of mind. New York: BasicBooks.

Garvin, D. A. (1993). Building a learning organization. Harvard Business Review, 71(4), 78-91.

Glynn, M.A. (1996). Innovative genius: A framework for relating individual and organizational intelligences to innovation. Academy of Management Review, 21(4) 1081-1111.

Goldhar, J. D. & Lei, D. (1995). Variety is free: Manufacturing in the twenty-first century. Academy of Management Executive, 9(4), 73-86.

Grover, V. (1993). An empirically derived model for the adoption of customer-based interorganizational systems. Decision Sciences, 24(3), 603-639.

Grover, V. (2000, May). A tutorial on survey research: From constructs to theory [On-line]. Available: http://dmsweb.badm.sc.edu/grover/survey/MIS-SUVY.html

Hair Jr., J.F., Anderson, R.E., Tatham, R.L., & Black, W.C. (1995) Multivariate Data Analysis with Readings, 4th ed. Prentice Hall: Englewood Cliffs, NJ.

Hannabuss, S. (1984). Learning and information. Information and Library Manager, 3(4), 38-45.

Harman, H.H. (1976). Modern factor analysis. Chicago: University of Chicago Press.

Hedberg, B.L.T. (1981). How organizations learn and unlearn. In P.C. Nystrom & W.H. Starbuck (Eds.), Handbook of organizational design (pp. 8-27). London: Oxford University Press.

Hedberg, B., Nystrom, P., & Starbuck, W.H. (1976). Camping on seesaws: Prescriptions for a self-designing organization. Administrative Science Quarterly, 21(1), 41-65.

Hobday, M. (1990). Telecommunications in developing countries: The challenge from Brazil. London: Routledge.

Huber, G. P. (1984). The nature and design of post-industrial organizations. Management Science, 30(8), 928-951.

Huber, G. P. (1991). Organizational learning: The contributing processes and the literatures. Organization Science, 2(1), 88-115.

Huber, G. P. & Daft, R. L. (1987). Information environments. In L. Putnam (Ed.), Handbook of organizational communication (pp. 130-164). Beverly Hills, CA: Sage.

Inkpen, A.C. (1996). Creating knowledge through collaboration. California Management Review, 39(1), 123-140.

Kachigan, S.K. (1982). Multivariate statistical analysis. New York: Radius Press.

Kerlinger, F.N. (1986). Foundations of behavioral research. New York: Holt, Rinehart & Winston.

Kiernan, J. M. (1993). The new strategic architecture: Learning to compete in the twenty-first century. Academy of Management Executive, 7(1), 7-21.

Kim, D.H. (1993). The link between individual and organizational learning. Sloan Management Review, 35(1), 37-50.

Kim, J.O., & Mueller, C.W. (1982). Introduction to factor analysis. Beverly Hills: Sage Press.

Lawshe, C.H. (1975). A Quantitative Approach to Content Validity. Personnel Psychology, 28, 563-575.

Lederer, A.L. & Sethi, V. (1992). Root Causes of Strategic Information Systems Planning Implementation Problems, Journal of Management Information Systems, 9(1), 25-45.

Lee, S., Courtney, J. F., Jr., & O'Keefe, R. M. (1992). A system for organizational learning using cognitive maps. OMEGA International Journal of Management Science, 20(1), 23-36.

Leonard-Barton, D. (1992). The factory as a learning laboratory. Sloan Management Review, 34(1), 23-38.

Levinthal, D. A. & March, J. G. (1993). The myopia of learning. Strategic Management Journal, 14(Winter), 95-112.

Levitt, B. & March, J. G. (1988). Organizational learning. Annual Review of Sociology, 14, 319-340.

Lewis, B.R. (1993). The information resource management concept: Domain, measurement and implementation status. Unpublished doctoral dissertation, Auburn University, AL.

Lewis, B. R., Snyder, C. A. & Rainer, R. K., Jr. (1995). An empirical assessment of the information resource management construct. Journal of Management Information Systems, 12(1), 199-223.

Lukas, B. A., Tomas, G., Hult, M. & Ferrell, O.C. (1996). A theoretical perspective of the antecedents and consequences of organizational learning in marketing channels. Journal of Business Research, 36(3), 233-244.

Lyles, M.A. & Schwenk, C.R. (1992). Top Management, Strategy and Organizational Knowledge Structures. Journal of Management Studies 2(2), 155-174.

Mackenzie, K.D. (1994). The science of an organization. Part I: A new model of organizational learning. Human Systems Management, 13(4), 249-258.

Mahoney, J. T. (1995). The management of resources and the resource of management. Journal of Business Research, 33(2), 91-101.

Malhotra, M.K. & Grover, V. (1998). An assessment of survey research in POM: from constructs to theory, Journal of Operations Management 16(4), pp. 403-423.

March, J. (1991). Exploration and exploitation in organizational learning. Organization Science, 2(1), 71-87.

McGill, M.E., Slocum, J.W., Jr. & Lei, D. (1992). Management practices in learning organizations. Organizational Dynamics, 21(1), 5-17.

Miller, D. (1993). The architecture of simplicity. The Academy of Management Review, 18(1), 116-138.

Miller, D. (1996). A preliminary typology of organizational learning: Synthesizing the literature. Journal of Management, 22(3), 485-505.

Miller, D. & Chen, M-J. (1994). Sources and consequences of competitive inertia: A study of the U.S. airline industry. Administrative Science Quarterly, 39(1), 1-23.

Miner, A.S. & Robinson, D.F. (1994). Organizational and population level learning as engines for career transitions. Journal of Organizational Behavior, 15(4), 345-364.

Nevis, E.C., DiBella, A.J. & Gould, J.M. (1995). Understanding organizations as learning systems. Sloan Management Review, 36(2), 73-85.

Nonaka, I. (1991). The knowledge-creating company. Harvard Business Review, 69(6), 96-104.

Nunnally, J.C. (1967). Psychometric theory. New York: McGraw-Hill.

Nunnally, J.C. (1978). Psychometric theory. New York: McGraw-Hill.

Orlikowski, W. (1992). The duality of technology: Rethinking the concept of technology in organizations. Organization Science, 3(3), 398-427.

Overall, J.E. & Klett, C. J. (1972). Applied multivariate analysis. New York: McGraw-Hill.

Pedler, M., Boydell, T. & Burgoyne, J. (1989). Towards the learning company. Management Education and Development, 20(1), 1-8.

Pennings, J.M., Barkema, H. & Douma, S. (1994). Organizational learning and diversification. Academy of Management Journal, 37(3), 608-640.

Popper, K.E. (1979). Objective knowledge. Oxford: Oxford University Press.

Pucik, V. (1988). Strategic alliances with the Japanese: Implications for human resource management. In F. Contractor & P. Lorange (Eds.), Cooperative strategies in international business (pp. 487-498). Lexington, Mass.: Lexington Books.

Rainer, R. K., Jr. & Harrison, A. W. (1993). Toward development of the end user computing construct in a university setting. Decision Sciences, 24(6), 1187-1202.

Robey, D. & Sahay, S. (1996). Transforming work through information technology: A comparative case study of geographic information systems in county government. Information Systems Research. 7(1), 93-110.

Rothwell, S. (1993). Managing organizational learning. Manager Update, 4(3), 221-32.

Sackmann, S.A. (1991). Cultural knowledge in organizations. Newbury Park, CA: Sage.

Schein, E. H. (1996a). Culture: The missing concept in organization studies. Administrative Science Quarterly, 41(2), 229-240.

Schein, E. H. (1996b). Three cultures of management: The key to organizational learning. Sloan Management Review, 38(1), 9-20.

Senge, P.M. (1990). The fifth discipline: The art & practice of the learning organization. New York: Doubleday/Currency.

Senge, P. & Sterman, J. (1993). Systems thinking and organizational learning: Acting locally and thinking globally in the organization of the future. European Journal of Operational Research, 59(1), 137-150.

Sethi, V. & King, W.R. (1991). Construct Measurement in Information Systems Research: An Illustration in Strategic Systems. Decision Sciences, 22(4), 455-472.

Sethi, V. & King, W. R. (1994). Development of measures to assess the extent to which an information technology application provides competitive advantage. Management Science, 40(12), 1601-1627.

Shani, A.B. and Lau, J.B. (1996). Behavior in organizations: An Experiential Approach (6th ed.). Chicago: Irwin.

Shrivastava, P. (1983). A Typology of Organizational Learning Systems. The Journal of Management Studies, 20(1), 7-28.

Sinkula, J. M. (1994). Market information processing and organizational learning. Journal of Marketing, 58(1), 35-45.

Slater, S. F. & Narver, J. C. (1995). Does competitive environment moderate the market orientation-performance relationship? Journal of Marketing, 58(1), 46-55.

Smith, A. (1776). An inquiry into the nature and causes of the wealth of nations. London: Clarendon Press.

Spector, P.E. (1992). Summated Rating Scale Construction: An Introduction. Quantitative Applications in the Social Sciences Series, Sage University Paper 82, Beverly Hills, CA: Sage.

Spender, J.-C. (1989). Industry recipes: An enquiry into the nature and sources of managerial judgment. Oxford: Basil Blackwell.

Stata, R. (1989). Organizational learning: The key to management innovation. Sloan Management Review, 30(3), 63-74.

Stein, E. W. & Zwass, V. (1995). Actualizing organizational memory with information systems. Information Systems Research, 6(2), 85-117.

Stone, E. (1978). Research methods in organizational behavior. Santa Monica, CA: Goodyear Publishing.

Straub, D.W. (1989). Validating instruments in IS research. MIS Quarterly, 13(1), 147-169.

Templeton, G. & Snyder, C. A. (1997, September). Toward a method for providing database structures derived from an ontological specification process: the example of knowledge management. Paper presented at The German Conference on Artificial Intelligence, Frieburg, Germany.

Templeton, G. & Snyder, C. (1999). A model of organizational learning based on control, International Journal of Technology Management, 18(5/6/7/8), 705-719.

Templeton, G.F. & Snyder, C.A. (2000). Precursors, Contexts, and Consequences of Organizational Learning, International Journal of Technology Management, 19.

Van de Ven, A. H. (1986). Central problems in the management of innovation. Management Science, 32(5), 590-607.

Vandenbosch, B. & Higgins, C.A. (1995). Executive support systems and learning: A model and empirical test. Journal of Management Information Systems, 12(2), 99-130.

Ventriss, C. (1990). Organizational theory and structure: An analysis of three perspectives. International Journal of Public Administration, 13(6), 777-798.

Ventriss, C. & Luke, J. (1988). Organizational learning and public policy. American Review of Public Administration, 18(4), 346-347.

Walsh, J. P. & Ungson, G. R. (1991). Organizational memory. Academy of Management Review, 16(1), 57-91.

Ward, A. (1996). Lessons learned on the knowledge highways and byways. Strategy & Leadership, 24(2), 16-20.

Zachman, J.A. (1987). A Framework for Information Systems Architecture. IBM Systems Journal, 26(3), 276-92.

APPENDICES

Appendix A: Survey Evaluation Form

Survey Evaluation Form

1. How long did it take you to complete the questionnaire? _____ minutes

2. Review the questionnaire a second time for the purpose of critiquing it for a) format, b) content, c) understandability, d) terminology, and e) ease of completion. If you notice any problem, feel free to make any correction directly on the actual questionnaire document. In addition, write suggestions or other concerns you have with the survey to the right of the following problem categories:

Category	Concerns and Suggestions (if any)
a) format	_____
b) content	_____
c) understandability	_____
d) terminology	_____
e) ease of completion	_____

3. List any question (by number) you feel should be deleted from this list.

4. List any concern you feel should be added to this survey.

5. Do you have any additional suggestions for improving the Organizational Learning Survey?

Appendix B: Profile of Pretest Respondents

Area	**Name**	**Position**	**Affiliation**
Org Behavior	Lt. Col. Chester C. Carter, III	Quality Consultant	West Virginia Air National Guard
	Dr. Robert R. Hirschfield	Assistant Professor/ Management	Georgia Southern University
	Dr. Stan Harris	Associate Professor/ Management	Auburn University
MIS Practitioner	Bill Deery	President	RemTech
Instrumentation	Dr. Terry Byrd	Professor/ MIS	Auburn University
	Dr. Hubert Field	Torchmark Professor/ Management	Auburn University
	Dr. David Nye	Professor/ Management	Athens State University
	Dr. Frazier Douglas	Professor/ Psychology	Athens State University
	Dr. Susan Owen	Asst. Professor/ Psychology	Athens State University

Appendix C: Profile of Pilot Test Respondents

Demographic	n	% of N
Industry (n=23)		
Professional, Scientific, and Technical Services	7	30.4
Manufacturing	4	17.4
Educational Services	2	8.7
Finance and Insurance	2	8.7
Public Administration	2	8.7
Other Services	2	8.7
Arts, Entertainment, and Recreation	1	4.3
Agriculture, Forestry, Fishing, and Hunting	1	4.3
Health Care and Social Assistance	1	4.3
Utilities	1	4.3
Functional Area (n=24)		
Information Systems/Technology	16	66.7
Research and Development	5	20.8
Accounting/Finance	1	4.2
Customer Support	1	4.2
Human Resources	1	4.2
Gender (n=24)		
Male	20	83.3
Female	4	16.7
Permission to call (n=24)		
Yes	13	72.2
No	5	27.8
Position (n=24)		
Technology Director	7	29.2
Project Manager	5	20.8
Chief Information Officer	2	8.3
Vice President	2	8.3
Data Center Director	2	8.3
Other	6	25.0

Demographics	n	Median	Low	High
Company Employees	23	700	4	119,999
Company Age	21	41	2	177
Years in Current Position	24	3	1	17
Years in Position with Company	24	8	1	28
Instrument Quality				
Understandability	20	2	1	2
Readability	20	1	1	2
Ease of Use	20	1	1	2
Validity	20	2	1	2

Appendix D: Panelists for the Lawshe Procedure

Name	Title	Organization
Karen S. Ayas	Research Fellow	Erasmus Institute of Management
	Director of Research	Society for Organizational Learning
	Associate Editor	Reflections: The SoL Journal
Art Bedeian	Boyd Professor, Ralph & Kacoo Olinde Distinguished Professor of Management	Louisiana State University
Richard Daft	Ralph Owen Professor of Management	Vanderbilt University
Jim H. Davis	Associate Professor of Strategic Management	University of Notre Dame
Anthony J. DiBella	President	Organizational Transitions
Nancy M. Dixon	Associate Professor of Administrative Sciences	George Washington University
David A. Garvin	Robert and Jane Cizik Professor of B.A.	Harvard Business School
Dorothy A. Leonard	Professor & Director of Research in Technology and Operations Management	Harvard Business School
Bryan A. Lukas	Senior Lecturer in Marketing	University of Melbourne
Micheal Marquardt	Associate Professor of Management	George Washington University
Paul Nystrom	Professor of Management	University of Wisconsin-Milwaukee
Carl Pegals	Professor of Management Science and Systems	State University of New York -Buffalo
George Roth	Executive Director Ford/MIT Collaboration	Massachusetts Institute of Technology
Stan Slater	Professor of Marketing & Management and Vice Chancellor for Academic Affairs	University of Washington Bothell
John Slocum	O. Paul Corley Professorship in Organizational Behavior	Southern Methodist University
Ray Stata	Chairman	Analog Devices
Gerardo R. Ungson	The Victor P. Morris Professor of Management	University of Oregon
Andy Van de Ven	Vernon H. Heath Professor of Organizational Innovation & Change and 3M Professor of Human Systems Management	University of Minnesota
Curtis Ventriss	Professor of Policy and Natural Resources Policy	University of Vermont
Robert W. Zmud	Michael F. Price Chair In Management/Professor	University of Oklahoma

Appendix E: Final Questionnaire Version

Instructions: The following questions pertain to your company's **local** operations, employees, and management. Please respond to each question using the following scale:

1	2	3	4	5
Strongly Disagree	Moderately Disagree	Undecided	Moderately Agree	Strongly Agree

	Str. Disagree				Strongly Agree
The following questions relate to your company's local operations:					
1. The company develops experts from within.	1	2	3	4	5
2. The company stores detailed information for guiding operations.	1	2	3	4	5
3. There is a formal data management function in the company.	1	2	3	4	5
4. The company is slow to react to technological change.	1	2	3	4	5
5. The company maintains a certain mix of skills among its pool of employees.	1	2	3	4	5
6. The company hires highly specialized or knowledgeable personnel.	1	2	3	4	5
7. The company makes extensive use of electronic storage (e.g., databases, data warehousing, scanned documents).	1	2	3	4	5
8. The company collects data on all facets of performance.	1	2	3	4	5
9. The company acquires subunits (e.g., organizations, functions, departments) based on short-term financial gain.	1	2	3	4	5
10. When internal capabilities are deficient, we acquire them from the outside.	1	2	3	4	5
The following questions relate to your company's local employees:					
11. Employees use electronic means to communicate.	1	2	3	4	5
12. Employees have a large variety of communications tools (telephone, e-mail, Internet, etc.) from which to choose.	1	2	3	4	5
13. Our employees resist changing to new ways of doing things.	1	2	3	4	5
14. Employees learn about the company's recent developments through informal means (e.g., news stories & gossip).	1	2	3	4	5
15. Employees retrieve archived information when making decisions.	1	2	3	4	5
16. Employees make extensive use of IS to support their work.	1	2	3	4	5
17. Employees are keenly aware of where their knowledge can serve the company.	1	2	3	4	5
18. Employees keep information (e.g., numbers, plans, ideas) away from other employees.	1	2	3	4	5
19. When employees need specific information, they know who will have it.	1	2	3	4	5
20. Employees are encouraged to communicate clearly.	1	2	3	4	5
The following questions relate to your company's local management:					
21. Management proactively addresses problems.	1	2	3	4	5
22. Management monitors important organizational performance variables.	1	2	3	4	5
23. Management removes obsolete information from employee access.	1	2	3	4	5
24. Management assigns employees to other parts of the organization for cross training.	1	2	3	4	5
25. Top management integrates information from different organizational areas.	1	2	3	4	5
26. Management learns from the company's partners (e.g., customers, suppliers, allies).	1	2	3	4	5
27. Management ignores the strategies of competitors' top management.	1	2	3	4	5
28. Management learns new things about the company by direct observation.	1	2	3	4	5
29. Management encourages the use of frameworks and models to assist in decision-making.	1	2	3	4	5
30. Management uses feedback from company experiments (e.g., surveys & trials of new methods).	1	2	3	4	5
31. Employees are discouraged from recommending new work ideas.	1	2	3	4	5

32. Which of the following best describes your job position (check one)?
_ CEO _ CIO _ Data Center Director _ Project Manager Other_____

33. Number of years you have worked in this company _____

34. Number of years worked in your current position in this company _____

35. Number of employees in your local company operations _____

36. Age (in years) of your local company operations _____

Please fax your response to (256) 233-8151. To receive the results using a method other than fax, please write your name and the appropriate contact information here:

_____