

# Organizational Measures as a Form of Knowledge Management: A Multitheoretic, Communication-Based Exploration

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**One form of knowledge management is the use of measures, to foster learning, to transform individual tacit understanding to shared explicit sensemaking, to evaluate and improve processes and customer service, and even to rationalize and control organizational activities and workers. This article summarizes and applies four theoretical approaches—organizational learning, sense-making, quality management, and critical theory—to explore how measures are constructed, interpreted, and used within organizational settings as forms of knowledge management. The primary principles, the role of communication, and the role of measures are summarized for each approach. The article ends by discussing some implications of measures in general and this multitheoretic conceptualization of measures in particular for knowledge management.**

## Introduction

Organizational measures may be conceptualized and analyzed as one manifestation of organizational knowledge. However, there are many assumptions and philosophies embedded in any particular implementation and use of measures. We explore four theoretical approaches to understanding organizational measures as a form of knowledge management: organizational learning, sense-making, quality management, and critical theory.

## Organizational Knowledge Management and Measures

The organizational knowledge necessary to manage and apply resources and their resultant services, and to generate

new knowledge, is embedded in documents, procedures, policies, technology, behaviors, employees, relationships, and culture (Alavi & Leidner, 2001; Polanyi, 1998). This implies the need to create, store/retrieve, transfer/disseminate, and apply knowledge—both explicit and initially tacit—among organizational members dispersed across time and boundaries. Creation may involve developing or acquiring knowledge, as well as refining it (through adding value, cleansing, labeling, indexing, sorting, abstracting, standardizing, integrating, and recategorizing). Transfer also implies presentation, or the displaying and reporting of knowledge in ways that contextualize it (Zack, 1999). Primary categories of knowledge content are declarative knowledge (meaningful concepts, categories, definitions), procedural knowledge (processes, actions, sequences of events), and causal knowledge (rationale for actions or conclusions), with linkages among all three (Zack, 1999).

Knowledge management presumes that creating and disseminating knowledge are primary organizational capabilities, with knowledge, or stocks of expertise, as a key organizational asset (Nonaka & Takeuchi, 1995; Starbuck, 1992). Thus, as it is difficult to extract and appropriate outside of the organization, organizational knowledge is a potential source of competitive advantage (Alavi & Leidner, 2001; Stenmark, 2001). Unfortunately, it is also often difficult to extract, share, and analyze even within organizations. Spender (1998) argues that the truly significant contribution of sharing tacit knowledge is to create organizational public goods, which create more benefits than the sum of individuals' knowledge, and make those benefits available to a wider internal community. The extent and form of knowledge sharing is influenced by organizational norms, whether the knowledge is personally or organizationally owned, and whether the sharing is internal or external

(Jarvenpaa & Staples, 2001). Indeed, there is no specific, isolated knowledge, but, rather, a "situated knowledge web," as knowledge is embedded in individuals, connections between individuals, and artifacts (Nidumlolu, Subramani, & Aldrich, 2001). One common objective of knowledge management practices is to implement one or more kinds of knowledge repository, to gather, organize, disseminate, and make available knowledge, and pointers to individuals with expertise and shared interests, throughout the organization.

One manifestation of such organizational knowledge is organizational measures.

"Measurement is experiencing a revival . . . In an environment of rapid change, decentralization, globalization, and a move from manufacturing to service industries," critical organizational decisions as well as daily practices are based on information from and analysis of reliable measures (Lingle, 1997, p. 19). Through insights provided by feedback from measures, individuals and organizations can choose to maintain the current situation, make necessary changes, or transform the organization. Measures may represent all three categories of knowledge content: declarative knowledge (what requires attention, how organizational processes are categorized), procedural knowledge (what sequences of events constitute a process), and causal knowledge (what phenomena are related as implied by the analysis of measures). In other words, organizations can manage knowledge through measures.

However, the conceptualization, use and consequences of this form of knowledge may have multiple interpretations and implications. The following two sections first review the wider historical context of, and the particular importance of communication in, the conceptualization and use of organizational measures. The subsequent sections apply four relevant theoretical approaches for considering the particular form of knowledge management referred to as measurement.

### Measurement History and Current Trends

Of course, measurement and quantification are not new ideas. As Crosby (1996, p. 18) states: "western civilization's acquaintance with quantification certainly dates at least as far back as the Neolithic (my herd has twelve goats and yours only seven), but millennia passed before it became a passion." This "passion" developed at different rates for different areas of study and for different parts of the world. Measurement advances in physics, mathematics, and astronomy paved the way for measurement systems in the areas of economics, sociology, and psychology (Woolf, 1961). For example, basic mathematical principles would eventually allow the psychologist to measure reaction time and individual differences (Boring, 1961).

Collecting, analyzing, coordinating and sharing information has been central to the rise of modern states and institutions from the late 19th century (Beniger, 1986) and earlier (Chandler & Cortada, 2000). Detailed measurement

became more explicitly central to organizational functioning through principles of scientific management and Taylorism, and the general application of the science metaphor to social contexts (Day, 2001). Organizational measurement has resulted in the routine quantification of such areas as sales, profits, productivity, inventory, stock prices, etc.

By the 1950s more and more workers were involved in "the production and distribution of knowledge" (Machlup, 1962, as cited in Beniger, 1986, p. 21). Some have argued that the role of measurement in United States organizations really began with the quality movement in the 1950s (Czarnecki, 1999). Organizations of the 1970s and 1980s were concerned primarily with accounting-based, financial measures. But these traditional accounting-based measures "are too historical; lack predictive power; reward the wrong behavior; are focused on inputs and not on outputs; do not capture key business changes until it is too late; reflect functions that are not cross-functional processes within a company; and give difficult to quantify items, such as intellectual capital, inadequate consideration" (Brancato, 1997, p. 10).

Many approaches to the study of measures tend to conceptualize them as isolated quantitative indicators, and view them strictly for what they can offer to management and the organization's bottom line. For example, much of the current work that addresses measures simply offers a listing of the measures organizations should be collecting and how these can be used to support strategic planning and other management initiatives (Brancato, 1997; Czarnecki, 1999; Lingle, 1997).

By the late 1980s and into the 1990s, many organizations were beginning to recognize the value of nonfinancial measures. Measures of customer and employee satisfaction had as much to say about the current status of an organization as did traditional measures of sales and profits. Recent trends in organizational management such as the balanced scorecard approach, quality management, and business process reengineering have extended the domain of measurement to quantification of such complex concepts as customer and employee satisfaction, shared sense of mission, innovation and learning, and process effectiveness (Kaplan & Norton, 1996).

Measures and measurement systems are important for all types of organizations. For example, educational institutions rely on measures relating to enrollment, attrition, and student performance (Ruben, 1995; Ruben & Lehr, 1997). Health care institutions use measures of admission rates, insurance claims, incidence and diffusion of illnesses, and length of stay, among others.

Given this brief background, and our present purposes, we define organizational measures as explicit definitions of the characteristics, or comparison to criteria (performance, in general), of organizational inputs, processes, and outputs, or stakeholder behaviors and perceptions. Measures involve the use of symbols (text, numbers, images, etc.) to communicate about, and are symbols themselves for, activities in progress, processes, performance, results and consequences,

responses to those processes and outputs, perceptions, attitudes, evaluations, and so on. They may include or imply more or less organizational context, and may be the site of more or less shared meaning. For the purposes of this conceptual exposition, we do not distinguish between the levels (individual, group, organization, or industry), or the nature (qualitative or quantitative) of measures, although these may have different implications for understanding various organizational phenomena, such as the relationship between organizational productivity and information technology (Chan, 2000).

### Multiple Theoretical Perspectives Applied to Organizational Measurement

Different philosophical and theoretical approaches toward measurement, held by management, members, other stakeholders, and researchers, will influence what is considered as measurement, how it is implemented and analyzed, and what role it plays in organization and member behavior and perceptions. Multiple theoretical lenses provide a richer, more comprehensive basis for understanding phenomena in general, and knowledge management (here, measures) in particular (Burrell & Morgan, 1979; Gioia & Pitre, 1990; Hassard, 1991; Lee, 1991; Papa, Auwal & Singhal, 1995).

The approaches applied here include organizational learning, Weickian sensemaking, quality management, and critical theory. Each of these can be used to conceptualize measurement, in the context of knowledge management, in different though sometimes overlapping ways. Of course, other theoretical frameworks could be used, such as a feminist theory, rhetorical criticism, cultural studies, systems theory, or an organizational decision-making approach. However, the present four frameworks seemed to be particularly valuable for their contributions to the understanding of organizational measures. Each of the following sections summarizes that theory's argument, the role that communication plays within the approach, and the theory's relationship to organizational measures.

### Organizational Learning

The organizational learning approach suggests that the organization is more than a collection of isolated individuals, and is capable of, and indeed depends upon, learning (Argote, 1999; Argyris & Schön, 1996; Huber, 1991; Kim, 1990; Levitt & March, 1995; Locke & Jain, 1995; March, 1991, 1999; Senge, 1990; Simon, 1991; Stata, 1989). Organizational learning can be characterized as occurring only under specific unique conditions, as a mature stage of organization development, or as something innate to organizations that may take different forms (DiBella & Nevis, 1998, p. 4). Overall, organizational learning is most often treated as an extended process through which organizations grow, change, adapt, and improve to remain viable.

There are two primary levels of learning: single loop learning, and double loop learning. In *single loop* organizational learning, variations from a criterion, or errors, are detected that indicate the need for modifying organizational action, and then the appropriate process is corrected so that outputs are once again within organizational norms and established variance levels (Argyris & Schön, 1996, pp. 20–21; Choo, 1995). Single-loop learning is where a particular implementation of information can be evaluated, validated or verified. In *double loop* learning, however, observed actions provide a first feedback loop to organizational members, who then act as a second feedback loop by changing existing organizational "theories-in-use," norms, and values (Argyris & Schön, 1996). Double-loop learning is where knowledge is generated from information: more specifically, where the process of implementing information is evaluated, validated, verified, and adapted.

It is not necessarily the case, however, that all organizational members learn the same lessons, that action follows from learning, that lessons learned remain valuable, or that learning necessarily generates positive outcomes; and organizations can learn, but still decline. Wallace Company, an oil equipment company, had learned enough about itself and its processes to win a Malcolm Baldrige National Quality Award in 1990. Two years later the company filed for Chapter 11 as its internal costs rose and oil prices collapsed (Greising, 1994).

The organizational learning approach underscores the importance of distributing and organizing knowledge for reuse by others and at later times. Markus (2001) proposes four types of knowledge reusers: (1) shared work producers (who later reuse the knowledge they produce), (2) shared work practitioners (who reuse each others' knowledge), (3) expertise-seeking novices, and (4) secondary knowledge miners. Measures can link users and experts, reducing the conceptual and applied distance between the creators and reusers of knowledge.

Organizational learning involves a variety of related fundamental concepts. Among these are the role of the individual, the place of routines and organizational memory, the type of learning, the role of theory in learning, how organizations learn, and the transition from individual to organizational learning. Table 1 summarizes the core concepts embedded in organizational learning.

#### *The Role of Communication in Organizational Learning*

Communication allows for the sharing and interpretation of the routines and protocols that are a key part of organizational memory. An individual must participate in some initial act of communication before any corrective (single-loop) or modifying (double-loop) learning can be taken. Communication processes allow for the transformation of tacit knowledge to explicit knowledge, and then the dissemination and interpretation of this knowledge that other organizational members can apply, and which the organization can retain for future use. Communication, though not

TABLE 1. Core concepts of the organizational learning approach.

Role of the individual	<ul style="list-style-type: none"> <li>• Learning occurs at individual level</li> <li>• Organizational learning is metaphorical</li> <li>• Organizations only learn through experiences and actions of individual</li> <li>• Organizations can learn even if not all individual employees learn</li> </ul>
Routines and organizational memory	<ul style="list-style-type: none"> <li>• Behavior in organizations is driven by routines</li> <li>• Routines are transmitted through a variety of methods including socialization and education</li> <li>• Routines and other protocols are part of the organizational memory</li> <li>• Portions of organizational memory are external to the organization</li> <li>• Portions of organizational memory may be lost with employee turnover</li> </ul>
Type of learning	<ul style="list-style-type: none"> <li>• Single loop learning—corrective action; also referred to as adaptive learning and lower level learning</li> <li>• Double loop learning—modification of underlying process; also referred to as generative learning and higher-level learning</li> <li>• Triple loop learning—the organization questions its own learning method</li> </ul>
The role of theory	<ul style="list-style-type: none"> <li>• Espoused theories—how we talk about what we do</li> <li>• Theories in use—what we actually do at work</li> <li>• Alignment between espoused theories and theories in use</li> </ul>
How organizations learn	<ul style="list-style-type: none"> <li>• Adoption of disciplines</li> <li>• Learning from self and others</li> <li>• Striking balance between system-structural approach and interpretive approach</li> <li>• When individual learning is transferred to other organizational members</li> </ul>
Moving from individual to organizational learning	<ul style="list-style-type: none"> <li>• Dissemination of individual lessons learned to other organizational members</li> <li>• Information distribution and interpretation</li> </ul>

noted as a core value by itself in the organizational learning literature, is integral to the fulfillment of the core concepts associated with organizational learning (Daft & Huber, 1987). Learning occurs in the context of communities of practice and the web of social and material relations (Brown & Duguid, 1996). These “communities” or “groups” are often without a formal boundary or organizational identity; they emerge as participants and situations unfold. So, knowledge management needs to detect and support such communities rather than create and design them (p. 71). These are what Zack (1999) terms interactive knowledge management applications, which integrate tacit knowledge through social interaction among organizational members. Thus, measures must be developed, discussed, applied, and revised by the community of practice, including both central and peripheral members. The formal description of “work” (espoused theory) and how it is actually accomplished (theory in use) may be quite different (Gasser, 1986; Orr, 1996). What is necessary to accomplish one’s work is highly contextualized, possibly ephemeral and time-bound, often at odds with formal procedures, and difficult to explicate. Thus, transforming this context and understanding from tacit to explicit knowledge that can be shared—bridging the gap between espoused and in-use theory—is problematic. So, because people may not know what tacit knowledge they have, may wish to withhold tacit knowledge that they are aware of, and simultaneously hold an “espoused theory” of what is involved in accomplishing the work that is quite divergent from their tacit knowledge and actual activities, relying on an uninvestigated and supposedly “shared” understanding of specific organizational processes may be quite erroneous, dangerous, and damaging. The perfor-

mance of actual practice requires deviation from formal procedures, as systems and diagnoses based upon measurements of those systems are ambiguous, flawed, and unpredictable. Thus, excessively procedural documentation can actually result in providing less useful information to the worker (Brown & Duguid, 1996, p. 62). Communication about, and through the lens of, measures is one way that organizational members can share knowledge about how actual organizational practice is performed.

### *The Role of Measures in Organizational Learning*

Measures then are a form of information that individuals can use, must communicate about, and potentially learn from. In fact, DiBella and Nevis (1998, p. 67) identify “concern for measurement” as one of the factors that support the acquisition of knowledge necessary for the learning cycle to be complete. As they explain: “measurement is part of any adaptive learning system” that helps organizational members to “decide if they are on course or if corrections are needed.” From a learning perspective, accepted measures represent forms of explicit “organizational memory” that contain path-dependent knowledge and sources of innovation that are freed from the confines and transitoriness of individuals’ tacit knowledge (Walsh & Ungson, 1991). Measures of processes or outcomes are compared to goals or standards, and divergence can be the basis for single-loop or double-loop learning, depending on the nature of the measure and the response. Double-loop learning is particularly crucial in conditions of environmental complexity and change, and when long-term outcomes are considered. This is because what an organization learns at one time may

become irrelevant or even harmful under different conditions or at a different time. Thus, organizations may need to unlearn or relearn various practices or processes. So measures must occur at multiple levels, relating to both individual and organizational performance, and to the extent to which practices achieve specific output goals as well as contribute to longer term growth, adaptation, and survival goals. Recursively, double-loop learning requires that the performance of particular measures is also measured and evaluated, and the assessments used to change the focus, operationalization, and application of those measures.

Based on Markus's (2001) propositions, we can infer that shared work producers and shared work practitioners need contextualized measures, although the former can use more primitive measures because of their tacit understanding of the knowledge. However, measures from primary knowledge creators may be devised informally for personal use so are hard to use by others, or are developed for short-term needs. Thus, the organization loses memory of long-term needs and of higher level processes or rationales that are usually noted by users during a particular activity but then forgotten. Expertise-seeking novices need to have access to decontextualized measures, know what contextual information is useful, and understand how to recontextualize measures for their own practice; and secondary knowledge miners often have to do without in-depth contextual knowledge about the measures they use, as measures typically appear in summary and abstracted form, such as in quarterly reports. So conceptualizing measures as potential instances of knowledge reuse, or organizational learning, reveals that particular measures should be associated with related contextual information, such as through on-line linked materials, discussion lists, expert contacts, and contingency tables.

If the measure producers know that others dissimilar to themselves will use the measures, they will be more likely to shape them into public documents. But it is difficult to document rationales for particular measures, even for knowledgeable similar others, and some may wish to censor and edit some of the understanding to prevent it from becoming public history. Measure producers might intentionally want to make the problem and answer more generalizable and less contextual so that the measure applies to more situations. Thus practitioners, novices and miners may need access to the initial producers, experts, or motivations to make sense of the measures. However, reusers may misuse this explicit knowledge. To avoid misuse or misinterpretation, measure producers may document what not to do, provide images, deliberately note details, include annotations, and hyperlink measures to contingencies and comments from multiple producers and reusers. As with knowledge reuse in general, there may be several roles performed by individuals, groups, or systems in the process of reusing knowledge through measures: producer, intermediary, and consumer (Markus, 2001). Intermediaries may be needed/used to foster knowledge reuse even among those who will reuse the knowledge themselves.

Learning occurs in the context of practice and the web of social and material relations within and across an organization (Brown & Duguid, 1996): to learn particular knowledge requires becoming an "insider," learning how to function within a particular community, and developing a perspective and speak a language. Thus, measures must be developed, discussed, applied, and revised by the community of practice, including both central and peripheral members.

### Weickian Sensemaking

People need help (within and across time, location, and organizational boundaries) in making sense of and resolving complex problems (Weick, 1979). Weick (1995) labels the state of confusion and uncertainty that can stem from these complex problems as "equivocality," or, more recently (1995), "ambiguity." One of the aims of organizing (and often the explicit function of managers and supervisors) is to reduce equivocality. Weick clearly emphasizes the "activity of organizing rather than the structure of organizations" (Bantz & Smith, 1977, p. 171). Organizations would not exist were it not for the process of organizing due to the need to deal with and resolve issues and problems.

To address this notion of equivocality reduction, Weick's theory of organizing identifies four sets of interlocking processes constituting organizational sensemaking: ecological change, enactment, selection, and retention. Sensemaking begins with *ecological change*, "when there is some change or difference in the organizational environment, resulting in disturbances or variations in the flows of experience affecting the organization's participants" (Choo, 1998, pp. 5-6). This may be sensed directly, or relative to some measure. *Enactment* is the process whereby individuals create their environments through attending to and interpreting certain phenomena. From Weick's (1979, p. 27) point of view, "organizing consists of adapting to an enacted environment, an environment which is constituted by the actions of the interdependent human actors." One must do more than just "discover"—respond to changes detected in environment—but also "enact"—proactively interpret the environment through experiments and probes. "The process of innovating involves actively constructing a conceptual framework, imposing it on the environment, and reflecting on their interaction" (p. 74). For example, often the nature of work and organization must be reconceptualized—including the development of entirely new measures—to take advantage of the potential of a new practice or technology (such as word processing, see Johnson & Rice, 1987; or the office copier, see Brown & Duguid, 1996, p. 76; Orr, 1996).

Members collectively make sense by *selecting* from alternative explanations of this enacted environment. During the selection process, answers are generated to the question: "what is going on here?" (Choo, 1998). Then, selections and the related actions that are deemed useable or functional at that moment are retained for future use, thus generating routines for use in nonequivocal situations, or as initial

TABLE 2. Core concepts of Weickian sensemaking.

Grounded in identity construction	<ul style="list-style-type: none"> <li>• One cannot divorce sensemaking from the self</li> <li>• All sensemaking activity is grounded in the identity of the sensemaker</li> </ul>
Retrospective	<ul style="list-style-type: none"> <li>• All sensemaking is retrospective: we make sense of action after it has taken place</li> <li>• Individuals can only know what they have done after they have done it</li> </ul>
Enactive of sensible environments	<ul style="list-style-type: none"> <li>• The individual is a cocreator of the environment in which they exist</li> <li>• As cocreators of the environment, we strive to enact environments that are sensible</li> <li>• Enactment also includes reflection, selection, and interpretation</li> </ul>
Social	<ul style="list-style-type: none"> <li>• Sensemaking is inherently social</li> <li>• Identity construction is a social activity</li> <li>• Enactment is a social activity</li> <li>• The language and talk of the workplace is social</li> <li>• The stories created to make sense of workplace activity have a social component</li> </ul>
Ongoing	<ul style="list-style-type: none"> <li>• Sensemaking never starts and never stops: it is a continuum</li> <li>• The flow of organizational life is marked by interruptions</li> <li>• The interruptions that mark the flow of organizational life have an emotional component</li> </ul>
Focused on and by extracted cues	<ul style="list-style-type: none"> <li>• People "chop" moments from time to reflect on and make sense</li> <li>• Sensemaking can vary depending on the cues or moments that are extracted from time</li> <li>• What extracted cues become also depends on the context of the continuum from which they are drawn</li> </ul>
Driven by plausibility rather than accuracy	<ul style="list-style-type: none"> <li>• Accuracy in sensemaking is not necessary</li> <li>• Sensemaking is governed by the plausibility of the argument being made</li> <li>• Stories as the most appropriate method for developing plausible and coherent accounts of what has occurred</li> </ul>

attempts to reduce equivocality. Overall, organizing is an on-going, cyclical process. Organizations structure and are structured by the sensemaking practices that they use. The goal is to create and foster an organizational culture that is conducive to sensemaking, one that allows for the development of plausible, coherent, and memorable stories and double interacts that aid in reducing equivocality for members of the organization.

Weick (1995, p. 17) identifies seven core characteristics that set sensemaking apart from ideas such as interpretation, attribution, and others: grounded in identity construction, retrospective, enactive of sensible environments, social, ongoing, focused on and by extracted cues, and driven by plausibility rather than accuracy. Table 2 summarizes these seven core concepts.

#### *The Role of Communication in Sensemaking Theory*

Communication is firmly embedded in the Weickian sensemaking framework. Identity construction, retrospection, enactment, socialization, extraction, and the construction of plausible stories all have communicative elements. Within each of the four primary processes, a participant might engage in one or more cycles involving the responses and iterative interpretations of other individuals. "The person performs some action [act], which is accepted or rejected by a second person [interact], after which the first person makes some response to what the first person did [double interact]" (Weick, 1979, p. 74). It is the actions and behaviors involved in these cycles of social interaction and interpretation that foster sensemaking, a shared interpreta-

tion that is tentatively retained as organizational knowledge. Weick (1995, p. 75) notes that "If the communication activity stops, the organization disappears. If the communication activity becomes confused, the organization begins to malfunction." Thus, Weick suggests that sensemaking research should study the use of language and words.

Organizational members need to experiment with different narratives to see which one best recreates the context of the problem and provides the best understanding about how to resolve it. This also leads to a revised, convergent retained narrative that contributes to organizational memory and facilitates knowledge reuse. Constructed narratives—including knowing what and when to tell—also help develop the individual worker's identity as well as the identity of the community of practice (Brown & Duguid, 1996). The importance of narrative does not reject the concept of causation or the utility of measures; indeed, the goal of a coherent narrative from users, clients, other workers, specialists, revised through working with the system or problem, is often a causal account.

#### *The Role of Measures in Sensemaking Theory*

Using the sensemaking approach, we can conceptualize measures as the agreed-upon, retained, set of procedures and routines for enacting environments and selecting interpretations. Retention creates organizational memory or knowledge stock, provides a mechanism for knowledge reuse, and may take the form of tentative or well-developed measures. Measures might be used to indicate the level of equivocality surrounding certain tasks, as provide an indi-

TABLE 3. Core concepts of the quality approach.

Customer Focus	<ul style="list-style-type: none"> <li>• Clear identification of consumers—both external and internal</li> <li>• All activity should be in support of consumers' needs and customer satisfaction</li> <li>• Move beyond simply meeting customer needs to exceeding customer needs</li> </ul>
Leadership	<ul style="list-style-type: none"> <li>• Top management support as critical to quality program success</li> <li>• Leadership must include both talk and action</li> <li>• Leaders must lead by example</li> <li>• Importance of creating a system that allows for leadership at all levels of the organization</li> </ul>
Communication	<ul style="list-style-type: none"> <li>• Necessity of feedback systems and loops for customers—both internal and external</li> <li>• Necessary for obtaining information regarding customer needs and expectations</li> <li>• Use of multiple methods in order for the organization to "tell its own story"</li> </ul>
The use of data	<ul style="list-style-type: none"> <li>• Insights into customer needs must be rooted in reliable information</li> <li>• Gathered to track processes and procedures used by the organization</li> <li>• Allows for tracking processes and outcomes over time</li> <li>• Use of both qualitative and quantitative methods to gain a comprehensive picture of the organization and its customers</li> <li>• Allows for comparison to competitors—"benchmarking"</li> </ul>
Organizational assessment	<ul style="list-style-type: none"> <li>• Necessity of looking "inward" at the start of, and during, any quality initiative</li> <li>• Use of the Malcolm Baldrige National Quality Award criteria for internal—and possibly external—assessment</li> </ul>
Continuous improvement	<ul style="list-style-type: none"> <li>• Recognition that quality does not occur naturally or within a short amount of time</li> <li>• Commitment to long-term change and improvement</li> <li>• Based on Japanese concept of "kaizen"</li> </ul>

cation of how well a retained response is reducing that equivocality. But measures can also constrain sensemaking, by enacting an narrowly defined environment, limiting the occurrence of double interacts, or retaining responses that do little to reduce equivocality.

### The "Quality" Approach

The quality approach suggests that organizational actions should be driven by the needs and expectations of the organization's stakeholders (such as customers). Toward fulfillment of this goal, the quality approach emphasizes attention to the processes and people that contribute to the products and services used by the customer. This means assessing the efficiency of internal processes and supporting the employees who fulfill the tasks associated with these processes. Also central to the quality approach is the recognition that there is always room for improvement and that commitment to continual and incremental improvement is necessary to compete in today's marketplace.

Key features of quality management include: (1) a process orientation (not just attending to output characteristics); (2) customer focus (the utility function of both internal and external consumers, identified through design teams, focus groups, surveys, complaints, etc.); (3) an analytical and factual basis for process improvement (based on experiences and innovations provided by those involved with the subprocess, subject to evaluation and testing and not for instant implementation); and (4) leadership and participation (management is primarily responsible for problems because management designed and implemented the processes and systems, so "management must behave so as to provide a supportive structure within which people at lower

levels can act effectively to improve performance"—Winter, 1996, p. 470).

Interest in the quality approach has grown steadily in recent years, and as such, it would be difficult to find a U.S. company that has not applied some fundamental quality management concepts to some aspect of their business (Flynn, Schroeder, & Sakakibara, 1996; Ittner & Larcker, 1996). Many of the techniques of total quality management can be traced to Shewhart (1931), but others credit W. Edwards Deming, a physicist, with launching the quality movement by bringing his ideas to Japan after World War II (Aguayo, 1990; Dobyns & Crawford-Mason, 1994; Gabor, 1990; Grant, Shani, & Krishnan, 1994). Deming delineated two means of process improvement: changing the "common causes" that were systemic, and removing the "special causes" that produced nonrandom variation within systems (March, 1994, p. 140). Common causes included poor product design, while special causes might include a worker's lack of knowledge. Common causes were the responsibility of managers while special causes were the responsibility of operators. Deming taught that 96% of the causes can be labeled common, while only 4% would be labeled as special, firmly placing the bulk of the responsibility in the laps of managers (Ross, 1989). The key method that Deming used for distinguishing between common and special causes was statistical process control, deeply grounded in precise measurement and variance feedback. Over the years, Deming's methods have been expanded and modified by numerous other quality gurus including Crosby (1996), Feigenbaum (1983), Ishikawa (1985), Juran (1990), and Taguchi (1986; Ross, 1989). What began as a movement driven by statistical process control has given way to a much broader philosophy and approach to quality as can be found in the writings of

Garvin (1993) and some of the work of Drucker (1991). This revised and expanded approach to quality clearly focuses on customers, employees, innovation, and a growing sense of social responsibility. Also, quality approaches have branched out to include most, if not all, functions within an organization, not just the manufacturing plant.

Many organizations have moved away from using the traditional "TQM" term or acronym because it tends to raise unfavorable images of statistical quality control and, consequently, Taylorism and scientific management. However, certain themes and concepts remain, "values that transcend various approaches" (Ruben, 1995, p. 10). These include: customer focus, leadership, communication, use of data, organizational assessment, and continuous improvement. Table 3 summarizes these core concepts of the quality school of thought.

#### *The Role of Communication in the Quality Approach*

Communication plays an integral role in the quality approach, and is embedded in each of the core concepts of the framework. Communication is necessary for learning about internal and external customer needs and expectations, for constituting and conveying leadership, for using data and assessment, and for continuously identifying and implementing improvement. A "quality management" corporate culture influences the nature, form, and frequency of organizational communication (Fairhurst, 1993) about measures such as customer satisfaction or error rates. The quality approach explicitly and formally implements communication processes and structures, such as increased feedback across levels, explicit and understandable procedures and product/service requirements, and collection and analysis of evidence through flowcharts and diagrams (Riordan & Gatewood, 1996, pp. 322-323).

#### *The Role of Measures in the Quality Approach*

A substantial portion of the knowledge forming the basis of organizational capabilities is tacit, derived from an organization's particular history, and influenced somewhat by imitation across boundaries (Winter, 1996). Because of its tacit nature, and also because it is fragmented and distributed within an organization, knowledge is inherently difficult to understand or communicate. Significant improvements may be unseen but close at hand: current processes represent past satisficing, and may well be a local, not a general, optimum, but in no way a maximum or ideal solution (Simon, 1991). Thus, the quality management approach presumes that intensive self-assessment through measures of current processes, as well as external comparative benchmarking, are required for understanding and improving organizational capabilities, to overcome habit, tradition, ignorance, and fragmentation.

In the quality approach, measures function as the raw data and information used by companies to drive improvement efforts. Measures document processes and outcomes,

sources of problems, causes of insufficient quality, and the consequences of changes in these processes. The quality management approach presumes that the tacit knowledge in organizational routines may become both identified and communicated through designed interactions and processes, such as the development and assessment of measures. Note that some aspects will remain tacit, either individually or organizationally, leading to inadequate improvement or even negative consequences. However, by constantly assessing each process and its associated measures, these can be identified and improved in the next iteration.

Although measurement is crucial for the success of TQM, "measuring the wrong things can lead a company into trouble very quickly" (Brown, Hitchcock, & Willard, 1994, p. 84). Some organizations measure only the quality program activities themselves (e.g., the number of process improvement teams) rather than aspects of organizational processes or important results from those processes. Other common mistakes that organizations make with regard to measures include compiling too much data, failing to base decisions on data, unspoken measurements, incomplete measurements, and inconsistent measurements. So the simple existence and use of organizational measures in no way represents or guarantees improvement. Nonetheless, "the pursuit of improvement relative to measurable, analyzable proximate goals is the heart and soul of quality management" (Winter, 1996, p. 479).

#### **Critical Theory**

Modern critical theory can be traced to the works of Karl Marx (Alvesson & Willmott, 1996). At the risk of oversimplifying his position, Marx (1944) believed that the lines of division between business owners and employees, one of the fundamental tenets of a capitalist society, were unfair, and would lead employees to overthrow the organization. Marx's ideas were later adopted and adapted by a group of professors at the University of Frankfurt, often referred to as the Frankfurt School (including Horkheimer, Adorno, Marcuse, Fromm, and Habermas). The contributions of these theorists have evolved and been adapted into what has come to be known as critical organizational theory.

Critical theorists view the organization as a system of domination where those in power (owners, managers) exert control over those without power (employees, even customers). The central goal of critical theory is to reveal these systems of domination and oppression by peeling away the layers of discourse to reveal the power structures that exist beneath. Such awareness should lead to positive results for *all* organizational members (Alvesson, 1996). Critical organizational theorists focus much of their attention on minority groups (women, laborers, Blacks, and Hispanics), but acknowledge that employees at all levels are oppressed by those who are in power (Clegg, 1989).

Central to a critical approach is a concern with the problem of locating and monitoring knowledge and expertise: can it be left with the worker, or should it be controlled

TABLE 4. Core concepts of critical theory.

Power and the knowledge–power connection	<ul style="list-style-type: none"> <li>• Power is not held by a person, but is granted to a person by others</li> <li>• Power can be overt or covert: surface or deep</li> <li>• The possession of knowledge or information can be perceived as holding power</li> </ul>
Language and discourse	<ul style="list-style-type: none"> <li>• Language, linguistic enactment, and discourse are used by managers to establish and maintain power</li> <li>• Language is not simply representational, it is value-laden</li> <li>• Language can provide both division and unity, it can include certain individuals while excluding others</li> </ul>
The role of ideology	<ul style="list-style-type: none"> <li>• Basic assumptions about how things are or how they should be</li> <li>• Accepted ideologies shift over time</li> <li>• Ideologies can be weak or strong</li> <li>• The dominant ideology governs organizational behavior</li> </ul>
Domination and oppression	<ul style="list-style-type: none"> <li>• Those that are dominated and oppressed by society will be dominated and oppressed by the organization</li> <li>• Expression of domination and oppression can lead to displays of power</li> <li>• Closely related to exploitation: organizations consume and use employees for economic benefit</li> <li>• Employee health and mental well-being are sacrificed for economic benefit</li> </ul>
Organizational culture as the locus of control	<ul style="list-style-type: none"> <li>• Corporate culture as the focal point through which corporations control employees</li> <li>• The rhetoric of culture provides opportunities for normative control</li> <li>• The culture controls individual behavior thus controlling the employee's identity</li> </ul>
Emancipatory intent	<ul style="list-style-type: none"> <li>• Reveal systems of domination and oppression</li> <li>• Reveal the existing power structures</li> <li>• Free organizational members from both the visible and hidden structures of power</li> </ul>

by management? The development and application of measures in particular, and knowledge management in general, can be seen as part of a drive by owners and managers to encourage and exploit “creativity” as a controllable, measurable, and predictable process. Thus, there is some inherent conflict in the phrase “knowledge management” (Chumer, Hull, & Prichard, 2000; Malhotra, 2000).

Several core or key concepts in contemporary critical theory include: power and the knowledge–power connection, language and discourse, the role of ideology, domination and oppression, organizational culture as the locus of control, and finally, emancipatory intent. Table 4 offers an overview of these core concepts and values.

#### *The Role of Communication in Critical Theory*

Communication functions as the process through which each of the core concepts is achieved and manifested. Communicative processes manifest both overt and covert forms of power. Communicative action can foster domination, oppression, and exploitation, and communicative activity constitutes and conveys organizational culture with its accompanying ideology. For example, Day (2001, p. 2) argues that “professional and authoritative texts about the social importance of information tried to use language . . . to construct a social, utopian value for information and helped to raise information and its connotations of factuality and quantitative measure to a privileged, even totalitarian, form of knowledge and discourse.” Yet it is only through communication that we can hope to achieve the ideals of eman-

ipation and participation (Deetz, 1992; Habermas, 1984, 1987).

Knowledge management has, in the past, treated information sharing as primarily a one-way transmission of explicit, abstract knowledge, separated from context and site, or even as a rational market exchange process. Jarvenpaa and Staples (2001) argue that knowledge sharing may be better conceptualized as a social exchange process. That is, the value of what is shared is not explicit, and there may be no expectation of a specific future return. Rather, the guiding motivations are future interaction, power, reputation, and image (Culnan & Armstrong, 1999).

#### *The Role of Measures in Critical Theory*

Measures in particular and knowledge management more generally represent a large-scale struggle over the new means of production and thus over labor and management; over new forms of government and participation (governance through indirect forms of expertise, and norms of accountability); over the forms of and inherent contradictions in knowledge and positivist science; and over attempts to redefine professions as knowledge flows, knowledge resources, and embodied knowledge. Indeed, the increasing identification, codification, and application of knowledge may well be a reinvigorated version of Taylorism and capitalism, imposing new forms of authority and expertise, and exploiting individual knowledge as a corporate asset (Chumer et al., 2000).

Managers can use measures to exert and reinforce various forms of power over employees. Measures may be

implemented as part of intentional job deskilling, in a Tayloristic perception of work as programmable and routinizable. Measures also function as a form of organizational discourse that serves to oppress and dominate employees. The very language of measures can serve to limit the attention and focus of discourse within the workplace (as, e.g., embedded within the discourse and vision of "quality management"—see Fairhurst, 1993; Wendt, 1994). Those things that are being measured will be attended to by organizational members while those things that are not measured tend to remain outside organizational members' frame of interest, or even their consciousness.

Malhotra (2000) argues that organizational "control" is typically narrowly construed and practiced. Typically, organizational control is conceptualized as the exertion of influence on organizational members to make them comply with organizational goals. This form of control uses the single-loop learning model, whereby actions are evaluated against a preset standard and a sensing system that provides feedback, or measures, about how well actions match the standard. That is, feedback is used to regulate behavior, to obtain rewards or avoid punishment. In the case of knowledge management, this notion of control is often applied to the use, processing, creation, dissemination and sharing of knowledge. This is the source of what he calls the "oxymoron" of knowledge management—can knowledge, embedded in social relations and largely voluntarily shared, actually be managed in this sense of control?

Such blind compliance and convergence may create a "core rigidity," trading off adaptation for conformity (Bartlett & Ghoshal, 1995). "With its key emphasis on the obedience of rules at the cost of correction of errors (Landau & Stout, 1979), the traditional model of organizational control thus constrains creation of new knowledge and renewal of existing knowledge" (Malhotra, 2000, p. 249). These approaches tend to presume a static conceptualization of knowledge, overlooking the proactive role of knowledge workers. Rather, knowledge represents a "potential for action" that makes sense through the user's interaction with prior knowledge, especially in organizational environments experiencing rapid and perhaps discontinuous change. Such knowledge management needs to consider "ambiguity, inconsistency, multiple perspectives, and impermanency of existing information" (p. 251). In such environments, reliable and precise performance evaluation is neither possible nor appropriate. "A control system based on such measurements is likely to systematically reward a narrow range of maladaptive behavior, leading ultimately to organizational decline" (p. 250).

Latour, for example, conceptualized information as a relation between a "center of measure" and a periphery of objects that are organized by the center (Day, 2001, p. 25). Thus, measurement redefines an object by removing it from its full, natural context, and comparing it to some abstract categorization or referent phenomenon (in this sense, measurement acts as a metaphor). This allows the controlling institution to manage and redistribute the object, as well as

the discourse about the object (here, in the form of a measure), on the basis of the values, goals, and standards of the center. Day (2001) argues that Shannon's, Weaver's, and Wiener's promulgation of statistical information and cybernetics theories allowed the operationalization of culture and language by information measures, representing a "complete appropriation of textual and social hermeneutics to an ideology of information" (p. 36) and an "attempt to naturalize a technical model as a social utopia" which is really "a state of control" by systems engineering (p. 49).

Rather, a more organic conceptualization of organizations and knowledge highlights the need for experimentation, and therefore ongoing evaluation, to help systems self-evaluate and self-adapt. Organizations need to continuously examine practices through feedback and measures, but also to identify and disseminate best practices based on these evaluations. Thus, organizational control must be "ultimately self-imposed" (p. 251) and emphasize identification and correction of errors, and consideration of alternative solutions, rather than simple compliance with prespecified rules through fixed routines. Thus, long-term beneficial organizational control comes through self-leadership and self-regulation, or "proactive self-control" (Manz, Mossholder, & Luthans, 1987, p. 5), guided by consistent but adaptable feedback measures designed, applied, and assessed by the users.

### **Discussion: Measures as a Form of Knowledge Management**

We return to the stages of knowledge management introduced earlier, and apply some of the concepts of the four approaches, to speculate how measures may play a role in the creation, storage/retrieval, transfer/dissemination, and application of knowledge—both explicit and tacit—among organizational members dispersed across time and boundaries.

The extent or success of *knowledge creation* may be indicated in measures, such as patents, suggestions, new network relationships, concepts and the like. Feedback from measures may be used to stimulate or generate double-loop learning, which creates knowledge in the form of reconceptualizations and new organizational values. The quality approach explicitly, and the sense-making approach implicitly, emphasize how measures of process failures or customer needs are the basis of developing better processes and innovative products and services. The critical theory approach, as would the learning approach, highlight the opposite effect of measures, that of constraining knowledge creation through conformity to standardization and imposition of a controlling ideology.

Measures can play a central role in *storage/retrieval*, by indicating various characteristics (such as age, source, amount, etc.) as well as the extent to which stored knowledge is related to or associated with the user's or others' stated needs. Thus, as some on-line stores provide movie or book "recommender systems" based on similar retrievals or

TABLE 5. Theoretical approaches, basic assumptions, role of measures, and core questions concerning measures in each.

Theoretical approach	Basic assumptions	Role of measures	Questions concerning measures based on core concepts
Organizational learning	<ul style="list-style-type: none"> <li>Organizational learning is an extended process.</li> <li>An organization learns through its members.</li> <li>Organizational learning occurs through communication.</li> </ul>	<ul style="list-style-type: none"> <li>Measures provide the raw data and information that individuals can develop, use and potentially learn from.</li> <li>If the individual learns through the development or application of measures and distribute the shared meaning in the form of a measure, then the organization can learn as well.</li> </ul>	<ul style="list-style-type: none"> <li>used for individual learning?</li> <li>used as, understood as, or involving a metaphor?</li> <li>part of organizational routines, can be used to alter routines?</li> <li>how use to facilitate socialization, and how are members socialized toward the measures?</li> <li>used to obstruct or narrowly direct learning?</li> <li>part of organizational memory?</li> <li>what measures, sources, uses or interpretations are internal or external?</li> <li>used to accomplish single-loop or double-loop learning?</li> <li>part of espoused theories or theories in use?</li> <li>distributed to transform individual learning beyond tenure and location of the individual?</li> <li>allow for translating individual learning into organizational learning?</li> <li>what context necessary for users to apply and understand implications of measure?</li> <li>how construed by users?</li> </ul>
Weickian sensemaking	<ul style="list-style-type: none"> <li>We live in a world of uncertainty.</li> <li>Individuals organize for the purpose of equivocality reduction, through enactment, selection, retention, to "make sense."</li> </ul>	<ul style="list-style-type: none"> <li>Measures are an agreed-upon, retained set of procedures for enacting environments and selecting interpretations.</li> <li>They can both enable and constrain sensemaking.</li> </ul>	<ul style="list-style-type: none"> <li>what is the role of individual and group identity in the development and interpretation of the measure?</li> <li>how is the development and application of a measure justified retrospectively? And how are measures used respectively to explain or interpret a phenomenon or situation?</li> <li>used to make sense of job/task?</li> <li>used to reduce equivocality?</li> <li>what social relationships are involved in the development, application, evaluation, revision of measure?</li> <li>organizational language and talk associated with the measures?</li> <li>used positively or negatively in stories and accounts, in some situations and not others?</li> <li>represent, foster, or constrain single interact or double interact?</li> <li>used in an ongoing process of interpretation?</li> <li>adapted to represent that ongoing process?</li> <li>narrowly or prejudicially enact particular environment based on what is measured, and how the measures are interpreted?</li> <li>when considered okay to ignore or not apply a measure?</li> <li>in what contexts and to what extent is accuracy of measurement necessary, feasible, or misleading?</li> <li>plausibility used to rationalize away, or to better understand, measure?</li> <li>used as plausible stories to help make sense of a situation?</li> <li>used toward improving customer satisfaction?</li> <li>customers source of the measures, data, and interpretations?</li> <li>leaders use and apply measures to themselves?</li> <li>indicators of quality, leadership pervasive, and publicly displayed or accessible?</li> <li>used toward improving employee satisfaction?</li> <li>used as part of larger feedback system?</li> <li>results from measures made available to relevant organizational members at appropriate levels of aggregation?</li> <li>multiple forms of data and measures?</li> <li>reliability and utility of both data and measures themselves assessed?</li> <li>used for comparison across time, across units, across competing organizations, and across industries?</li> <li>used for self-assessment, as well as in regional and national award programs?</li> <li>part of long-term improvement plan?</li> <li>related to adaptation, improvement, effectiveness, efficiency, reputation, worker satisfaction, customer loyalty, and other quality outcomes?</li> </ul>
Quality management	<ul style="list-style-type: none"> <li>Strong orientation toward customer and employee satisfaction.</li> <li>Multiple sources of quality leadership.</li> <li>Open communication, emphasizing feedback.</li> <li>Clear delineation of internal processes.</li> <li>Constant and pervasive assessment.</li> <li>Continuous assessment, adaptation, improvement.</li> </ul>	<ul style="list-style-type: none"> <li>Measures a strong component of assessment and improvement programs.</li> <li>Measures provide the raw information needed by the organization to improve customer and employee satisfaction.</li> <li>Measures enable the organization to document internal and external processes.</li> <li>Measures enable the organization to assess itself as well as compare itself to others.</li> </ul>	<ul style="list-style-type: none"> <li>possession indicative of power?</li> <li>who "grants," defines, or acknowledges the power of the measure?</li> <li>who controls or defines data collection, analysis, interpretation, and resulting changes, and how public is this knowledge?</li> <li>access limited to those in authority?</li> <li>does form and application of measure foster unit cohesion or conflict?</li> <li>assumptions about nature of work and role of organizational member embedded in measure?</li> <li>changes in nature, focus, or definition of measure represent shifts in power and ideologies?</li> <li>who benefits from the use of the measure?</li> <li>limits attention and focus of language and discourse, preventing some tacit knowledge from becoming explicit?</li> <li>part of maintaining the dominant discourse?</li> <li>used by management to control employees?</li> <li>rooted in the culture of the organization?</li> <li>reinforces a limited notion of knowledge?</li> <li>used by employees to control their own work processes and environment?</li> <li>measures of problems, conflicts, obstacles, different organizational stakeholders used and accessible?</li> </ul>
Critical theory	<ul style="list-style-type: none"> <li>Organizations are instruments of domination and oppression.</li> <li>Power is a basic element.</li> <li>Power is maintained through language and discourse.</li> </ul>	<ul style="list-style-type: none"> <li>Measures offer an opportunity for management to dominate organizational members; they limit what can be learned and reinforce the power of those who produce the measures.</li> <li>The language of measures limits the attention and focus of discourse, and reifies the concept of "measure" as a social and cultural value and fact.</li> </ul>	<ul style="list-style-type: none"> <li>used for self-assessment, as well as in regional and national award programs?</li> <li>part of long-term improvement plan?</li> <li>related to adaptation, improvement, effectiveness, efficiency, reputation, worker satisfaction, customer loyalty, and other quality outcomes?</li> <li>possession indicative of power?</li> <li>who "grants," defines, or acknowledges the power of the measure?</li> <li>who controls or defines data collection, analysis, interpretation, and resulting changes, and how public is this knowledge?</li> <li>access limited to those in authority?</li> <li>does form and application of measure foster unit cohesion or conflict?</li> <li>assumptions about nature of work and role of organizational member embedded in measure?</li> <li>changes in nature, focus, or definition of measure represent shifts in power and ideologies?</li> <li>who benefits from the use of the measure?</li> <li>limits attention and focus of language and discourse, preventing some tacit knowledge from becoming explicit?</li> <li>part of maintaining the dominant discourse?</li> <li>used by management to control employees?</li> <li>rooted in the culture of the organization?</li> <li>reinforces a limited notion of knowledge?</li> <li>used by employees to control their own work processes and environment?</li> <li>measures of problems, conflicts, obstacles, different organizational stakeholders used and accessible?</li> </ul>

reviews by the user or other customers, a knowledge management system could obtain and provide assessments of the contextual utility, accuracy, and interpretability of what otherwise might be limited explicit knowledge.

Measures of the degree and location of knowledge *transfer* could be used to assess the absorptive capacity (ability to obtain, assimilate, recreate, reinvent, and contextualize new knowledge) of various positions or units to organizational learning, the paths by which such knowledge diffuses, the value of knowledge contributions from sources and to users, the extent to which formally individual tacit knowledge becomes collective explicit knowledge. Nonaka and Takeuchi (1995; see also Alavi & Leidner, 2001) propose *four modes through which tacit and explicit knowledge can be shared or transformed*: socialization, externalization, internalization, and combination. A measure can be used to *externalize* knowledge through making learned procedures and valued outcomes explicit. It can be used to *internalize* knowledge, that is creating new tacit knowledge from the explicit knowledge of the measure, by focusing attention to contextual, complex, or infrequent issues otherwise not attended to. A measure can foster transfer through *socialization* by focusing discussion about the purpose, nature, rewards, and interpretations of the practice or product being measured, as a locus for sense making and creating shared understandings. Interpersonal knowledge management roles such as gatekeepers, liaisons, or boundary spanners could be assessed and encouraged through transfer measures; and a measure can help through *combination*, by showing how disparate aspects of a process or practice relate to each other, or assess the extent to which participants create an integrated team.

Finally, measures are one indicator of knowledge *application*, insofar as they are embedded in directives, routines or self-contained tasks (Alavi & Leidner, 2001). Cycles of generation, application, and evaluation, fostered through single- and double-loop learning, and represented in *well-understood, but revisable, measures*, remove uncertainty and ambiguity about the value of particular processes and knowledge, improving the internal knowledge marketplace (Grover & Davenport, 2001, p. 15). Organizational measures of process and performance can also be seen as mechanisms of *knowledge reuse* (Markus, 2001), or forms of *applied organizational memory*.

Part of the knowledge repository devoted to measures should include opportunities for user commentary, indicating ambiguities or negative implications of application of a particular measure, and even "recommender" systems that suggest related measures based on how other members have used groups of measures. Or, each measure could be linked to comments and cases emphasizing problems or insights relating to each theoretical approach—organizational learning, sensemaking, quality, and critical analysis. For example, evidence of the organizational relevance of a particular measure could include the extent to which its development involved double-interacts, and ways in which it could support both single-loop and double-loop learning. All four

theoretical approaches emphasize the role of social interaction in developing and applying measures, although through slightly different mechanisms, so users could highlight the more useful forms and participants in this interaction. Alternatively, both managers and subordinates could comment on the relation of a measure to their control over their work, as a form of power. The quality approach both requires autonomy in terms of member involvement and participation, as well as highlights the important organizational asset that worker autonomy represents. Measures allow employees to seek out a better understanding of their processes and outcomes, to separate (managerial and customer) evaluations of process from individual personnel, and to become the means for exerting control over those processes. Critical theory views the relation of measures to autonomy in a more negative light, as the deep structure of the meaning of measures becomes inaccessible or at least undebatable for employees, and managers can impose the language and criteria of measures to constrain members actions. In this sense, measures can strip workers of their autonomy in decision making and sensemaking. So a measures repository might include suggestions as to how measures can be developed or applied to improve workers' control over their own sensemaking, improving retention, and equivocality reduction, and fostering more general organizational learning. It might also allow participants to suggest alternatives to the form and interpretation of a specific measure (Day, 2001).

## Next Steps

One next step would be to empirically explore the applicability of each of these four frameworks to how measures are constituted, applied and interpreted in practice, applying and assessing the basic assumptions of each of these four theoretical approaches (see Table 5). This structured approach, rooted in the core concepts of each of the four approaches, could serve as an organizing matrix for analyzing both quantitative and qualitative data, from a variety of stakeholders, through the stages of knowledge management, about organizational measures.

The goal here would be to identify common, unique, and opposing results from the various approaches, and to assess what processes, individuals, and contexts influenced those results. These insights could help guide theories and practices of knowledge management. For example, what may appear to be enlightened policies designed to foster organizational learning may, because of a reliance on formalized groups, restricted discussion of symbols, and repositories full of decontextualized measures, short-circuit double interacts and double-loop learning. What might seem to improve short-term efficiency could, unfortunately, foster isolated processes, noncollaborative communities of practice, and disenfranchised employees, harming long-term quality and organizational adaptation.

Another intriguing avenue for research would be to consider how each theoretical approach would conceptualize

and identify the sources and nature of errors in measurement (such as difficulty in applying specific measures, appropriateness for qualitative aspects such as quality or climate, lags in use and feedback from measures, difficulty in establishing accountability or ownership of a measure, etc.). Chan (2000) suggests that multiple, possibly only minimally overlapping and even contradictory measures, relevant to multiple stakeholders, are most useful.

Accepted and applied measures indicate some level of organizational learning, retention of sense-making through reduction of equivocality, benchmarks by which to evaluate processes and quality, and the extent to which jobs and organizational members are rationalized and controlled. By applying multiple theoretic approaches to analyzing the use of organizational measures, and the communication processes surrounding, and embedded in, measures, we can better understand, develop, and apply this particular form of knowledge management.

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