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Evaluating Knowledge Management and the Learning Organization: An Information/Knowledge Value Chain Approach

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An Information/Knowledge Value Chain Approach

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**KNOWLEDGE
MANAGEMENT**

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ABSTRACT

Based on the common elements in the definitions and operationalizations of knowledge management and the learning organization, a triad of objectives for both knowledge management and the learning organizations is identified: 1) improved information and knowledge that enables (2) organizational behaviors and decisions that have greater impacts, and (3) improved organizational performance. These objectives are used to guide the development of an information/knowledge value chain model that can form the basis for a framework for evaluating progress in knowledge management programs and in the development of a learning organization. Four classes of evaluation are identified for this purpose (cognitive and post-cognitive process, behavioral, learning process, and organizational impact). A number of operational measures are suggested for each class. The measures that are appropriate in a given circumstance may be selected from, or suggested by, that list.

Keywords: organizational learning, knowledge management, value chain, evaluation framework

I. INTRODUCTION

Knowledge management (KM)¹ and the learning organization (LO)² are two of the potentially most important notions for allowing organizations to transform themselves so that they will be competitive in the new millennium [Sethi and King, 1998].

Numerous authors offer definitions of a learning organization. Perhaps the most cited is from Peter Senge's *The Fifth Discipline* [1990]. He defines learning organizations as: “. . . an organization that is continually expanding its capacity to create its future.” Garvin [1993], however, suggests that a more specific definition of a learning organization is needed if managers are to derive value from this approach. He provides this working definition of a learning organization: “. . . a learning organization is an organization skilled at creating, acquiring, and transferring knowledge, and at modifying its behavior to reflect new knowledge and insights.”

Many interpretations are given to knowledge management, ranging from Dow Chemical's broad view—“getting the right information in front of the right person at the right time,” to Skandia's narrower scope that focuses on knowledge as professional expertise [O'Dell, 1996].

Indeed, the two areas of KM and LO have been used to define one another. For example, Arthur Andersen (now Accenture) defines KM as, “. . .the process of accelerating individual and organizational learning:” [O'Dell, 1996, p. 124]. The relationship of these two concepts is clearly evidenced through the definition of KM set forth by the American Productivity and Quality Center: “. . .the strategies and processes of identifying, capturing, and leveraging knowledge to help the firm compete. It is also tangible evidence of a 'learning organization,' one that can analyze, reflect, learn, and change based on experience” [O'Dell, 1996, p. 7].

¹ For an introduction to knowledge management, see [Nonaka, 1991, 1994; Leonard, 1995; Grant, 1996; Spender, 1996; Quinn, Anderson, and Finkelstein, 1996b; Davenport and Prusak, 1998]

² For an introduction to learning organizations, see [Senge, 1990; Huber, 1991; Garvin, 1993]

The two concepts (KM and LO) are obviously related, although they are not generally considered to be identical. However, their commonalities are significant. Both areas deal with one or more of three *content* constructs: data, information and knowledge. Both deal with *processes* for acquiring, refining, storing and sharing the content in an organizational setting. And, both share the *objective* of creating improved business performance through these processes.

Although the basic processes and objective of KM and the LO are common, we argue that KM focuses primarily on knowledge content while the LO embraces all aspects of data, information and knowledge. Given the similar basic processes and objective of KM and the LO, there does not appear to be great value in making careful distinctions between the two areas for evaluative purposes. So, while it may not always be valid to do so, in this article we treat KM as a subset of a LO.

II. KM-LO EVALUATION

Even though the potential importance of knowledge management and the learning organization is widely understood and recognized, validated empirical methodologies for assessing progress toward the allied goals of efficient and effective KM and/or the creation of a LO are not yet developed..

Various organizational practices were identified, categorized, and recommended to firms that wish to practice KM or to become a LO [Schein, 1993; Nevis, Dibella, and Gould, 1995; Davenport, DeLong, and Beers, 1998]. Some organizations are making attempts to incorporate KM and LO projects in their organizations for strategic advantage [Sveiby, 1997; Hansen, Nohria, and Tierney 1999]. However, many projects are abandoned or viewed as failures – many of those as a result of the difficulty in measuring the benefits accruing from them [O’Dell, 1996; Davenport, DeLong, and Beers 1998].

Practitioners attempted to develop measurement systems, usually by relying on analogies to well-known methods such as the balanced scorecard, Scandia’s Navigator, Economic Value Added, and M’Pherson’s Inclusive

Valuation Methodology to assess progress and evaluate the effectiveness of their KM and LO activities [Skyrme and Amidon, 1998].

Some researchers studied the “success of KM projects” without either having an explicit definition of “success” or of what constitutes a “KM project” [Davenport, DeLong, and Beers, 1998]. This approach serves to muddle the population of projects to which any conclusions might be generalized as well as to leave the definition of success to the vagaries of the individuals who are called on to identify successful and unsuccessful projects.

Until corporate managers are able to assess progress using replicable methods, to evaluate the cost-effectiveness of specific activities and to create accountability practices, the areas of KM and LO will not achieve the goals espoused for them. Enabling these goals requires that an assessment methodology be developed, tested, and validated to provide management with the ability to measure progress both in implementing KM and in the pursuit of a learning organization.

To accomplish this measurement goal, it is important that a theoretically-sound conceptual framework first be developed. This framework will not only provide the basis for the development of measures, but it will also permit the development of research hypotheses that can then be tested. It is the best way for the ideas of KM and the LO (which have largely been supported by anecdotes and the pronouncements of gurus), to be further developed, extended, and implemented. The following sections of this article present such a framework.

III. DATA-INFORMATION-KNOWLEDGE

Before we describe our framework, it is useful to provide our perspective on data/information/knowledge argument that recently emerged in the IS literature (e.g., Spiegler, 2000; Tuomi, 2000). One camp holds a traditional view that knowledge is something more than information and information is something more than data. The premise is that data without any structure is meaningless, and serves no purpose. On the other hand, information is a set of data that is organized and structured within a context, and provides meaning. Knowledge is

taking a set of information and one that provides value added. This argument is consistent with that of explicit knowledge converted to tacit knowledge (Nonaka, 1994).

The second camp argues that data-information-knowledge is circular and that knowledge eventually reverts back to data (Spiegler, 2000). Other authors (e.g., Tuomi, 2000) argue that KM is really about the knowledge-information-data sequence because knowledge is needed to know what data to obtain. This argument is consistent with that of tacit knowledge converted to explicit knowledge (Nonaka, 1994).

We view these two opposing camps to be complementary; Nonaka's (1994) Spiral of Knowledge suggests the need to convert tacit knowledge to explicit, and vice versa. In Figure 1 (shown in Section V), the process of searching and noticing may be a collection of data (e.g., marketing data) that will serve as information when given some meaning (data-information-knowledge argument). Or, it could be a search for a specific set of data and/or information based on existing knowledge (e.g., competitive intelligence) (knowledge-information-data argument).

Our framework supports both arguments for assessing and evaluating progress in KM programs and in the development of a learning organization.

IV. CONTENT AND OBJECTIVES OF KM/LO

Our assessment of the diverse definitions of KM and LO serves to identify a common core that may be stated in simple terms. A learning organization is one that creates, acquires and communicates information and knowledge, behaves differently because of these actions, and produces improved organizational results from doing so [Huber, 1991; Garvin, 1993].

Knowledge management (KM) represents a key process in the LO. "Core" KM, as distinct from all of the diverse idiosyncratic processes and systems that some firms organize under the KM rubric, involves acquiring, explicating and communicating mission-specific professional expertise to organizational participants in a focused, relevant, and timely way [King, 1999].

“Core” KM focuses on mission-specific professional expertise, as distinct from data, information, and general knowledge. Therefore, a KM capability is an important element of a learning organization. However, it deals only with a limited range of “content”, that is tacit knowledge, or knowledge that can be described as "know-how," personal, context-specific, and difficult to formalize and transfer (Nonaka and Takeuchi, 1995), that exists in the minds of expert professionals, or which is embedded in organizational processes. This tacit knowledge must be made explicit, or knowledge that can be codified (Nonaka and Takeuchi, 1995) or knowledge that has a characteristic of "knowing about" (Grant, 1996), before it can be used by those who do not already possess it.

The KM department/function in an organization may sometimes deal with explicit knowledge such as patents, but the characteristic that makes knowledge management distinct from information processing, competitive intelligence, environmental scanning, and a host of other valuable organizational activities is that at its core, the content of KM is knowledge that exists in tacit form that must be made explicit and disseminated to others if it is to be useful to the organization. The distinguishing feature between explicit and tacit knowledge becomes one of codification (e.g., Grant, 1996).

Thus, one way of conceptualizing the relationship between KM and the LO is in terms of the differences in the knowledge-related content of the two areas:

1. KM focuses on tacit knowledge that makes up professional expertise, or which is embedded in organizational processes, while
2. the LO seeks to promote the acquisition and dissemination of a broader range of information and general knowledge such as knowledge concerning the best way to use teams as well as information that reflects competitors' or governmental actions that might influence future opportunities for the organization.

Two key outputs of KM and the LO are suggested by Garvin [1993]:

- improved knowledge and
- improved actions.

The third key objective is widely understood by practitioners, “bottom line” performance. Thus, the objectives of KM and the LO may be summarized in terms of an aphorism: “Better information and knowledge for better actions to create better results.”

The objectives of an LO and/or KM may therefore be specified as:

- *improved information and knowledge*, that enables
- *organizational behaviors and decisions that have greater impacts*, and
- *improved organizational performance*.

This triad of objectives for the LO and KM obviates the argument concerning “means versus ends” in which many KM and LO activities are portrayed as having only “knowledge enhancement objectives” rather than “bottom-line” objectives. In this framework, the objective set entails all three elements—improved information and knowledge, improved decisions and behaviors and improved “bottom line” performance. Thus, the objective set for the LO is a combination of means and ends since improved knowledge and improved actions may be considered to be necessary, but not sufficient, conditions for bottom-line organizational performance.

V. AN INFORMATION/KNOWLEDGE VALUE CHAIN MODEL OF KM AND THE LEARNING ORGANIZATION

To develop a framework for evaluating KM and the LO, a model of the knowledge-related processes must first be built that can contribute to the achievement of the aforementioned objective triad. Such a model must be sufficiently rich to describe the various stages of acquiring, processing, using, and sharing information/knowledge at various organizational levels.

A sound theoretical basis for such a model can be developed from the “value chain” concept of business strategy.

VALUE-CHAIN THEORY

Organizations deliver their products and services and create value through their value chain activities [Porter, 1985; Porter and Millar, 1985]. Porter's [1985] value-chain model provides a useful mechanism for categorizing the business activities that are involved in an organization's value-creation process. A company's value chain consists of the technologically and economically distinct activities that it performs to do business. These activities consist of two groups: primary activities and support activities. Primary activities include inbound logistics, operations, outbound logistics, marketing and sales, and service. Support activities include corporate infrastructure, human resources management, technology development, and procurement. While primary activities embody the execution of tasks comprising the activities of an organization's value chain, secondary activities consist primarily of management processes associated with decision-making, planning, control, coordination and communication.

The value-chain model is used by IS researchers in developing frameworks of IT impact at the process level [Porter and Millar, 1985]. Rockart and Short [1991] use a value-chain perspective to consider the role of IT at the behavioral level in supporting the networked organization and the management of interdependence. Venkatraman [1991] adopts the value-chain framework in his discussion of "IT-induced business reconfiguration." Tallon, Kraemer, and Gurbaxani [1997] use the value-chain model in developing an instrument for measuring the business value of IT investment.

THE INFORMATION/KNOWLEDGE VALUE CHAIN

The adaptation of the value chain concept to the information and knowledge domain is fairly straightforward. Various researchers focused on the individual and organizational processes for acquiring information/knowledge, applying it and communicating it to others in the organization that can make use of it.

Given the triad of objectives for KM and the LO, the following axioms may be used to guide the adaptation of the business value chain to this new domain of information and knowledge:

- (1) Information/knowledge that is acquired is more valuable than that which is unacquired.
- (2) Information/knowledge which affects the attitudes or thinking patterns of individuals or groups is more valuable than that which does not have such impact.
- (3) Information/knowledge that influences decisions, actions or other behaviors is more valuable than that which does not.
- (4) Information/knowledge that is communicated to others at the same level (e.g., individual to individual) or to other organizational levels is more valuable to the organization than that which is not communicated.
- (5) Information/knowledge that impacts “bottom line” performance is more valuable than that which does not have such impact.

These axioms serve to guide the adaptation of the business value chain model to an Information/Knowledge value chain model that can serve as a framework for evaluating KM and the LO.

OVERVIEW OF THE INFORMATION/KNOWLEDGE VALUE CHAIN MODEL

Figure 1 shows an Information/Knowledge value chain process model that is based on three important levels at which value enhancing activities may be conducted:

- the individual,
- the work unit, and
- overall organizational levels.

These levels are arrayed as rows in the figure against a process model that describes the stages of an organization’s processes of acquiring, disseminating, and using information and knowledge.

The matrix of Figure 1 represents an organizational value-chain for information and knowledge. Thus, as information and knowledge is processed to

	Cognition		Post Cognition	Organization Related Actions by the Acquirer	Diffusion	Elaboration	Infusion	Thoroughness	Organization Related Actions by Others	Organization Performance
Individual	Willingness to search and notice	Conscious or subconscious - search and noticing	Analysis and interpretation of findings	Actions based on analysis and interpretation	Sharing information, knowledge and results of analyses with others at the same level and with other levels	Varied interpretations are formulated	Identification of related problems and issues	Comprehensions of varied interpretations are developed	Actions based on analysis and interpretation	Impact on performance
Work Unit (Group, Team or Department)	“	“	“	“	“	“	“	“	“	“
Overall Organization	“	“	“	“	“	“	“	“	“	“

The diagram illustrates the Information/Knowledge Value Chain across three levels: Individual, Work Unit (Group, Team or Department), and Overall Organization. The process is structured into columns representing stages: Cognition (subdivided into Willingness to search and notice, and Conscious or subconscious - search and noticing), Post Cognition, Organization Related Actions by the Acquirer, Diffusion, Elaboration, Infusion, Thoroughness, Organization Related Actions by Others, and Organization Performance. Red arrows indicate the flow of information/knowledge from the Individual level to the Work Unit level, and then to the Overall Organization level. Additionally, vertical red double-headed arrows connect the Diffusion stage across the three levels, indicating interaction and feedback loops.

Figure 1. The Information/Knowledge Value Chain

stages that are further to the right and/or further down in the matrix, value is being added in terms of improved knowledge, improved actions, or improved organizational performance—the triad of objectives for KM and the LO.

The first row of the model deals with the individual, who must initially be cognitively willing to “search and notice” [Fiol and Lyles, 1985; Cohen and Levinthal, 1990; Huber, 1991]. The remainder of the first row then depicts the processing, use and sharing of that which is noticed by the individual. An organization in which an individual searched and noticed adds incremental value beyond that of one in which an individual is merely open to searching and noticing. An organization that diffuses information from an individual to a work group adds value beyond that of one that has not done so, and so on. (The specific constructs which make up this model are discussed in the next subsection).

At the column labeled “Diffusion” in the first row of Figure 1, the processed information/knowledge is shared in two ways –

- “horizontally” with other individuals, as indicated by the subsequent columns in the first row, and
- “vertically” with other organizational levels, as indicated by the vertical arrow in that column.

Horizontal sharing is done between individuals, often within a work unit, and most often, informally. Vertical sharing takes place between an individual and work units, and with the overall organization, with a greater proportion of the sharing being done formally.

The remainder of the model depicts similar flows at the work unit, and organizational level, with each level depicted as carrying out the same general process. Thus, the overall process is one in which information and knowledge are acquired at one of the levels indicated at the left of the figure. Then, they are processed at that level, shared with others at the same level and shared with other levels.

In the second row, sharing also takes place both vertically and horizontally. As with the first row, vertical sharing at this level is with the other

levels—with the overall organization and with individuals; horizontal sharing is between work units as would be the case if the marketing department developed new knowledge that it shared with the production and finance departments.

At the third (overall organizational) level, vertical sharing is with work units and individuals, whereas horizontal sharing is with other organizations such as suppliers, customers, and strategic partners.

Once a “unit” received information vertically or processed it horizontally, it processes it using the phases to the right of the column labeled “Diffusion” in Figure 1. In other words, information received vertically from an individual by a work unit is subjected to elaboration, infusion, and thoroughness and may become the basis for business actions by “others” as shown in the next-to-last column. In this case, “others” refers to some unit other than the one that shared the information.

The row representing each level in Figure 1 culminates with “impact on organizational performance,” indicating that at each level, once information is processed and shared with other individuals, work units, or organizations, respectively, one or more of these entities can use it as a basis for further actions which impact performance.

THE CONSTRUCTS OF THE MODEL

The constructs which make up the model of Figure 1 are identified in more detail in Table 1.

These constructs are used in the model of Figure 1 to represent stages in the overall process of acquiring, creating, processing, communicating and applying information and knowledge.

Of course, some of these constructs are formally defined in the references only at the individual level. In this model, their application to the other levels reflects an analogical argument.

Table 1. Model Constructs

Construct	Meaning	Sources
Cognitive Processes	The conscious and subconscious willingness to acquire patterns of cognitive associations. This may be disaggregated into a willingness to search and notice and the acquisition process itself (as is done in Figure 1).	Fiol and Lyles, 1985; Cohen and Levinthal, 1990; Huber, 1991; Quinn, Anderson, and Finkelstein, 1996b
Post cognition	Follows cognition in the causal order; the complexity level of an individual's cognitive structure after exposure to an information system.	James and Tetric, 1986; Pratt, 1982
Organization-related Actions	The behaviors that reflect the patterns and/or cognitive associations that were developed or interpreted. (In the model, these actions are represented separately as actions taken by the "unit" that acquires and processes the information and actions taken by "others").	Daft and Weick, 1984; Fiol and Lyles, 1985; Cohen and Levinthal, 1990; Huber, 1991; Garvin, 1993
Diffusion	The sharing and dissemination of information, results and/or interpretations with other individuals and/or throughout the organization	Huber, 1991; Nonaka, 1991, 1994; Garvin, 1993; Zander and Kogut, 1995; King, 1996
Elaboration	The development of possibly-different interpretations by various individuals for changing the range of potential behaviors	Huber, 1991; Nonaka, 1991, 1994; Weick, 1991
Infusion	The identification of underlying non-obvious problems and issues based on the information, results, and/or interpretations.	Nonaka, 1991, 1994; Weick, 1991; King, 1996; Quinn, Anderson, and Finkelstein, 1996a
Thoroughness	The development of multiple understandings, across individuals and levels, of the possibly-different interpretations	Huber, 1991; Nonaka, 1991, 1994; Weick, 1991
Organizational Performance	The impact of the behaviors on organizational performance (e.g., customer satisfaction, ROI, shareholder value, reduced duplication of effort, employee satisfaction)	Vandenbosch and Higgins, 1995; Hiebler, 1996

DETAILS OF THE MODEL

Having provided an overview of the model and a description of the constructs, we may now describe the Information/knowledge value chain model more fully beginning with the individual-level activity. The first row in Figure 1 depicts two cognitive elements – the willingness to search and notice new information and the process involved in doing so. Once new information is detected, it must be analyzed and interpreted, as shown in the column labeled

“Post Cognition.” Then, actions (or inactions) based on the analysis and interpretations may be taken by the individual who acquired the information as indicated in the Organization column.

Diffusion, a key notion in the LO, is depicted as the next step in the process. In this step, information, analytic results, and interpretations are shared both with other individuals and throughout the organization. As depicted by the vertical arrows in Figure 1, diffusion is the prime point of contact of individual-level processes with the other levels: work units and the overall organization. It is also the place in which computerized information systems and formal databases play the greatest role in the model, since it is often through those vehicles that transfer of knowledge is enabled.

Once information/knowledge is shared, it can be amplified and enhanced in three major ways: through elaboration, infusion, and thoroughness:

- *Elaboration* means that varied interpretations are developed by other individuals as they interpret the disseminate information in terms of their unique “mental models” and as they relate it to their own context.
- *Infusion* means that the information is used to identify underlying problems and issues.
- *Thoroughness* is the benefit that comes from various individuals in the organization developing an understanding of the results of elaboration and infusion – e.g., when one individual understands the different interpretation that another has made or understands the underlying problem that may have been identified by what he/she preliminarily believed to be the “solution” to a problem. For example, information depicting a “stock outage” problem is eventually understood to reflect a production coordination problem which requires either new equipment or more advanced software to solve.

The model of Figure 1 shows that this process, when conducted at any or all of the levels, can result in action by others. The actions of the “unit” that acquired and processed the information and the actions of “others” to whom it has been communicated jointly impact the organization’s performance.

The same general process is described in the second row for information that noticed and acquired at the work unit level—e.g., by a benchmarking study conducted by the marketing department. This information is processed, shared both vertically (with individuals and with the overall organization) and horizontally (with other work units), and applied by the work unit in the form of organizational actions that impact organizational performance.

The third row depicts information that is noticed and acquired at the overall organizational level and is processed and used at that level as well as shared vertically within the organization and horizontally with other organizations who may apply it to impact organizational performance.

USES OF THE MODEL

Two major uses of the Information/knowledge value chain model are apparent. It may be used as a basis for the planning and design of KM and the LO, in much the same way as business value chain models were used to plan/design strategic systems [Porter and Millar, 1985]. Such uses of the Information/knowledge value chain model would involve planners and designers sequentially considering each phase of the value chain at each organizational level (each element of the matrix in Figure 1). A “brainstorming” or other idea generation process is then used to surface ideas concerning how the organization might be redesigned or introduce innovations to enhance the value added in each element [Rackoff, Wiseman, and Ullrich, 1985]

Another major use of the model is as a conceptual base for evaluating KM and the LO. This application, which is the focus of this paper, is described in the next section.

VI. A FRAMEWORK FOR KM/LO ASSESSMENT

Figure 1 provides a conceptual framework for key KM and LO processes that may be used as a basis for developing an evaluation framework. Since Figure 1 reflects an organizational value chain for information and knowledge, the evaluation of KM or LO should entail an evaluation of each stage in the value

chain. Thus, a comprehensive framework for evaluating KM or an LO must focus on each of the elements in Figure 1.

In theory, to evaluate KM and the LO in this manner requires that we assess all participants' willingness to search and notice, all instances in which work units act on new information acquired by them or provided to them by others, and so on.

In practice, of course, such an assessment might need to be done on a more highly aggregated basis or through the use of a sampling process. However, the underlying theory prescribed in Figure 1 serves as a guide to what should be done as well as a standard for judging deviations from the prescribed model.

Since any comprehensive assessment framework must encompass measures for each of the elements of the matrix in Figure 1, four quite different varieties of assessment, must be made at each of the three organizational levels:

- cognitive and post-cognitive process assessments
- behavioral assessments
- learning process assessments
- organizational impact assessments

Table 2 shows the elements of the assessment framework in terms of these four types of assessments at the three levels. The first column of Table 2 suggests that the cognitive and post-cognitive assessments must be made of the willingness to search and notice, conscious or subconscious searching and noticing and the analysis and interpretation of that which is noticed. The behavioral assessment column in Table 2 describes an assessment of organization-related actions that may directly follow from the prior steps or that may be taken by others as a result of subsequent sharing (the learning process column).

Table 2. Knowledge Management/Learning Organization Evaluation Framework*

Cognitive and Post-Cognitive Process Assessments	Behavioral Assessments	Learning Process Assessments	Organizational Impact Assessments
<ul style="list-style-type: none"> • Willingness to search and notice • conscious or subconscious searching and noticing • analysis and interpretation of that which is noticed 	<ul style="list-style-type: none"> • Organization-related actions or inactions 	<ul style="list-style-type: none"> • diffusion • elaboration • infusion • thoroughness 	<ul style="list-style-type: none"> • operating efficiency and quality • market share • profitability (ROI) • customer satisfaction • sales revenue

*Each assessment made at the individual, work unit and overall organization level as appropriate.

The learning process assessment column shows a variety of learning assessments that involves the constructs diffusion, elaboration, thoroughness, and infusion. Organizational impact assessment (the last column) involves value delivered to customers and benefits accrued to the appropriate organizational level as a result of behaving differently through improved information/knowledge.

OPERATIONALIZING THE EVALUATION FRAMEWORK

A number of suggested operationalizations of the four measures in table 2 are shown in Table 3. Each of these measures is appropriate for all circumstances, since the KM and the LO implementations are invariably idiosyncratic. However, the list serves to illustrate each measure, thereby providing a better understanding.

In some instances, it may be useful for an organization to select from the listings in Table 3. In other instances, these measures may be suggestive of others that are more appropriate to a given circumstance.

Cognitive and post-cognitive process measures must, in part, be perceptual and attitudinal in nature. However, search behaviors and resulting analytic behaviors may be assessed in relatively straightforward ways, such as

Table 3. Suggested Assessment Measures

Cognitive and Post-Cognitive Process	Behavioral Process	Learning Process	Organizational Impact
<ul style="list-style-type: none"> • Usage patterns for intranet, expert systems, and other search-facilitating system • Time for search related activities • Knowledge-related strengths and weaknesses • Planning effort • Better understanding (e.g., of customers, processes, products, markets) • Expansion of knowledge • Increase in new ideas • Better formulations of problems • Avoidance of problems • Faster problem solving 	<ul style="list-style-type: none"> • Improved decision making • Fewer mistakes • Don't repeat mistakes • Less rework/better reuse, don't duplicate work • Don't compete on price • Better productivity • Faster cycle times to problem resolution • Faster customer response time • Faster new product cycles • Improved process quality • Reduce time and cost for search • Reduced training time and cost • Increased individual and/or team-training activities • Wider range of options considered 	<ul style="list-style-type: none"> • Increase in sharing and dissemination of information and knowledge • Increase in varied interpretations • Increase in identification of underlying non-obvious problems and issues • Increase in understanding of multiple interpretations • Mechanisms ... (e.g., different levels of automation, sophistication) • Increase in confidence • Better formulations of problems/ issues • Not heavily dependent on few individuals • Increase in organizational memory • Transferring second-hand experience; corporate intelligence • Transferring best practices • Openness • Benchmarking 	<ul style="list-style-type: none"> • Operating efficiency and quality • Increased market share • Improved profitability • Increased ROI • Improved customer satisfaction • Increased sales revenue • Improved products (quality) • Improved services (quality) • Reduced costs (e.g., R&D) • Maintaining pace with market leaders • Improved growth (e.g., customer base, market share) • Improved employee satisfaction • Increased expertise (personal, team, and/or org.) • Increased number of innovative products/services • Higher expectation of results (arising from confidence) • Increased shareholder value

by tracking usage patterns for intranets, expert networks and other search-facilitating systems.

The basic attitudinal measures involve the willingness to accept new information and the development of better understandings and improved problem formulations based on the information that is received. The first column of Table 3 provides a list of suggested measures for the two earliest stages of the process.

Behavioral assessments are more objective in nature. This category includes improvements in decision-making and/or personal productivity, fewer mistakes, and fewer repetitions of errors. Suggested measures are shown in the second column of Table 3.

Measures of Learning assessments (third column in Table 3) include many of the same benefits that are achieved in the cognitive and post cognitive phases, except that in the learning phases these benefits are achieved through multiple individuals sharing their interpretations and the consequences of their actions.

VII. LIMITATION

A major limitation of our framework is the linearity of the model presented in Figure 1. In providing an evaluation framework for Knowledge Management and Learning Organizations, we simplified a complex model by imposing constraints on the dissemination process and eliminated the feedback loop. Although we argue that dissemination occurs primarily during the diffusion phase, we recognize that often, in real organizations, knowledge dissemination occurs throughout the process and vertically in all levels and direction. For simplicity, we chose not to present various dissemination and feedback loops. We believe that such cybernetics notions of self correction are valuable and worthy of future research consideration.

VIII. CONCLUSION

The basis for competition during the last decade started to shift toward how well knowledge is managed to gain competitive advantage, increase employee and customer satisfaction, increase profits, improve efficiency, and lower customer costs [O'Dell, 1996; Davenport, DeLong, and Beers, 1998; Epstein, 1998; Wah, 1999]. This shift, suggests that it is important to be able to assess and evaluate progress in Knowledge Management and Learning Organization activities.

In this article, a framework for evaluating Knowledge Management and the Learning Organization is developed based on an information/knowledge value chain. This chain describes the steps in the process of acquiring, refining, applying and communicating information and knowledge throughout the organization. The Information/Knowledge value chain model serves not only as a basis for evaluation, but as a planning tool for the further development of knowledge management and the creation of a learning organization.

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