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Associative Patterning: The Unconscious Life of an Organization

by David Bennet and Alex Bennet¹

Introduction

Every decision made every day in an organization is a guess about the future based on past, present and anticipated activities in relationship with each other. In the brain of the decision-maker, thoughts are represented by patterns of neuronal firings, their synaptic connections and the strengths between the synaptic spaces. A single thought might be represented in the brain by a network of a million neurons, with each neuron connected to 5,000 other neurons. A decision is the result of recursive interactions between external information and internal information of relevance to the problem at hand. The intermixing of these sets of information (patterns) creates new neural patterns that represent understanding, meaning, and the anticipation of the consequences of actions, in other words, knowledge. We call this process of creating knowledge associative patterning.

For purposes of this chapter, the mind represents the patterns created by the neurons in the brain. A useful analogy is to consider that the mind is to the brain as the waves on the ocean are to the water in the ocean, that is, patterns to particles. From the objective perspective, electrical impulses flow down neuronal axons and impact other neurons through networks of connections. Since we are not able to see our own mind patterns, we interpret them as thoughts, ideas, visions, feelings, etc., some of which are stored as memory. For the sake of simplicity, we will not address the role of electro-chemical processes.

It is well-established that the storage and retrieval of memories lie in the structure, association and activities of neurons. Ascoli, head of the Computational Neuroanatomy Group at the Krasnow Institute for Advance Study, says,

... the principal axiom of modern neuroscience: the key substrate for all the functions performed by nervous systems, from regulation of vital states, reflexes, and motor control, to **the storage and retrieval of memories** and appreciation of artistic beauty, **lies** not in some 'magic' ingredient, but rather **in the structure and assembly of neurons** [Emphasis added]. (Ascoli, 2002, p. 3)

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Although there is much that is not understood about the mind/brain from a scientific viewpoint, the explosion of new technology coupled with neuroscience research is providing significant insights into the operation of the mind/brain/body. When considering tacit, implicit and explicit memory, learning and knowledge, neuronal patterns offer a useful perspective. Taking a multidiscipline approach, this chapter will move toward an understanding of knowledge and organizational memory through the lens of neuroscience, evolutionary biology, psychology, education and knowledge management. Each of these domains offers ideas, perspectives and insights that help build a holistic understanding of the nature, challenges, relationships and efficacy of memory, learning and knowledge concepts. We begin with a brief discussion of some basic concepts related to the unconscious life of an organization. We then address specific aspects of knowledge, learning and memory, providing a language and framework for comprehending their application to organizations. Finally, equipped with the perspective needed to understand the focus of this chapter, we relate these aspects of knowledge to organizational memory and briefly suggest ideas and actions leaders can consider that enhance and sustain organizational memory.

Background

As Tennessee Williams wrote in *The Milk Train Doesn't Stop Here Anymore*, "Has it ever struck you ... that life is all memory, except for the one present moment that goes by you so quickly you hardly catch it going?" (Kandel, 2006, p. 281) Memory is everywhere, stored throughout neurons in the brain and other parts of the body: approximately 100 billion in the brain; 20,000 in the heart and 6,000 in the gut. Parts of the brain act as central control systems and operating posts to connect incoming and outgoing signals to the many different regions of the central nervous system, and no two patterns of this creative process are the same.

In his three-volume study of the role of information in the structure of the Universe, the theoretical biologist Tom Stonier proposes that "organization is the physical expression of a system containing information" (Stonier, 1997, p. 14). By organization he means the existence of a non-random pattern of particles and energy fields, or more generally, the sub-units comprising any system. Stonier considers information (any organized or non-random pattern) to be a basic property of the Universe—as fundamental as matter and energy (Stonier, 1997). Along with Stonier, we take information to be any non-random pattern or set of patterns. Data (a subset of information) would then be simple patterns, and data and information would both be patterns but they would have no meaning until some organism recognized and interpreted the patterns. In other words, meaning comes from the combination of non-random patterns and an observer who can interpret these patterns to create recognition or understanding (Bennet & Bennet, 2007c). It is only when the incoming patterns from the environment are integrated with the internal neural patterns within the brain that they take on meaning to the individual. These units of understanding are referred to as semantic complexes. As Stonier explains,

... a semantic complex may be further information-processed as if it were a new message in its own right. By repeating this process, the original message becomes more and more meaningful as, at each recursive step, new semantic complexes are created. As these impinge on even larger areas provided by the internal information environment, whole new and elaborate knowledge structures may be built up—a process which leads to understanding (Stonier, 1997, p. 157).

Thus knowledge exists in the human brain in the form of stored or expressed neural patterns that may be activated and reflected upon through conscious thought. This is a high-level description of the creation of knowledge that is consistent with the neural operation of the brain and is applicable in varying degrees to all living organisms. It took 50 years of research before this process of neuroplasticity (the capability of the external environment and learning to change the internal patterns and structure of the brain) was understood and accepted by the scientific community. (For an interesting review of how this happens, see Bagley, 2007, pages 26-48.)

A broad, operational (functional) definition of knowledge then becomes: *knowledge is the capacity (potential or actual) to take effective action in varied and uncertain situations* (Bennet & Bennet, 2004). Note that use of this definition points to knowledge as a creation of the human mind. Therefore, by definition, it is information that represents an individual's or group's knowledge that is stored in libraries and various information systems, what can be called knowledge artifacts, a term initiated by George Washington University (GWU). GWU was the first university to develop a dedicated knowledge management doctoral program (Stankosky, 2005). The concept of knowledge can be somewhat confusing since the term is often used in organizations, popular literature, and technology solutions as a descriptor of "information." Nonetheless, for clarity of understanding memory and recognizing that knowledge is the result of associative patterning in the brain, we consider knowledge as composed of two parts: Knowledge (Informing) and Knowledge (Proceeding). This builds on the distinction made by Ryle (1949) between "knowing that" and "knowing how".

Knowledge (Informing), or Kn_I , is the *information* part of Knowledge; it could be implicit, explicit, tacit or any combination of these. Kn_I represents insights, meaning, understanding, expectations, theories and principles that support or lead to effective action. When viewed separately this is information that *may* lead to effective action. However, it is considered knowledge when it is used as *part of the knowledge process*. Note that when "knowledge" is described and stored in a database or book, only the information part of that knowledge is stored (and represent knowledge artifacts).

Knowledge (Proceeding), Kn_P , represents the *process and action* part of knowledge. Kn_P is the *process* of selecting information from a situation at hand and mixing it with internal information to develop new *information* (Kn_I) that guides and drives effective action. There is considerable precedence for considering knowledge as a process versus an outcome. As Kolb (1983) forwards in his theory of experiential learning, knowledge retrieval, creation and application requires engaging knowledge as a process, not a product. A large number of thought leaders in knowledge management

and related fields tie knowledge to action (Argryis, 1993; Sveiby, 1997; Wiig, 2004; Huseman and Goodman, 1999; Devlin, 1999).

A part of Kn_P , will almost always include implicit or tacit knowledge. The process we use to find, create and semantically mix the information needed to take effective action is often difficult—if at all possible—to communicate to someone else. The more complex the situation, the larger the role of tacit knowledge.

Individual memory is considered “the faculty by which things are remembered; the capacity for retaining, perpetuating, or reviving the thought of things past; an individual’s faculty for remembering things” (*Shorter Oxford English Dictionary*, 2002, p. 1744). Note that faculty represents ability, means, resources, power, capacity, inherent property, aptitude or competence. This definition of individual memory, while clearly represented as a noun, also has elements of an action (process) in terms of means and power and is very different than organizational memory. Consistent with the definition forwarded in this book, we take organizational memory, $M(\text{Org})$, to be *the body of knowledge required to achieve the strategic objectives of an organization*. That body of knowledge would be the sum of all relevant information available to employees (via artifacts) plus the sum of each employee’s knowledge plus the sum of all team knowledge throughout the organization. A way of describing organizational memory becomes:

$$M(\text{Org}) = \sum \text{Artifact } Kn + \sum \text{Individual } (Kn_I + Kn_P) + \sum \text{Team } (Kn_I + Kn_P)$$

Before we can explore the unconscious life of an organization in terms of associative patterning, it is necessary to develop a deeper understanding of knowledge and the relationship of an individual’s knowledge and memory. That is our starting point.

Knowledge and Its Relationship to Memory

Concepts that can be bounded and differentiated prove useful both in focusing the scope of thinking to facilitate deep thought about the area of interest, and in communicating similarities and differences among concepts. By the middle of the 20th century professionals across a number of disciplines began trying to define and understand types of knowledge with the result that the concepts of explicit, implicit and tacit knowledge began to emerge in organizational literature. This discussion of knowledge will serve as a baseline for exploring organizational memory.

Explicit Knowledge.

(1) Explicit knowledge (Kn_e) is the process of calling up information (patterns) and processes (patterns in time) from memory that can be described accurately in words and/or visuals (representations) such that another person can comprehend the knowledge that is expressed through an exchange of information. This has historically been called declarative knowledge (Andersen, 1983). (2) In other words, this would be

relatively simple knowledge expressible primarily as information through language or pictures such that the receiving individual can create the same knowledge (K_{n_i} plus K_{n_p}) in their own mind. (3) Explicit knowledge does not generally convey deep insights or intuitive content because—given some level of common language, understanding or direction—the words themselves (and the way the words are used and organized, perhaps with accompanying visuals) are adequate to allow the recipient to re-create the intended knowledge.

Sentences (1), (2) and (3) above convey (through information and some context) the concept of explicit knowledge in three slightly different ways. Take a moment to read these three sentences again. Because you chose to read this chapter on organizational memory, it is likely that even if you've never given much thought to the concept of explicit knowledge, one of these sentences will resonate with you and make sense in terms of everything else you have read and experienced. This is an example of the power of explicit knowledge.

A few dozen years ago, explicit knowledge would have been a more difficult concept to differentiate. But by the turn of the century thousands (perhaps millions) of people had been exposed to the concept and meaning of “explicit” as tied to knowledge. This may have occurred at a conference, or the concept may have been embedded in something that was read or used in a conversation. Whatever the case, there was an unconscious association in the mind to that previous exposure which, when associated with the above discussion, helped make sense of the information in this chapter. This associative process you are experiencing is part of the re-creation of knowledge in the mind.

Emotions are sometimes expressed as explicit knowledge. Damasio sees the essence of emotions as,

... the collection of changes in body state that are induced in myriad organs by nerve cell terminals, under the control of a dedicated brain system, which is responding to the content of thoughts relatives to a particular entity or event. Many of the changes in body state—those in skin color, body posture, and facial expression, for instance—are actually perceptible to an external observer.
(Damasio, 1994, p. 139)

Often these changes to the body state can be seen by an external observer and may represent part of an explicit knowledge exchange. Examples would be body posture, facial expressions, or a change in skin color. A discussion of feelings (internal) in relation to emotions (external) occurs later under the heading of affective tacit knowledge.

The *why* of explicit knowledge is generally understood.

Explicit memory (M_e) is information stored in the brain (in the form of neuronal patterns) which can be recalled at will. While explicit implies immediate and easy

access, the ease of recall depends on how strongly that information has been embedded, a function of its meaning, its usage, its relevance to some situation, and the magnitude of emotion attached to it. This brings us to a discussion of implicit knowledge.

Implicit Knowledge.

Implicit knowledge (K_n) is a more complicated concept, one not used—or even accepted—as often as explicit and tacit. This is understandable since even simple dictionary definitions—which over time are generally unbiased, powerful indicators of collective preference and understanding—show a considerable overlap between the terms “implicit” and “tacit,” making it difficult to differentiate the two. Since words (representations) help bound concepts, we propose that a useful interpretation of *implicit knowledge* is to consider it as knowledge that is stored in memory of which the individual is *not immediately aware*. While this information is *not readily accessible*, it may be pulled up when triggered (associated). Triggering might occur through questions, dialogue or reflective thought, or happen as a result of an external event. In other words, implicit knowledge is knowledge that the individual does *not know* they have, but is self-discoverable! However, while this knowledge is understood and can be described once surfaced, the individual *may or may not* have the ability to adequately describe this knowledge such that another individual could create the same knowledge from that transmitted information; the “why” may remain tacit knowledge.

Implicit memory (M_i) is information that is available for recall (and understood) when triggered but has sufficient depth that the ability may or may not be present to describe it adequately in order for another individual to re-create that knowledge. A number of published psychologists have used the term implicit interchangeably with our usage of tacit, that is, with implicit representing memory that once acquired can be shown to effect behavior but is not available for conscious retrieval (Reber, 1993; Kirsner, et al, 1998). As described in the above discussion of implicit knowledge, what is forwarded here is that the concept of implicit memory serves a middle ground between that which can be made explicit and that which cannot be made explicit. By moving beyond the dualistic approach to explicit and tacit—that which can be declared versus that which can't be declared and that which can be remembered versus that which can't be remembered—we posit the existence of a spectrum of levels between explicit and tacit. While explicit refers to easily available, some knowledge or memories require a higher stimulus for association to occur but are not buried so deeply as to prevent access. This understanding opens the domain of implicit knowledge and implicit memory.

The studies on implicit memory (Schacter, 1987; Tulving and Schacter, 1990) parallel those on implicit learning (Reber, 1993). Speaking in terms of learning, and similar to our description of a continuum between explicit and tacit knowledge and memory, Reber cautions not to treat implicit (what we consider tacit) and explicit as completely separate and independent processes:

... they should properly be viewed as interactive components of cooperative processes ... There is ... no reason for presuming that there exists a clean boundary between conscious and unconscious processes or a sharp division between implicit and explicit epistemic systems—and no one from Sigmund Freud on has ever argued that there was. (Reber, 1993, p. 23)

He calls this urge to treat explicit and implicit (our tacit) as altogether different processes the “polarity fallacy” (Reber, 1993). Similarly, Matthews says that the unconscious and conscious processes are engaged in what he likes to call a “synergistic” relationship (Matthews, 1991). What this means is that the boundary between the conscious and the unconscious is somewhat porous and flexible. Given that caveat, how do we describe tacit knowledge?

Tacit Knowledge.

Similar to the essential axiom in evolutionary biology, our separation of tacit from explicit and implicit will proceed from the general to the particular (Reber, 1993). As humans we are programmed to learn from our very beginnings. It is only as adults that we often lose the interest and excitement of learning. Nonetheless, because we take in and store both information and knowledge in our unconscious memory, we all *know more than we know we know*. As we move through life, our unconscious is exposed to and learns more than we are consciously aware, that is, the unconscious mind does more associating and learning than the conscious mind. This learning supports the needs and wants of the living organism through the creation and application of tacit knowledge.

Tacit knowledge (Kn_t) is the descriptive term for those connections among thoughts that cannot be pulled up in words, a knowing of *what* decision to make or *how* to do something that cannot be clearly voiced in a manner such that another person could extract and re-create that knowledge. An individual *may or may not know* they have tacit knowledge in relationship to something or someone, but even when it *is* known, the individual is unable to put it into words or visuals that can convey that knowledge. We all know things, or know what to do, yet may be unable to articulate *why* we know them, *why* they are true, or even exactly *what they are*. To “convey” is to cause something to be known or understood or, in this usage, to transfer information from which the receiver is able to create knowledge.

Michael Polanyi, a Professor of both Chemistry and the Social Sciences, wrote in *The Tacit Dimension* that, “We start from the fact that we can know more than we can tell” (Polanyi, 1967, p. 108). He called this pre-logical phase of knowing tacit knowledge, that is, knowledge that cannot be articulated (Polanyi, 1958). He forwarded that tacit knowledge was knowledge “whose origins and essential epistemic contents were simply not part of one’s ordinary consciousness” (Reber, 1993, p. 12). Further, Polanyi felt that tacit knowledge consisted of *a range* of conceptual and sensory information and images that could be used to make sense of a situation or event (Hodgkin, 1991).

Tacit knowledge is largely learned through experience. The way experts become experts is by effortful study that involves the chunking of ideas and concepts and creating understanding through the development of significant patterns useful for solving problems and anticipating future behavior within their area of focus. A recent study of chess players concluded that “effortful practice” was the difference between people who played chess for many years while maintaining an average skill and those who became master players in shorter periods of time. The master players, or experts, examined the chessboard patterns over and over again, studying them, looking at nuances, trying small changes to perturb the outcome (sense and response), generally “playing with” and studying these patterns (Ross, 2006). In other words, they use long-term working memory, pattern recognition and chunking rather than logic as a means of understanding and decision-making in a chess game. This indicates that by exerting mental effort and emotion while exploring complex situations knowledge becomes embedded in the unconscious mind. For additional information on the development of expertise see Ericsson, et al, 2006.

Tacit knowledge can be thought of in terms of four aspects: embodied [$Kn_{t(e)}$], intuitive [$Kn_{t(i)}$], affective [$Kn_{t(a)}$] and spiritual [$Kn_{t(s)}$]. Each of these aspects represents different sources of tacit knowledge whose applicability, reliability and efficacy may vary greatly depending on the individual, the situation and the knowledge needed to take effective action. Similarly, tacit memory [M_i] would be information and knowledge that cannot be explicated. By definition everything that is tacit knowledge is in memory and cannot be explained to others; however, all memory cannot be considered knowledge.

Embodied tacit knowledge, $Kn_{t(e)}$, also referred to as somatic knowledge, can be represented in bodily or material form stored within the body. It is both kinesthetic and sensory. *Kinesthetic* is related to the movement of the body and, while important to every individual every single day of our lives, is of primary focus for athletes, artists, dancers and kids. A commonly used example is knowledge of riding a bicycle. *Sensory*, by definition, is related to the five human senses through which information enters the body. An example is the smell of a turkey roasting in the oven or the smell of hay in a barn. These smells can convey knowledge of whether the turkey is burning (not a desirable Thanksgiving outcome), or whether the hay is mildewing (dangerous to feed horses, but fine for cows). These responses would be overt, bringing to conscious awareness the need to take effective action and driving that action to occur.

Because embodied learning is often linked to experiential learning (Merriam, et al, 2006), embodied tacit knowledge can generally be learned by mimicry and behavior skill training. While deliberate learning through study, dialogue or practice occurs at the conscious level, when significant or repeated over time it often becomes tacit knowledge. Further, as individuals develop their competency in a specific area, more of their knowledge becomes tacit, making it difficult or impossible for them to explain how they know what they know.

Embodied tacit knowledge can be either preventative or developmental. For example, a physical response can warn *not* to do something or move an individual *to do something*. Both of these responses constitute the capacity to take effective action since *not taking an action is an action choice*. Embodied tacit knowledge can also act either overtly (at the conscious level) or covertly (at the unconscious level). Damasio, a professor of Neurology, proposes that:

Acting at a conscious level, somatic states (or their surrogates) would mark outcomes of responses as positive or negative and thus lead to deliberate avoidance or pursuit of a given response option. But they may also operate covertly, that is outside consciousness... (Damasio, 1994, p. 187-188).

The *why* of embodied tacit knowledge is evasive and often unknown.

Intuitive tacit knowledge is a sense of knowing coming from inside an individual that may influence decisions and actions; yet the decision-maker or actor cannot explain how or why the action taken is the right one. Damasio calls intuition, “the mysterious mechanism by which we arrive at the solution of a problem *without* reasoning toward it” (Damasio, 1994, p. 188). The unconscious is the 24/7 servant of the individual, with a processing capability many times greater than that at the conscious level. This is why as the world grows more complex, decision-makers will depend more and more on their intuitive tacit knowledge. But in order to use it, decision-makers must first be able to tap into their unconscious.

Intuition is a form of knowing, deep tacit knowledge created within our minds (or hearts or guts) over time through experience, contemplation, and unconscious processing such that it becomes a natural part of our being—not just something consciously learned, stored, and retrieved (Bennet & Bennet, 2007a). Knowing is represented by the old adage that one must “live” with complex subjects so that knowledge can soak into the mind (and body) until it becomes a part of who we are, not just something that is “objectively” known. While this knowing is primarily experientially informed at the unconscious level, there is a school of thought that attributes intuition to the larger collective consciousness of a culture or the human race at large (Jung, 1990). Regardless, intuitive tacit knowledge can be both K_I and/or K_P , and it may reside in either the potential aspect of taking effective action (knowing how) or the actual aspect of taking effect action (acting).

The *why* of intuitive tacit knowledge is unknown.

Affective tacit knowledge is connected to emotions and feelings, with emotions representing the external expression of some feelings. Feelings expressed as emotions become explicit. Feelings that are not expressed—perhaps not even recognized—are those that fall into the area of affective tacit knowledge. The *why* is evasive or unknown.

Information coming into the body moves through the amygdala, that part of the brain that is,

“important both for the acquisition and for the on-line processing of emotional stimuli ... Its processing encompassing both the elicitation of emotional responses in the body and changes in other cognitive processes, such as attention and memory (Adolphs, 2004, p. 1026).

It is at this point that an emotional “tag” is attached to information. If incoming information is perceived as life-threatening, then the amygdala takes control, making a decision and acting on that decision before there is conscious awareness of the threat! Haberlandt goes so far as to say that there is no such thing as a behavior or thought not impacted by emotions in some way. Even simple responses to information signals can be linked to multiple emotional neurotransmitters (Haberlandt, 1998).

Affective tacit knowledge is generally attached to some other type or aspect of knowledge, and therefore emergent. For example, an individual must be thinking (internally or externally driven) or doing something that triggers a feeling. As Mulvihill states,

Because the neurotransmitters which carry messages of emotion, are integrally linked with the information, during both the initial processing and the linking with information from the different senses, it becomes clear that there is no thought, memory, or knowledge which is ‘objective,’ or ‘detached’ from the personal experience of knowing (Mulvihill, 2003, p. 322).

Feelings as a form of knowledge have different characteristics than language or ideas, but they may lead to effective action because they can influence actions by their existence and connections with consciousness. When feelings come into conscious awareness they can play an informing role in decision-making, providing insights in a non-linguistic manner and influencing decisions and actions. For example, a feeling (such as fear or an upset stomach) may occur every time a particular action is started which prevents the decision-maker from taking that action. As Damasio explains,

If you come to know ... situation X causes fear, you will have two ways of behaving toward X. The first way is innate; you do not control it. Moreover, it is not specific to X ... the second way is based on your own experience and is specific to X. Knowing about X allows you to think ahead and predict the probability of its being present in a given environment so you can avoid X, preemptively, rather than just have to react to its presence in an emergency (Damasio, 1994, p. 133).

The first way is the automatic amygdala response. The second is when this response has been consciously observed and—while the emotion itself may not be understood and cannot be controlled—it can be recognized and either handled or avoided. In contrast to our earlier example, intuition would inform a knowing that a specific action

was the wrong one to take. Note that this is not a clear-cut differentiation since affective tacit knowledge might easily be perceived as intuition rather than result in a “feeling” that can be consciously detected.

Spiritual tacit knowledge can be described in terms of knowledge based on matters of the soul, with soul representing the animating principles of human life in terms of thought and action, specifically focused on its moral aspects, the emotional part of human nature (overlapping with affective knowledge), and higher development of the mental faculties (Bennet & Bennet, 2007b). While there is a “knowing” related to spiritual knowledge similar to intuition, this knowing does not include the experiential tags of intuition, and it may or may not have emotional tags. Since at our current level of development the human race has not fully opened to spiritual knowledge, there are insufficient words or even groups of words to relate the transcendent power of spiritual knowledge, or to define the role spiritual knowledge plays in relation to knowledge that is cognitive, affective or embodied in nature. Nonetheless, this area represents a form of higher guidance with unknown origin, thus the *why* is unknown.

In a study in early 2007, representative human characteristics spiritual in nature were identified that contribute to learning (Bennet & Bennet, 2007b). These characteristics were grouped into five general areas: shifting frames of reference (represented by the characteristics of abundance, awareness, caring, compassion, connectedness, empathy, openness); animating for learning (represented by the characteristics of aliveness, grace, harmony, joy, love, presence, wonder); enriching relationships (represented by the characteristics of authenticity, consistency, morality, respect, tolerance, values); priming for learning (represented by the characteristics of awareness, eagerness, expectancy, openness, presence, sensitivity, unfoldment, willingness); and moving toward wisdom (represented by the characteristics of caring, connectedness, love, morality, respect, service). The general area of shifting frames of reference was intertwined with learning, thinking and acting (Bennet, 2006), covering the external approach (looking from a different perspective) and the internal approach (taking an empathetic perspective which moves the viewpoint from the objective to the subjective).

Frames of reference can be both focusing and limiting, allowing the mind to go deeper in a bounded direction. Shifting frames of reference potentially offers the opportunity to take a multidimensional approach to exploring the world around us. Animating for learning speaks to the fundamental source of life—learning, and energy used for survival and growth. The area of enriching relationships is tied to competence theory (White, 1959), which assumes that it is natural for people to strive for effective interactions with their world. This brings in the two dimensions of spirituality that exist beyond ourselves (with others and beyond human) with which we can truly learn to grow in understanding (Nouwen, 1975). Priming for learning attributes are considered as those that actively prepare and move an individual toward learning. Wisdom, the highest part of the knowledge spectrum, is considered as forwarding the goal of achieving the common or greater good (Sternberg, 2003). Reflecting on this short study, it would appear that spiritual knowledge would provide a transcendent frame of

reference that puts things in relationship to a larger perspective while promoting self-knowledge and learning.

Spiritual knowledge may be the guiding purpose, vision and values behind the creation and application of tacit knowledge. It may also be the road to moving information to knowledge and knowledge to wisdom. Zohar and Marshall call this spiritual intelligence, or SQ.

By SQ, I mean the intelligence with which we address and solve problems of meaning and value, the intelligence we can place on actions and our lives in a wider-richer meaning-giving context, the intelligence with which we can assess that one course of action or one life-path is more meaningful than another. (Zohar and Marshall, 2000, pp. 2-3)

In the context of this chapter, this would mean the source of creating and implementing knowledge that has greater meaning and value for the common good—wisdom.

An example of spiritual tacit knowledge that is primarily Kn_P might be Csikszentmihalyi's concept of flow (Csikszentmihalyi, 1990). Spiritual tacit knowledge that is primarily Kn_I is often referred to as streaming or channeling of information that is outside an individual's personal experience or awareness. An example would be the numerous recorded instances in times of warfare where military personnel under fire have known what movements to make without detailed knowledge of the terrain or enemy troop movement.

Memory Connections within the Organization

Let us return to our earlier description of organizational memory:

$$M(\text{Org}) = \sum \text{Artifact } Kn + \sum \text{Individual } (Kn_I + Kn_P) + \sum \text{Team } (Kn_I + Kn_P)$$

Recall that organizational memory is considered a *body of stored knowledge*. Using our growing understanding of the verb part of knowledge, i.e., Knowledge (Proceeding), this would translate into a large number of related connections and repetitions with some identified boundary. In the case of this definition of organizational memory, the largest boundary condition is the knowledge "required to achieve the strategic objectives of the organization." A useful analogy would be that of neuron firings compared to interactions among people and information in an organization. In this analogy the patterns in our earlier discussion on individual knowledge and memory can be compared to the flow and sharing of information and knowledge throughout an organization.

Knowledge sharing is a relatively recent concept in terms of organizational collaborative advantage. When the axiom "knowledge is power" came into the organizational literature the control of an organization and its people was accomplished by limiting the knowledge available to individuals at various levels of the organization.

This was foundational to Weber's bureaucratic approach (Gerth and Mills, 1946). This is no longer possible—nor desirable—in today's world, where decisions must be made quickly in an uncertain environment, often by individuals who have the best knowledge at the point of action. Add to this environment the recognition of the power of the unconscious to deal with complex issues. Then add an appreciation for the intricate and complex connections in all organisms and we realize the power of knowledge shared, whether that sharing is across an organization, within a community, or throughout a nation or the world. Consistent with our earlier discussion, in a knowledge-rich environment—whether we as individuals and organizations are purposefully studying or randomly experiencing—we are expanding the unconscious power of knowledge far beyond our conscious awareness.

We now reconsider the opening line of this chapter: "Every decision made every day in an organization is a guess about the future based on past, present and anticipated activities in relationship to each other." The human brain is continually trying to look into the future as guidance for what we should do. Every time we do anything, every decision we make, we are consciously or unconsciously anticipating what will happen. As Hawkins states,

Prediction is not just one of the things your brain does, it is the *primary function* of the neocortex, and the foundations of intelligence. The cortex is an organ of prediction. If we want to understand what intelligence is, what creativity is, how your brain works, and how to build intelligent machines, we must understand the nature of these predictions and how the cortex makes them (Hawkins, 2004, p. 89).

As an example, Hawkins describes the act of putting your foot down while walking, offering that when you put your foot down, your brain is constantly anticipating when your foot will stop moving and how much "give" the floor or step will have (Hawkins, 2004). Think of your surprise if you miss a step when walking down a flight of stairs.

In an organization, every decision is made (or should be made) in the light of achieving the organization's vision and mission. Patterns representing the future come from the *vision of the future and anticipated path (or possible paths)* to achieve that vision, taking the form of information residing within the organization that includes the articulated and understood vision, and the strategies to achieve that vision. These patterns would also include individual employee's memories entangled with organizational knowledge processes. Knowledge processes are what individuals use to (1) select the right information from a situation, (2) combine it with relevant information within the individual's memory and experience, and (3) decide what actions are most likely to yield the desired result and how they should be implemented. As day-to-day decisions accumulate, the ones that are successful are repeated over and over again, moving from explicit to implicit, and maybe even moving into the tacit realm. They may become *accepted practices* in which, over time, all knowledge of "why it was done that way" gets lost. This makes for very efficient decision-making so long as the behavior of the environment remains compatible with these processes. However, in a dynamic and

unpredictable environment, almost every decision will be highly context dependent and must be analyzed with the when's, how's and why's thoroughly understood. This can only occur if the organization's memory and knowledge generating capacity (learning) are continuous, flexible and adaptable to external situations.

When you first learn to drive a car, each action comes slowly and is learned only through practice—trial and error. You are creating explicit knowledge, being able to talk about every action you take. As your experience increases, many things such as how to brake evenly, how to turn corners in your lane, or how to accelerate smoothly become automatic. Soon, many of the aspects of driving become natural, moving them into implicit knowledge. After driving to work for some length of time, you know the road, the car and the traffic patterns so well that you can think about other things and still drive safely. Much of your driving is now tacit knowledge, yet there is always an implicit part as you can immediately *know* when something ahead may become a problem. Implicit driving can quickly become explicit if someone in front of you slams on their brakes or a passing car swerves close to you. Yet you may have no memory of you driving the last ten miles!

How does all of this come together to make competent decisions? One starting point is the competency of the decision-maker. Since an individual's competencies grow through experience (unique combinations and effortful development of associative patterning), they rely heavily on tacit memory. As Horwath states, "It [tacit knowledge] emerges from their particular situations, skills, and experiences and, in aggregate, reflects the history and circumstances of the firm" (Horwath, 2000, p. 39). As unique tacit knowledge, individual competencies not only differentiate an organization from its competitors but also are difficult for competitors to imitate.

How does the decision-maker select the right information? How does the decision-maker combine the selected information in a manner that leads to effective action? In the mind some pattern says that if this specific action (or combination of actions) is taken, then it is anticipated that this or that will happen. Although we may view this as cause-and-effect, mentally we are going through various associative patterning processes, hunting for the right set of patterns, creating knowledge (a specific action) that is highly context-sensitive. What is the leap from creating the information needed and deciding here's what I need to do? This comes from the incoming information of the current situation, and the memory (body of knowledge) of the organization, which has to be such that the decision-maker and those with whom the decision-maker interacts can semantically combine this incoming information with tacit organizational memory in a manner which suggests effective action options (creating new knowledge, new connections among patterns). Let's take a closer look at how that might work.

Recall that Knowledge (Informing) is represented by Kn_i and Knowledge (Proceeding) is represented by Kn_p . Beginning with a traditional associative example, there is a jigsaw puzzle in front of you that shows a tiger perched in a tree limb above a native (Kn_i). Using your Kn_p to pull up memories (Kn_i), perhaps of a story going back to

early childhood or more recent stories told around the fire on a recent camping trip, and are aware that the tiger is getting ready to jump and will most likely eat the native. In an instant, without any deep thought, you recognize and understand the situation and its probable outcome (K_{n_i}). While a simple example, this is a full set of information semantically pulled together through your own knowledge processes.

If you were *living in* the puzzle and sensed the tiger, you might take actions such as running or leaping behind the nearby campfire while simultaneously getting your gun (if you were lucky enough—and smart enough—to have one. While these actions (K_{n_p}) would be spurred onward by the fight or flight response originating from the amygdala in your limbic system, there's more to it than that. The amygdala is the life-saving gate for human beings. It compares patterns coming in with its own innate set of patterns, using observed and experiential memories to send instant messages to the body on whether this is dangerous or not. It may also take action on its own before you are consciously aware of the danger. What is happening in the conscious mind is the process part of knowledge (K_{n_p}) connecting the external situation with internal patterns of information (K_{n_i}) to make sense of the situation, make a decision, and take the right action(s). During this process you would likely simulate several action sequences. If you just run (flight), you might be overtaken by the tiger and become dinner. If you dive behind the near-by fire and/or start shooting (K_{n_p}), there is a higher probability of survival driven by a deeper level of knowledge (K_{n_i}). If you have heightened awareness, fast physical responses and are an expert shot (all $K_{n_{t(e)}}$), the probability for survival is even higher. In the latter case, it could be said that you have greater knowledge in terms of what is happening, what needs to be done and the capacity—and ability—to do it.

The process of associative patterning described in the above story is similar for the organizational decision-maker, although the outcome resting on the use of knowledge may not be as fatal. That process is to assimilate (the process K_{n_p}) the external information (K_{n_i}) with the internal relevant information (K_{n_i} selected through K_{n_p}) based on your knowledge, experience, and learning capacity, make sense of all this (K_{n_p}), and decide on an action (K_{n_p}). Further, the decision-maker must take this connected system of new information (K_{n_i}) and use it to extrapolate into the future, mentally simulating the future of a specific action (or actions) on that system (K_{n_p}). “If I do this, here is what I think will happen, here's what might happen, and here's what will happen if that happens (second and third order effects).” As the future is mentally simulated through (K_{n_p}), the evaluation of the simulated consequences of an action (or actions) also become part of the decision-maker's knowledge (K_{n_i}). In addition, as you reflect in various imagined actions (K_{n_p}), questions may arise that lead to the need for additional information from your own knowledge base or from the situation (K_{n_i}). You may also question the K_{n_p} process you used and deliberately select new ones.

Thus goes the process of reflection and learning. The more you know about something and are able to access what you know (knowledge), and the better your intuition is developed and trusted, the more likely it is that you can effectively deal with a situation (recall that knowledge is the potential or actual ability to take effective action). This is the process of sense-making, that is, searching and mixing relevant internal and

external information until the right set of information is created which is in agreement with your pre-conceptions of this particular domain of reality. This would mean that from your own frame of reference and experience, the external situation and your proposed action are consistent and the anticipated results of your actions should occur. Always, of course, beware that your frame of reference is not antiquated!

It is clear that knowledge is not a single process. Knowledge is actually the capacity to create and apply a *range of information with information association processes* depending on the external information environment and the internal information stored in memory. That range may be small or large. When you are learning to become an expert in a specific area, you start with one or two of the simplest processes, then expand your knowledge spectrum as you increase your expertise. The knowledge spectrum is the range of K_{n_p} processes which are necessary because of the changing external situations and internal information you have. *It is that capacity to adapt and create the right variant of the knowledge process for a given external situation and the current internal set of information that provides tremendous flexibility when making decisions in changing, uncertain and complex environments.*

Tacit Memory in the Organization

When we think of the process part of knowledge (K_{n_p}) as a group of processes rather than as an outcome, and memory as having two aspects—information (patterns of neurons and synaptic strengths) *and* sequences of pattern associations (processes)—then knowledge represents the capacity for selecting and combining memories and incoming information in preparation for taking effective action. Information would be stored in memory, and so would K_{n_p} in terms of an individual's capacity to relate and build relationships among certain sets of information to create or apply knowledge. The key—so beautiful and scary at the same time—is that humans don't store and use a specific knowledge process. They develop and store the capacity and ability to pull out whatever process(es) they need (or create new ones) based on the external situation and their memory. This is why non-biological computers at the present time cannot replicate the human mind. *Every time* you apply knowledge it is in a different context or situation, and therefore the process of applying any specific knowledge is *never* the same! Humans can and do adapt or modulate their knowledge processes as needed to make actions effective over a broad range of varied and uncertain situations.

Organizations create and use *specific* processes; for example, in production lines. Since most of an organization's knowledge resides in its tacit memory, it is difficult for the organization to adapt to a changing environment. Further, the more expertise an organization or individual develops in one value stream, the greater the difficulty in bringing about change, that is, identifying the "*why's*" for specific actions and changing them as appropriate. This reality has driven many large organizations to use contracting, partnering, and joint venturing to fluidly move in and out of relationships involving specialized expertise in response to the crescendo and diminuendo of a fickle environment. Understanding the aspects of tacit memory used and needed by an

organization expands the potential for digging out the *why's* and understanding what action or set of actions might be effective to create change.

Building on general principles that Reber considers heuristics for the evolution of species, successful decisions and processes held in organizational memory become the foundation for later decisions and processes. As Reber states, "Once successful forms are established, they tend to become fixed and serve as foundations for emerging forms" (Reber, 1993, p. 85). The more these forms are built upon, the more difficult it is to move away from the patterns developed by these early forms. They tend toward stability, "showing fewer successful variations than later appearing forms" (Reber, 1993, p. 85). Considering these general principles in an organizational context—and recognizing that consciousness is a late arrival on the evolutionary scene—this would mean that the foundational decisions and processes of an organization tend toward stability and would have a stronger presence in the tacit memory of an organization than more recent decisions and processes. Thus the *why's* of tacit knowledge (stored as organizational tacit memory) may well date back to an organization's beginnings, reflecting the knowledge, beliefs and values of the founders embedded in the environment of that period of time. In this situation, the organization is living in the past and believing that its previous successes will assure future security.

A variation of this theme occurs when individuals within organizations create their own ways of solving problems or making decisions that become habit-forming; for example, rigid frames of reference for understanding situations that lock individuals into specific, repeatable patterns. Knowledge becomes frozen in organizational memory, and learning and adapting disappear. Rigidity (or rigor mortis) can also occur at the organizational level. If not continuously tested and validated, in a changing world organizational memory may become rigid and outdated. When it does, the first challenge is getting the organization to become aware of it and believe there is a need for change. This can be very difficult since historical tacit knowledge often brings with it a "feeling" of confidence, security and self-esteem (embodied or affective tacit memory) that sees any serious change as a threat. The resistance is neither logical, rational, nor based on fact, rather based on learned patterns, $M_{t(e)}$. This also explains why change cannot be mandated. While leadership plays a strong role, significant change must come from the individuals within the organization, usually involving creating an *explicit to implicit learning sequence* driven by employees.

Horvath (2000) suggests looking at organizational tacit knowledge in terms of two forms: (1) knowledge embodied in people and social networks, and (2) knowledge embedded in the processes and products that people create. His use of the term "embodied" includes individual and team or community K_I and K_P . "Embedded" would include K_I in terms of knowledge artifacts and prototypes and K_P in terms of processes, *the way work is done* (Horvath, 2000). For example, Dorothy Leonard contends that prototypes allow individuals and groups to externalize their tacit knowledge in terms of assumptions, ideas and values for continued use in a product line (Leonard-Barton, 1995), that is, tacit knowledge is embedded in the product and thus made available for future application. This is, of course, the process of innovation.

Whether within an individual or a social process, memory recall is a dynamic and creative process. The Nobel Laureate neuroscientist Gerald Edelman describes memory as follows:

It is robust, dynamic, associative and adaptive. If our view of memory is correct, in higher organisms every act of perception is, to some degree, an act of creation, and every act of memory is, to some degree, an act of imagination. Biological memory is thus creative and not strictly replicative (Edelman, et al, 2000, p. 101).

Similarly, the Nobel Laureate neuroscientist Eric Kandel states,

Recall of memory is a creative process. What the brain stores is thought to be only a core memory. Upon recall, this core memory is then elaborated upon and reconstructed with subtractions, additions, elaborations and distortions (Kandel, 2006, p. 281).

This explains why storing and retrieving Kn_i in a computer system is not the same as storing it in a human brain. The first would give you an exact replica of what was put in, the second would probably not. One should not assume that the exact replica is better. The human, recalling the memory differently, may unconsciously be adapting the memory to the present situation of application. When this occurs, the human is re-membering and creating relevant tacit knowledge. The computer is presenting you with old information.

While helpful and necessary, relevant knowledge artifacts and employee knowledge are not enough. They must be considered in connection with the embodied, intuitive, affective and spiritual aspects of organizational tacit memory to fully support team discussions, problem solving and decision-making. To more fully understand the significance of these aspects, we will further explore them in the context of the organization. Figure 1 provides representative thoughts from the following discussion.

The **embodied aspect of tacit memory**, $M_{t(e)}$, might include leadership approaches specific to the organization or physical motions on assembly lines (such as those used by mail handlers). A general sensing of something being right or wrong might be related to tacit awareness of previous failures and successes in a similar situation or issue, especially in terms of the four process of the organization: creativity, problem-solving, decision-making and implementation. This sensing could well manifest itself through apprehension, which might be connected to a feeling (described as affective tacit knowledge). Apprehension is considered the totality of the tangible, felt qualities of immediate experience (Kolb, 1984).

Cultural norms are often driven by embodied tacit memory. Examples include: the preferred approach to interacting with others; what language is appropriate; and what subjects can or cannot be discussed. This would be Knowledge (Proceeding),

Kn_P , supported by Knowledge (Informing), Kn_I . As another example of the impact of embodied tacit memory, think about what you would wear and how you would act when attending a budget meeting at the Pentagon (where cuts were going to be made) versus when attending a budget meeting at a church or community group (where cuts must be made or additional funds raised). In these situations your embodied tacit memory would guide your approach, words and actions, although generally in a covert fashion. From another perspective, the physical layout of the work space could be thought of as an explicit reflection of the beliefs that may either support or hinder the development of embodied tacit knowledge. For example, in an office environment open desks in close proximity and a centrally-located stairwell become natural facilitators of the flow of information across the organization, and are explicit representations that embody the significance of knowledge sharing and the spirit of collaboration.

Embodied tacit knowledge requires new pattern embedding for change to occur. This might take the form of repetition in physical training or in mental thinking. For example, an athlete training to become a pole vaulter may well make a video of his perfect pole vault and by reviewing that movie increase his athletic capability. This is a result of the fact that when the pole vaulter goes through his perfect vault, the patterns going through his brain while he is doing that pole vault are the same patterns that go through his brain when he is watching himself do the pole vault on video.

Recent neuroscientific research (beginning the late 1990's) has identified what are referred to as mirror neurons. As Dobb's states,

These neurons are scattered throughout key parts of the brain—the premotor cortex and centers for language, empathy and pain—and fire not only as we perform a certain action, but also when we watch someone else perform that action (Dobbs, 2006, p. 22).

This is a cognitive form of mimicry that transfers actions, behaviors and most likely other cultural norms. Thus when we see something being enacted, our mind creates the same patterns that we would use to enact that “something” ourselves. If these patterns fade into long-term memory, they would represent tacit knowledge (both Kn_I and Kn_P). While mirror neurons are a subject of current research, it would appear that they represent a neuroscientific mechanism for the transfer of tacit knowledge between individuals or throughout a culture. For more information on mirror neurons, see Gazzaniga, 2004.

The **intuitive aspect of tacit memory**, $M_{t(i)}$, lies deep within the individual—and deep within the organizational structure, culture and processes, playing an important role in organizational performance. $M_{t(i)}$ is often hidden in *the way things are done*, reflecting that which is generally acknowledged as part of the organizational culture. While there may be considerable overlap between the intuitive and embodied aspects of tacit memory, recall that embodied concerns physical sensing and kinesthetics while the intuitive is linked to the continuous associative patterning underway in the unconscious, that is, associative patterning of external and internal information sources (Kn_I) in an

individual or social setting. The knowing that surfaces is described as intuition. That which is pulled up and acted upon with positive results, or even without negative results, would most likely be cohesive with the organizational frame of reference—the direction from which an organization is looking, or meaning perspectives (Mezirow, 1991), or operating assumptions that govern actions (Schön, 1983). The organization's frame of reference heavily influences organizational memory as well as the current use of knowledge by the organization (Bennet, 2006).

Since intuition is based on the continuous association of internal and external information (Kn_i), it follows that the more decision-makers at all levels are exposed to, learn about and practice decision-making and implementation related to the organization's mission, the greater intuition is nurtured and developed. Participation in communities of practice and interest, involvement in mentoring programs and apprenticeships, attendance at conferences and knowledge fairs, and the myriad of other learning and knowledge sharing experiences all contribute to the development of implicit and tacit knowledge, and hence of organizational intuition. In addition, recall that emotion plays a strong role in determining the importance of information. A spirited dialogue with someone who is respected and admired or some other emotional event may be a powerful learning experience, contributing to easier recall and, on the unconscious level, a larger number of associations.

Job and functional area rotations are other ways to engage both the embodied and intuitive aspects of tacit knowledge. They offer the opportunity through immersion to develop systems perspectives and pattern recognition capabilities while facilitating connections and information flows within the organization. This approach is used in many military organizations. It is also used in some government and industry firms as part of their development programs for high potential employees. It is important to recognize the distinction between creating and storing knowledge with an emphasis on understanding versus an emphasis on information. The former helps carry an organization into the future; the latter "may" become a dead weight. Storing information is easy and can be very useful, but it cannot solve future problems or make complex decisions.

The varied approaches to action assessment and learning (AAL)—whether process-driven or action-driven, whether pre, during or after action reviews—are an attempt to develop an explicit record of implicit knowledge and embody tacit knowledge such that what is learned drives future related decisions. Of course, without the organization setting expectations and continuously rewarding those who engage this new knowledge (Kn_i) in future decisions and actions (Kn_p), this approach will not take hold. Note the similarity between the AAL process that the organization is trying to instill (learning pre, during and after actions) and the instilling process itself (providing direction and setting expectations, supporting the process of reviews, and rewarding learning and application of learning from reviews). This is one of the exciting attributes of knowledge work; it has the unique quality of being self-referential with reinforcing feedback loops (Bennet, 2005). The nature of the knowledge initiatives being

implemented and the processes involved in implementation (and sharing that work with others across the organization) are consistent with the content of knowledge work itself.

This leads us to a discussion of the **affective aspects of tacit memory**, $M_{t(a)}$. These involve the feelings of an organization. How can an organization have feelings? The analogy used here is that of the organization as a living, intelligent complex adaptive system, which it is since organizations are comprised of complex adaptive systems (people) which are trusted to act cohesively and intelligently!

Largely unacknowledged, feelings abound in an organization. Common causes that might create negative feelings include work overload, value conflicts, over-control issues and unfair practices. Common causes that might cause positive feelings include words of appreciation, a successful bid, completion of a complex project, empowerment and a stimulating new idea. Feelings are also embedded in the culture of the organization, and in the processes and approaches of everyday life. For example, an organization's feeling toward risk may well emerge from historic successes or failures without explicit awareness, or the depth of employee dialogue may be influenced by an embedded fear of "rocking the boat" based on an historic incident. Further, emotions move across an organization through the interactions among people, and are passed on as people come in and out of the organization.

As discussed above, those things that the organization feels most strongly about are the things that the organization will continue to do, whether or not they are the things written in the strategy or spelled out in the operations manual. The stronger the importance in terms of emotional tags, the more likely those behaviors will continue. In short, every decision that is made by every individual in an organization is related to some level of affective tacit memory.

Goleman brought the significance of emotions in the workplace to light in his ground-breaking work on Emotional Intelligence (Goleman, 1995). His emotional competence framework is built on three areas: self-awareness (knowing internal states, preferences, resources and intuition), self-regulations (managing internal states, impulses and resources, and motivations (emotional tendencies that guide or facilitate reaching goals). In other words, emotional intelligence for the individual includes the ability to know, manage and understand the motivations of their emotions. As a social competence emotional intelligence also brings in empathy (awareness of the feelings, needs and concerns of others) and other social skills (such as collaboration) that bring about desirable responses in others (Goleman, 1998). The level of an organization's emotional intelligence may be visible through the affective aspects of its organizational tacit memory.

One way to help identify affective knowledge held in organizational tacit memory is through the Japanese five-why's approach. This approach can help surface and understand underlying emotional drivers. Asking "why" you feel the way you do can generate a logical train for emotional feelings. This process frequently surfaces

unstated assumptions and beliefs that in the current organizational context foster the emotional perspectives.

Spiritual tacit memory, $M_{t(s)}$, has always been a driving source of decisions and actions in organizations, howbeit covert. Organizations need to have a purpose, vision, and values, with all of these related to meaning and motivation. Dependent on the organization, there may be spiritual aspects to each of these that connect individuals in an organization to a larger goal, perhaps tied to the environment, a greater good, or the advancement of humanity. For example, many organizations recognize their innate responsibility to ensure the health of the environment.

While spiritual knowledge has historically been a difficult subject to address in terms of organizations, there are hundreds of studies and dozens of books in both the popular and academic press that address the need for holistic representation of the individual in the workplace. In other words, the soul cannot be left outside the door; it is an integral force of the effectiveness of every individual.

In a 1999 study involving in-depth interviews, 90 high-level managers and executives were nearly unanimous in defining spirituality as the basic desire to find ultimate meaning and purpose and to live an integrated life. They saw the search for meaning, purpose, wholeness and integration as a never-ending task, and most of those interviewed, “believed that spirituality is one of the most important determinants of organizational performance” (Mitroff and Denton, 1999, p. xviii).

The knowledge that is spiritual in nature is that representing the “deepest meaning, values, purposes and highest motivation” of the organization, and is “how we use these in our thinking processes, in decisions that we make, and the things that we think it is worthwhile to do” (Zohar and Marshall, 2003, p. 3).

The memory that drives these models are what could be and has been called spiritual capital,

... is the capital amassed through serving ... the deeper concerns of humanity and the planet. It is capital that reflects your shared values, shared visions, and fundamental purposes in life. Spiritual capital is reflected in what an organizational believes in, what it exists for, what it aspires to, and what it takes responsibility for (Zohar and Marshall, 2003, p. 3).

As individuals and organizations undergo continuous associative patterning, expanding their Kn_I and Kn_P in response to complexity, uncertainty and change, they build a larger appreciation for the interconnectedness of the world. This is easily evidenced through the advent of the Internet, the global economy, and the recognition of collaborative advantage (Bennet, 2007a). Interconnectedness also appeared as the word best capturing the meaning of spirituality and its vital role in the Mitroff and Denton (2003) study.

Spiritual tacit memory is the common set of larger beliefs, attitudes, purposes and values that quietly exist throughout an organization, yet become visible and sometimes powerful when actions are suggested (or taken) that conflict with their intent.

Final Thoughts

With the move into the new century and the refocus on knowledge as a significant determinant of organizational success comes the recognition of potential knowledge loss due to an aging workforce moving toward retirement. This loss primarily involves the knowledge resident in individuals ($K_{N_I} + K_{N_P}$).

Using the descriptions of the types and aspects of knowledge developed above, prior to an employee retiring, the explicit knowledge deemed necessary for organizational effectiveness can be fully shared, understood and, where possible, replicated in action. It can also be captured and stored as information (with context including *what's*, *how's* and *why's*), thereby becoming organizational artifact knowledge. Implicit knowledge can be explored and surfaced through dialogues and stored as information (with context as *what's* and *how's* without *why's*), becoming organizational artifact knowledge. The irony is that most of what will be needed is indeed tacit. As Johnson posits, “as individuals master more and more knowledge in order to do a task efficiently as well as accurately, they also lose awareness of what they know” (Johnson, 1983, p. 79). So the very knowledge necessary for organizational sustainability—that which is desirable to store in a computer program and to have available for others to learn—“often turns out to be knowledge that individuals are least able to talk about” (Johnson, 1983, p. 79).

One solution is to create permeable and porous boundary conditions, thereby effectively expanding the organization’s memory base. Through pre-planning such as retaining selected retiring employees on a part-time consulting basis (a few hours a week) for a period of time, or having them spend a few hours a week in a community of practice, potential loss can be mitigated. Since the rate at which knowledge becomes obsolete increases with the rising rate of change in the environment, after some period of time creating new knowledge will likely be much more important than holding onto senior employees. However, as stated earlier, this new knowledge must emphasize understanding and expertise, not just facts and information.

The loss of K_I is very difficult—if not impossible—to recover. The long-term challenge is how to maintain and develop organizational memory for future needs, which requires an understanding of the *how's* and *why's*. If you don’t understand the *how's* you cannot act effectively. *How's* are the knowledge that drive current actions. But when a situation changes, past knowledge fails and new knowledge must be developed. *Why's* provide the power to examine, challenge and update knowledge (K_{N_I} and K_{N_P}) within organizational memory. *Why's* drive the knowledge needed for future actions.

Since the organization is an inter-connected group of living organisms with each employee continuously affected by, responding to, and influencing the environment, organizational memory is also continuously changing. Even artifact knowledge may be translated, understood and applied differently as people and information move in and out of situations, teams and the larger organization. The same information may reside in the organization's databases with the same processes being followed and still produce very different organizational results.

Ultimately, as the internal environment of organizations co-evolves with a changing, uncertain and complex external environment, the focus on knowledge must move from knowledge storage through knowledge retrieval to knowledge creation and application. This requires engaging knowledge as a process, not a product.

Organizational memory holds the historic knowledge of how to anticipate the outcomes of decisions and actions. It follows that once this is achieved, there are two dangers that put the organization's future at risk. The first is the previously mentioned exodus of individuals who represent key memory. Second is an organization's inability to learn fast enough to keep up with a dynamic and complex environment such as we are currently experiencing. Under these conditions, having good organizational memory may not be good enough. Along with this memory, leadership must ensure an efficient and effective organizational learning capacity coupled with rapid, adaptive organizational knowledge associative patterning, continuously creating and re-creating organizational memory, much as the human brain re-creates memory. We offer that this is the fundamental challenge—and critical success factor—facing world-wide leaders.

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