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Contents

From the Editor

In 2004 I co-organized and chaired the first International Conference on Knowledge Management (Trezzini et al 2004). One of our goals was to bring together practitioners and academics into a common forum, and indeed there were good contributions from both academe and practice. As an experiment, I conducted a social network analysis exercise, based on participant self-reports of whom they had had conversations with, during the conference breaks. When we shared this at the conference close, it was striking that for the most part, practitioners had been talking to practitioners, and academics had been talking to academics. It was also striking that there was a third, "blended" group of participants, who were active in the teaching and research space, but also in KM implementation and practice. They were the network brokers, holding this rather tenuous web of connections together.

Since then, I have argued strongly that KM cannot advance until it breaks down the fragmentation that exists, between schools of practice, and between the realms of practice and theory (Lambe 2011a, Lambe 2011b). Of course, there are positive signals. Many Master's programmes in KM engage practitioners as adjunct faculty. Several universities actively engage with the practitioner community and industry, and may offer consulting services to clients (Hong Kong Polytechnic University, Bangkok University, Monash University, Kent State University). Academics and practitioners serve together on standards and advisory bodies, and partner in research projects. Discussion forums such as the actKM Forum have participation from both practitioners and academics. The boundaries between academe and practice are also porous, with academics going into practice, and practitioners entering academe.

The pertinent question is whether this is enough. While cooperation has positive models to show, there are still very few institutional mechanisms for leveraging evidence from KM practice in KM research, or for testing theoretical postulates in practice.

This issue was conceived to explore the relationship between KM theory and practice, and to provide insights to the KM research and practitioner community about how to advance this relationship. In the spirit of the issue, submissions were invited from both researchers and practitioners, and all submissions were reviewed by reviewers who have experience in both research and practice, in a blind peer reviewed process.

Our flagship article, from Alex and David Bennet, challenges the entire premise of this special issue. It suggests that an academic-practitioner dualism is a false and potentially misleading construct. The Bennets argue that knowledge management necessarily mirrors the fluidity and complexity of working with knowledge in the world. It is messy by nature. They put an intriguing case for the role of theoretical constructs and frameworks as boundary objects between theory and practice, provoking both dialogue and exploration.

For example, we see in Andrzej Lis' paper how the SECI framework, while increasingly challenged for its lack of empirical underpinning (Gourlay 2006) may act as a sensemaking frame to interpret and account for KM practices in a military setting. David Williams' exploration of the DIKW framework shows how logical and performative shortcomings in a framework stimulate a push for a stronger theory-based framework that can inform practical decision-making about KM systems design.

Nick Milton's paper points out that consulting practitioners using consistent frameworks covering many organisations and over extensive periods of time, can build a body of data that illuminates both theory (eg. the effectiveness of a framework to assess KM maturity) and practice (eg. in identifying patterns of need and effective interventions). He makes the case for closer cooperation between academics and practitioners in making such data available for research purposes.

Arthur Shelley looks at the critical domain of KM education, and illustrates how practice-oriented teaching helps KM students internalize, query and apply KM theories in helpful ways.

Finally, Marek Szelągowski's paper describes how the evolution of business process management practices, which he describes as dynamic BPM, can – almost as a by-product – bring about the characteristics espoused by learning organization theory. This is particularly intriguing because of the difficult relationship that BPM has had with learning organization theory and knowledge management. All three were fashionable children of the 1990s, and some early exponents of KM were also BPM enthusiasts. However, BPM's rapid evolution into business process reengineering and its alignment with large scale restructuring and efficiency exercises, often meant large scale knowledge loss and actively anti-learning organization practices (Davenport 1995). Against this backdrop, Szelągowski's paper reads as a long overdue reconciliation between a key business practice and an important theoretical frame.

It has not been straightforward to curate a collection of articles, many of them written by practitioners, for an academic journal. I would like to thank Anna Ujwary-Gil who first invited me to undertake this special issue,

and who has supported me through several unconventional decisions. To the anonymous reviewers, though you may not always agree with my editorial decisions, your candour, challenges, and care for our discipline have immeasurably improved these papers. To the authors, writing at the boundary between KM theory and practice is a sensitive, sometimes tense, and often difficult task. You have borne the extra work with grace, patience and aplomb.

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Knowledge, Theory and Practice in Knowledge Management: Between Associative Patterning and Context-Rich Action

Alex Bennet and David Bennet

Abstract

Embedded throughout this paper you will find the diversity of opinions that correlates to the diversity of theories, frameworks, case studies and stories that are related to the field of Knowledge Management (KM). We begin by introducing the Sampler Research Call approach and the 13 KM academics and practitioners working in different parts of the world who answered the call. We then provide baseline definitions and briefly explore the process of knowledge creation within the human mind/brain. After a brief (and vastly incomplete) introduction to KM literature at the turn of the Century, the frameworks of Sampler Call participants are introduced, and two early frameworks that achieved almost cult status—the Data-Information-Knowledge-Wisdom (DIKW) continuum and the SECI (socialization, externalization, combination and internalization) model—are explored through the eyes of Sampler Call participants. We then introduce the results of the KMTL (Knowledge Management Thought Leader) Study, which suggest theories consistent with the richness and diversity of thought interwoven throughout this paper. The field of KM is introduced as a complex adaptive system with many possibilities and opportunities. Finally, we share summary thoughts, urging us as KM academics and practitioners to find the balance between the conscious awareness/understanding of higher-order patterns and the actions we take; between the need for overarching theory and the experiential freedom necessary to address context-rich situations.

Keywords: *knowledge, knowledge management, theory, information, learning, surface knowledge, shallow knowledge, deep knowledge, neuroscience, mind/brain, decision-making, higher-order patterns, complexity, thought leaders, practitioners, knowledge (proceeding), knowledge (informing), SECI model, DIKW continuum, wisdom, KM research, KM frameworks.*

Introduction

When Kant proposed a Copernican Revolution, he argued that our experiences are structured by the categories of our thought, the way we

think about space, time, matter, substance, causality, contingency, necessity, universality, particularity, etc. (Gardner, 1999). Bohm suggests that to achieve clarity of perception and thought "requires that we be generally aware of how our experience is shaped by ... the theories that are implicit or explicit in our general ways of thinking" (Bohm, 1980, p. 6). Bohm emphasizes that experience and knowledge are one process. It is our theories that give shape and form to experience in general, both expanding and limiting us.

The role of theory in the field of Knowledge Management (KM) is indeed controversial (Flock & Mekhilef, 2007). Some studies note that scholarly work in KM played an important role in developing the field (Serenko et al., 2012; Serenko and Bontis, 2013), and other studies point out the disparity between theory and practice (Booker et al., 2008). Many questions remain unanswered (Flock & Mekhilef, 2007). For example, can KM be seen as a discipline? If so, what are its principles, theories and models? Is there an overarching theory for KM? In this paper we explore the relationship of knowledge, theory and KM through the eyes of KM thought leaders and practitioners.

Working across domains, this paper takes a consilience approach, that is, by integrating evidence from independent sources to draw strong conclusions. Further, this exploration is intended as a thought expanding exercise which demonstrates the diversity of the field. Because of this diversity, for each opinion presented in this paper there is undoubtedly a bevy of literature to support it, and an equal amount of disagreement, with research studies often quoted as validation. It is not the intent of this paper to support or question the opinions of the contributors, but to share the different frames of reference these opinions represent. Connecting thought much like the workings of the mind/brain (which is an associative patterner), there is not a bounded literature review as such. Examples of theory or the models that represent theory, and references to supporting literature, are included in this paper.

The thought and findings from three research studies related to KM and practitioners of KM are represented in this paper. In preparation for this paper—to reflect current thought and demonstrate the diversity of opinion—a Sampler Research Call (Sampler Call) went out to KM academics and practitioners working in different parts of the world; there were 13 respondents. Two earlier research studies referenced in this paper are (1) the 2005 Knowledge Management Thought Leader (KMTL) Study which involved in-depth interviews and follow-up with 34 KM thought leaders across four continents (Bennet, 2005), and (2) the 2007 iKMS Global Survey which included responses from over 200 KM practitioners (Lambe, 2008).

Since opinions from the Sampler Call are embedded throughout this paper—including the definitions section—we introduce the Sampler Research Call approach before laying out foundational definitions and introducing

concepts that help develop a common understanding of what is meant by knowledge. We then briefly look at knowledge creation from the viewpoint of the human mind/brain to explore the powerful role that theories—and the frameworks and models emerging from those theories—play in the human decision-making process. Each individual has a self-organizing, hierarchical set of theories (and consistent relationships among those theories) that guide the decision-making process (Bennet & Bennet, 2010a; 2013). We introduce representative KM literature emerging at the turn of the century with a focus on literature and frameworks forwarded by participants in the Sampler Call, then focus on two early frameworks—the Data-Information-Knowledge-wisdom (DIKW) continuum and the SECI (socialization, externalization, combination, and internalization) model. These frameworks are viewed through the diverse opinions of Sampler Call participants. Finally, we look at characteristics of the KM field surfaced in the KMTL Study in conjunction with thoughts forwarded by Sampler Call participants and current examples before providing summary thoughts.

We begin.

The 2014 Sampler Research Call

An email Sampler Research Call went out to 19 geographically-dispersed Knowledge Management academics and practitioners. The intent was to hear from voices who practiced and/or taught KM in different cultures. The primary criteria were that each individual be a practitioner and/or academic in the field and have taken a leadership role through (1) publishing KM-related articles/books and/or recognized as a leader in the field, and (2) speaking at conferences and/or otherwise teaching KM. Due to the need for a short turn-around, ease of contact was also taken into account. For example, fourteen of the 19 individuals approached had participated in the 2005 KMTL Study. This previous relationship facilitated ease of contact. Nine of these participated in the Sampler Research Call.

In addition to meeting the primary criteria, the remaining 5 individuals approached were selected because of (1) their geographic location, and (2) the ease of contact, that is, a previous relationship with the editor of this JEMI special edition or with one of the authors. Four of these participated in the Sampler Call. Listed alphabetically by country, the 13 participants in the Sampler Call are: Charles Dhewa (Africa), Frada Burstein (Australia), Hubert Saint-Onge (Canada), Surinder Kumar Batra (India), Madanmohan Rao (India) Edna Pasher (Israel), Francisco Javier Carrillo (Mexico), Milton Sousa (Portugal), Dave Snowden (UK), and Nancy Dixon, Kent Greenes, Larry Prusak and Etienne Wenger-Trayner (across the US). The names and reputations of

these practitioners and academics will be familiar to many readers. Short descriptions are included at the end of this paper following the authors' bios.

Each participant was provided a copy of the call for papers that went out for this special JEMI issue. The intent of the Sampler Research Call was to "explore the connections between knowledge, KM and theory". Each individual was asked to provide the answers as appropriate to six questions, and to provide other thoughts "of significance in regards to this focus area". The six questions dealt with: KM practitioners trust of theoretical approaches and frameworks; why some KM frameworks (such as SECI and DIKW) had achieved cult status; favorite theories and their application; personal theories and how these personal theories serve them; authoring of papers/articles and the theories referenced in this work; and the tenuous connections in published works between KM research and KM practice.

Five of the responders chose to focus their thoughts on the relationship of knowledge, KM and theory rather than answer the specific questions; and three others left one or more questions unanswered. Thus this qualitative response was organized by related topics, with the thoughts and words attributed to these participants embedded throughout this paper. Where embedded, following each participant's name is the reference: "(Sampler Call, 2014)". While it is acknowledged that these are *opinions* that reflect a small number of academics/practitioners, a limitation of the Sampler Call approach, they demonstrate the diversity of thought related to the KM field, and the deliberate geographic spread should reduce region-specific bias. The authors do not propose to support or oppose these opinions, rather providing them for the reader's reflection.

Foundational definitions

The terms used in this paper are explicated below in order to provide a common language within the bounds of this paper to explore the relationship of knowledge, theory, and knowledge management. Through these definitions we will see that the characteristics of knowledge in action underpin the way that knowledge management plays out in practice, specifically in the interplay between theory and practice, and the critical role of context in determining how knowledge is applied.

The **brain** consists of an atomic and molecular structure and the fluids that flow through this structure. The **mind** is the totality of the patterns in the brain created by neurons and their firings and connections. These patterns encompass all of our thoughts. The term **mind/brain** refers to both the structure and the patterns emerging within the structure (Bennet & Bennet, 2010).

A **system** is a group of elements or objects, the relationships among them, their attributes, and some boundary that allows one to distinguish whether an element is inside or outside the system. a **simple system** remains the same or changes very little over time. Simple systems have few states, are typically non-organic and exhibit predictable behavior. Examples are an air conditioning system, a light switch, and a calculator. While a **complicated system** contains a large number of interrelated parts, the connections among the parts are fixed. Complicated systems are non-organic systems in which the whole is equal to the sum of its parts, that is, they do not create emergent properties. Examples are a Boeing 777, an automobile, a computer, and an electrical power system (Bennet & Bennet, 2004).

Complexity is the condition of a system, situation, or organization that is integrated with some degree of order but has too many elements and relationships to understand in simple analytic or logical ways. a **complex adaptive system** (CAS) is a partially ordered system with many agents (people) that interact with each other as the system unfolds and evolves through time. They are mostly self-organizing, learning and adaptive. Examples are life, ecosystems, economies, organizations, and cultures (Axelrod and Cohen, 1999). As the term is used in this paper, this would infer a nonlinearity and unpredictability among the elements and relationships, thus the difficulty in identifying a single or "best" response or solution to a specific issue or situation.

Embracing Stonier's description of information as a basic property of the Universe—as fundamental as matter and energy (Stonier, 1990)—we take **information** to be a measure of the degree of organization expressed by any non-random pattern or set of patterns. The order within a system is a reflection of the information content of the system. Data (a form of information) would then be simple patterns, and while data and information are both patterns, they have no meaning until some organism recognizes and interprets the patterns (Stonier, 1997; Bennet & Bennet, 2008b). Thus information exists in the human brain in the form of stored or expressed neuronal patterns that may be activated and reflected upon through conscious thought.

As a functional definition, **knowledge** is considered *the capacity (potential or actual) to take effective action in varied and uncertain situations* (Bennet & Bennet, 2004), a human capacity that consists of understanding, insights, meaning, intuition, creativity, judgment, and the ability to anticipate the outcome of our actions. There is considerable precedent for linking knowledge and action consistent with the emergence of the field of Knowledge Management as a business management approach in the early 1990's driven by computing, consultants, conferences and commerce (Lambe, 2011). As detailed later in this paper, in the KMTL Study 84 percent of respondents

tied knowledge directly to action or use (Bennet, 2005). Similarly, emerging from nearly 20 years of APQC's leading research in the field of KM, O'Dell and Hubert define knowledge from the practical perspective as "information in action" (O'Dell & Hubert, 2011, p.2).

While recognizing that it is common to define information as processed data, and knowledge as actionable information, Batra (Sampler Call, 2014) finds it interesting that the definitions or interpretations of the term knowledge are contextual. However, he also notes that in another context knowledge gets interpreted as know-what, know-how, know-who and know-why, and in an HR context knowledge includes the competence set of individual skills and attitudes. Further, from a strategic perspective knowledge can be considered as a strategic resource for the firm, taking the form of intellectual capital and intangible capital. Batra finds these differences in interpretation useful to the students of KM in "appreciating that knowledge is not a monolithic entity which can be managed in a prescriptive manner."

Dhewa (Sampler Call, 2014) likes the notion of "useful knowledge", which he sees as a way of understanding knowledge as an economic resource, a concept expanded on by Kuznets (1955) and extensively used by Mokyr (2005) in his studies about the role of knowledge in the industrial revolution. As Dhewa suggests, "I am applying this notion in exploring the role of knowledge in the agriculture sector. Unless knowledge solves a specific issue like income growth, it's not knowledge at all, according to me. When knowledge is applied, it defines itself."

Linking knowledge and action provides the opportunity to measure knowledge effectiveness (Porter et al, 2003). Outside of its context and the situation in which it is being applied, knowledge itself is neither true nor false. The value of knowledge in terms of good or poor is difficult to measure other than by the outcomes of actions based on that knowledge. Good knowledge would have a high probability (closer to 1 on a 0-1 scale) of producing the desired (anticipated) outcome, and poor knowledge would have a low probability (closer to 0 or a 0-1 scale) of producing the expected result. For complex situations the quality of knowledge (from good to poor) may be hard to estimate because of the system's unpredictability. After an outcome has occurred, it may be possible to assess the quality of knowledge by comparing the actual outcome to the expected outcome; although it is also possible that there may not be a direct observable causal relationship between a decision made/action taken and the results of that action (Bennet & Bennet, 2013).

Explicit knowledge is the descriptive term for that which can be called up from memory and described accurately in words and/or visuals (representations) such that another person can comprehend the knowledge

that is expressed through this exchange of information. This is consistent with Polanyi's description as knowledge which can be transmitted in formal systematic language (Polanyi, 1966). Explicit knowledge has historically been called declarative knowledge (Anderson, 1983). **Tacit knowledge** 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 (understanding, meaning, etc.). Consistent with this definition, Polanyi (1966) sees tacit knowledge as personal and context-sensitive, therefore hard to communicate.

We consider knowledge as comprised of two parts: Knowledge (Informing) and Knowledge (Proceeding) (Bennet & Bennet, 2008b). This builds on the distinction made by Ryle (1949) between "knowing that" and "knowing how" (the *potential* and *actual* capacity to take effective action). **Knowledge (Informing)** is the *information (or content)* part of knowledge. While this information part of knowledge is still generically information (organized patterns), it is special because of its structure and relationships with other information. Knowledge (Informing) consists of information that may represent understanding, meaning, insights, expectations, intuition, theories and principles that support or lead to effective action. When viewed separately this is information even though it *may* lead to effective action. It is considered knowledge when used as *part of the knowledge process*. In this context, the same thought may be information in one situation and knowledge in another situation.

Knowledge (Proceeding), represents the *process* and *action* part of knowledge. It is the process of selecting and associating or applying the relevant information, or Knowledge (Informing), from which specific actions can be identified and implemented, that is, actions that result in some level of anticipated outcome. There is considerable precedent for considering knowledge as a process versus an outcome of some action. For example, Kolb (1984) forwards in his theory of experiential learning that knowledge retrieval, creation and application requires engaging knowledge as a process, *not* a product. Bohm reminds us that "the actuality of knowledge is a living process that is taking place right now" and that we are taking part in this process (Bohm, 1980, p. 64). Note that the process our minds use to find, create and semantically mix the information needed to take effective action is often unconscious and difficult to communicate to someone else; therefore, by definition, tacit.

In Figure 1 below, "Justified True Belief" represents the theories, values and beliefs that are generally developed over time and often tacit. "Justified True Belief" is the definition of knowledge credited to Plato and his dialogues

(Fine, 2003). The concept is based on the belief that in order to know a given proposition is true you must not only believe it, but you must also have justification for believing it. Justified true belief represents an *individual's* truth, that is, the beliefs and values that make up our personal theories, all developed and reinforced by personal life experiences. It is acknowledged that an individual's justified true belief may be based on a falsehood (Gettier, 1963). However, if it is used to take effective action in terms of the user's expectations of outcomes, then it would be considered knowledge from that individual's viewpoint. Note that this is only one part of Knowledge (Informing), and that our beliefs and theories are part of the living process described above (Bohm, 1980; Bennet & Bennet, 2008b; 2014). The term "memory" is used as a singular collective and implies all the patterns and connections accessible by the mind occurring before the instant at hand.

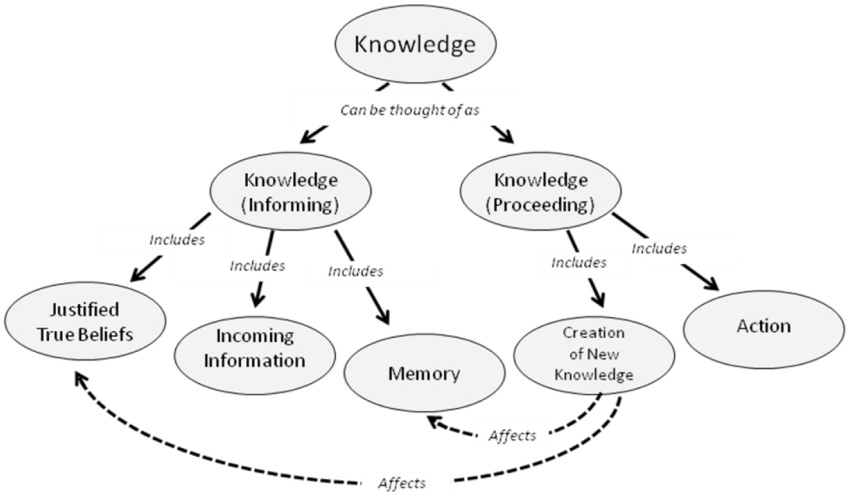

Figure 1. Knowledge (Informing) and Knowledge (Proceeding)
Source: Alex Bennet (used with permission).

Building on the definitions of Knowledge (Informing) and Knowledge (Proceeding) introduced above, it is also useful to think about knowledge in terms of three levels: surface, shallow and deep. Recognizing any model is an artificial construct, the focus on three levels (as a continuum) is consistent with a focus on simple, complicated and complex systems (Bennet & Bennet, 2013; 2008c) and appropriate in the context of its initial use with the U.S Department of the Navy (DON), the first government organization to be

named as a Most Admired Knowledge Enterprise for their extensive work in KM and organizational learning.

Surface knowledge is predominantly but not exclusively simple information (used to take effective action). Answering the question of what, when, where and who, it is primarily explicit, and represents visible choices that require minimum understanding. Surface knowledge in the form of information can be stored in books and computers. Because it has little meaning to improve recall, and few connections to other stored memories, surface knowledge is frequently difficult to remember and easy to forget (Sousa, 2006). **Shallow knowledge** includes information that has some depth of understanding, meaning and sense-making. To make meaning requires context, which the individual creates from mixing incoming information with their own internally-stored information, a process of creating Knowledge (Proceeding). Meaning can be created via logic, analysis, observation, reflection, and even—to some extent—prediction. Shallow knowledge is the realm of social knowledge, and as such this focus of KM overlaps with social learning theory (Bennet & Bennet, 2010b; 2007). For example, organizations that embrace the use of teams and communities facilitate the mobilization of both surface and shallow knowledge (context rich) and the creation of new ideas as individuals interact, learn and create new ideas in these groups.

For **deep knowledge** the decision-maker has developed and integrated many if not all of the following seven components: understanding, meaning, intuition, insight, creativity, judgment, and the ability to anticipate the outcome of our actions. Deep knowledge within a knowledge domain represents the ability to shift our frame of reference as the context and situation shift. Since Knowledge (Proceeding) must be created in order to know when and how to take effective action, the unconscious plays a large role, with much of deep knowledge tacit. This is the realm of the expert who has learned to detect patterns and evaluate their importance in anticipating the behavior of situations that are too complex for the conscious mind to understand. During the lengthy period of practice (lived experience) needed to develop deep knowledge in the domain of focus, *experts have developed internal theories* that guide their Knowledge (Proceeding) (Bennet & Bennet, 2008c).

Building on the definition of knowledge, **learning** is considered the creation of the capacity (potential or actual) to take effective action. From a neuroscience perspective, this means that learning is the identification, selection and mixing of the relevant neural patterns (information) within the learner's mind with the information from the situation and its environment to create understanding, meaning and anticipation of the results of selection actions (Bennet & Bennet, 2008e). Each learning experience builds on

its predecessor by broadening the sources of knowledge creation and the capacity to create knowledge in different ways. When an individual has deep knowledge, more and more of their learning will continuously build up in the unconscious. In other words, in the area of focus, knowledge begets knowledge. The more that is understood, the more that can be created and understood, relegating more to the unconscious to free the conscious mind to address the instant at hand. The wider the scope of application and feedback, the greater the potential to identify second order patterns, which in the largest aggregate leads to the phenomena of Big Data (Mayer-Schönberger & Cukier, 2013).

Descriptive definitions of **Knowledge Management** will be introduced below with the KMTL Study. **KM thought leaders**, as defined in the KMTL Study, are considered those individuals (a) whose focus has been in the area of KM for several years and continues in this or a related field, (b) who have published or edited books or multiple articles in the field, (c) who have developed and taught academic or certification courses in the area of KM, and (d) who have spoken about KM at multiple symposia and conferences (Bennet, 2005). By definition, this means that thought leaders are both learners and educators. As Durham (2004) points out, thought leadership is as much a social role as the command of knowledge, going beyond subject matter expertise to imply leadership and a willingness to assert direction.

A **theory** is considered a set of statements and/or principles that explain a group of facts or phenomena to guide action or assist in comprehension or judgment (American Heritage Dictionary, 2006; Bennet & Bennet, 2010a). Based on beliefs and/or mental models and built on assumptions, theories provide a *plausible or rational explanation of cause and effect relationships*. For purposes of this paper, assumptions are something taken for granted or accepted as true without proof, a supposition or presumption. Principles are considered basic truths or laws; rules or standards; an essential quality or element. Guidelines are a statement or other indication of policy or procedure by which to determine a course of action (how to apply). a **framework** is a set of assumptions, concepts, values and practices that constitutes a way of viewing reality (American Heritage Dictionary, 2006). Thus a framework is tied closely to action. For purposes of this paper, it is assumed that the frameworks developed and provided by participants in the Sampler Group represent their personal theories as related to KM.

Taken from the Greek word *theoria*, which has the same root as theatre, theory means to *see* or *view* or *to make a spectacle* (Bohm, 1980). **Theories reflect higher-order patterns**, that is, not the facts themselves but rather the *basic source of recognition and meaning of the broader patterns.* Bohm sees theories as a form of insight, a way of looking at the world, clear in

certain domains, and unclear beyond those domains, continuously shifting as new insights emerge through experience. While a written theory could be considered information, when understood such that it offers the potential to, or is used by, a decision-maker to create and guide effective action, it would be considered knowledge. Further, while in its incoming form it is Knowledge (Informing), when complexed with other information in the mind of the decision-maker to make decisions and guide action it becomes part of the process that is Knowledge (Proceeding). a framework or model based on a theoretical structure highlights the primary elements of the theory and their relationships.

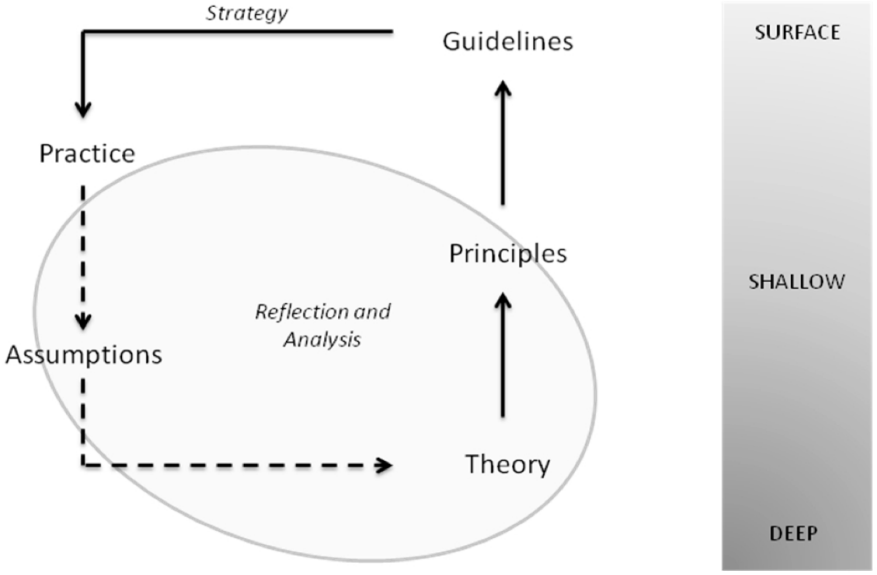

Figure 2. Theory as deep knowledge. Deeper understanding (recognizing second-order patterns) increases the ability to apply learning in different contexts and changing situations

Source: Alex Bennet (used with permission).

Batra (Sampler Call, 2014) says that the symbiotic relationship between theory and practice cannot be over-emphasized. In Figure 2 abowe, there is a dotted line between practice and assumptions and assumptions and theory. While every decision made and action taken is at some level based on the decision-maker's assumptions, these assumptions are often tacit. Further, people tend to not dig down below surface knowledge to *understand* their

assumptions, yet these assumptions underpin theory, from which principles can emerge. Principles drive guidelines, which in turn inform practice. Recall that a characteristic of deep knowledge is the ability to shift our frame of reference as the context and situation shift, the realm of the expert who has learned to identify and apply patterns (deep knowledge). Thus the expert is able to identify and understand second-order patterns and apply them in different situations. This is no easy task. As Fitzgerald (2003) observed, "in theory there is no difference between theory and practice; but in practice, there is."

Decision-making as a process

It is often claimed that KM supports decision-making and innovation (e.g. Snowden, 2014; Bennet & Bennet, 2013). The decision-making process begins with a situation that is both *context sensitive and situation dependent*, and with three sets of information that start the learning process: (a) theories, values, beliefs, and assumptions internal to the decision-maker, (b) memories and internally-stored information patterns related to aspects of the situation at hand, and (c) incoming information from the external environment. The decision-maker creates knowledge by reflecting upon and comprehending the interactions among (a), (b) and (c) above, complexed with knowledge related to potential actions available and applicable to the situation at hand (Bennet & Bennet, 2008a). Out of this process comes understanding, meaning, insights, perhaps creative ideas, and *anticipation of the outcome of potential actions*, that is, knowledge, the capacity (potential or actual) to take effective action.

Frequently, there are a number of potential actions that will move the decision-maker toward the desired outcome relative to the situation at hand. For example, assuming three potential actions and their forecasted outcomes, the decision-maker evaluates each decision option in terms of the science and the art of decision-making. The *science* of decision-making refers to the use of logic, analysis, cost-benefit investigations, linear extrapolation, and—where feasible—simulations, trade-off analysis, and probability analysis. The *art* of decision-making refers to the intuition, judgment, feelings, imagination, and heuristics which come mostly from the unconscious. Combining these two approaches to understanding the forecasted outcomes, the decision-maker selects the decision which either objectively or intuitively (or both) is expected to have the highest probability of success in achieving the desired goals and objectives, often the beginning of a decision journey. For a deeper layer of detail on complex decision-making see Bennet & Bennet (2013).

There are striking similarities between decision-making and the internal workings of the mind/brain. In the brain thoughts are represented by patterns of neuronal firings of 70 milivolt pulses and the strength of their synapse connections. The brain stores information (thoughts, images, beliefs, theories, emotions, etc.) in the form of patterns of neurons, their connections, and the strength of those connections. Although the patterns themselves are nonphysical, their existence as represented by neurons and their connections *are* physical, that is, composed of atoms, molecules and cells. Incoming signals to the body (images, sounds, smells, sensations of the body) are transformed into internal patterns in the mind/brain that represent (to varying degrees of fidelity) corresponding associations in the external world. The intermixing of these sets of information (patterns), what is referred to as semantic mixing (Stonier, 1997) or complexing, creates new neural patterns that represent understanding, meaning, and the anticipation of the consequences of actions (knowledge).

The mind/brain is essentially a self-organizing, cybernetic, highly complex *adaptive learning system* (complex adaptive system) that survives by converting incoming information from its environment into knowledge and then acts on that knowledge. This system is replete with feedback loops, control systems, sensors, memories, and meaning-making systems (theories) made up of about 100 billion neurons and about 1015 interconnections.

From the viewpoint of the mind/brain, any knowledge that is being "re-used" is actually being "re-created" and—especially in an area of continuing interest—most likely complexed over and over again as incoming information is associated with internal information (Bennet & Bennet, 2009, 2006; Stonier, 1997). Thus *knowledge is an emergent phenomenon*. There is no direct cause-and-effect relationship between information and knowledge, rather it is the *interaction among many ideas, concepts and patterns of thought* (including goals, objectives, beliefs, issues, context, etc.) that create knowledge. Further, if Knowledge (Informing) is different, there is a good chance that Knowledge (Proceeding) will be different, that is, the *process* of pulling up, integrating and sequencing associated Knowledge (Informing) and semantically complexing it with incoming information to make it comprehensible (usable and applicable) is going to vary. In essence, every time we apply Knowledge (Informing) and Knowledge (Proceeding) it is new knowledge because the human mind—unlike an information management system—*unconsciously tailors what is emerging as knowledge to the situation at hand* (Edelman & Tononi, 2000). Note that this is a living process occurring in the human mind/brain. See Bennet & Bennet (2013) for an in-depth treatment of this mind/brain process. This is a critical insight for understanding how knowledge management plays out in practice.

Early KM frameworks

In a 2011 paper citing the 2007 iKMS Global Survey, Lambe set forth a long and varied set of precedents beginning in the 1960s, focused on exploring practical and theoretical problems of knowledge transfer, utilization and diffusion (Lambe, 2011). As forwarded by Lambe, there is no doubt that—even if unacknowledged—this earlier work influenced the course of KM. Acknowledging this, a short review of KM literature begins with some representative work responding to the perceived management needs and environment of the 1990s.

Moving toward the new millennium, ideas related to the field of KM were emerging that supported every learning path, with a proliferation of theories, models, case studies and stories. For example, Butterworth Heinemann published the first annual *Knowledge Management Yearbook* in 1999-2000 to serve as a clearing house for new ideas (Cortada and Woods, 1999); Bukowitz and Williams (1999) produced the first *KM Fieldbook* focused on how to implement KM concepts and theories; Tiwana (2000) forwarded the first *KM Toolkit* and ASTD published an "In Action" case book on *Leading Knowledge Management and Learning* at the turn of the century (Phillips & Bonner, 2000). Rumizen (2002) authored *The Complete Idiot's Guide to KM* in 2002, dumbing it down for practitioners; followed by Barquin, Bennet and Remez's two volumes focused on KM in the government sector (*KM: The Catalyst for Electronic Government* (Barquin et al., 2003a) and *Building KM Environments for Electronic Government* (Barquin et al., 2003b), full of models *and* case studies. That same year Springer-Verlag published a two-volume *Handbook on Knowledge Management* (Knowledge Matters and Knowledge Directions) introducing a myriad of theory and its application (Holsapple, 2003a; 2003b).

During those early years of KM as described in this paper, the U.S. Department of Navy (DON) produced a series of KM-related toolkits that were spread by the thousands across the U.S. government sector and its supporting contractor base. The George Washington University, which had founded the first KM doctoral program and early become a partner in DON's aggressive leadership and implementation of KM, began its persistent journey to create KM as a separate academic discipline with its own body of knowledge. Stankosky built a Knowledge Management Framework (KMF), developing overarching theoretical constructs and guiding principles, and supporting GWU Ph.D. candidates as they expanded and applied those theories and principles (Stankosky, 2005; 2011). It was Stankosky who suggested that the DON sponsor a partnering session with academia and industry associations offering KM certifications to figure out what those things were in KM that government knowledge workers wanted and needed to know. This approach defined a conceptual framework for KM through developing criteria for

accredited government certification programs, defining the scope of KM for the Federal sector and laying the groundwork for successful implementation of KM in the U.S. government (Bennet & Neilson, 2003; Bennet & Bennet, 2004). The KMF is consistent with this effort.

The theories and models introduced above are a small representation of what is available today to KM practitioners. For example, each of the individuals who answered the Sampler Research Call and contributed to this paper has published and/or applied KM-related materials based on both theory and case studies. Prusak (Sampler Call, 2014) has authored many publications on KM that include some KM theories, although, true to his underlying personal theory, stories are much more prolific than theories in his books (Davenport & Prusak, 2000; Cohen & Prusak, 2001; Prusak et al., 2004; Davenport et al., 2012, and more). Dhewa (Sampler Call, 2014) works with metaphors and idioms that he says "capture various shades of knowledge." From his unique frame of reference situated in Zimbabwe, Dhewa (2014) argues that modern science cannot meet the demands of the developing world without harnessing indigenous knowledge and then sets about applying this theory in his practice.

Rao (Sampler Call, 2014) developed a holistic framework called the "8 Cs" of KM—connectivity, content, community, culture, commerce, capacity, cooperation, capital (Rao, 2014)—which is used extensively in two of his books (Rao, 2013; 2003; 2004; Tan & Rao, 2013) and in his consulting engagements with a wide range of companies. "These days," Rao shares, he is working on a "grand unified theory of knowledge which brings together innovation management and knowledge management" which he is combining with a search for "best practices and next practices."

While Greenes (Sampler Call, 2014) doesn't largely publish his work, in the early 90's with his team at British Petroleum he had to develop frameworks that didn't exist to assess, design and implement KM. "Over time and application (including plenty of ups and downs), I learned what works for me and the organizations I've enabled. To this day, I continue to evolve and renew my frameworks based on new insights from each relevant application." Over the years Greenes has freely shared these frameworks through conferences, workshops, interviews and benchmarking studies.

Saint-Onge's two books contain a number of frameworks (Saint-Onge & Wallace, 2003; Saint-Onge & Armstrong, 2004), as does Pasher's book on leveraging intellectual capital (Pasher & Ronen, 2011). Focusing on the social knowledge setting, Dixon developed theory and supporting frameworks and models around organizational sensemaking and the power of conversations (Dixon, 2014; 2000; Dixon et al., 2005). Wenger-Trayner developed the theory that brought the KM field communities of practice (Wenger, 2000; Wenger et al., 2002).

Sousa (Sampler Call, 2014) has forwarded KM and ICAS-related models on innovation and leadership (Sousa, 2006; 2008; 2010). For example, Sousa says he has often used the ICAS model in lecturing and to some extent in practice as an overarching theory of a knowledge organization. Sousa refers to the extensive theory of the firm published by Bennet & Bennet (2004) developing the intelligent complex adaptive system (ICAS) model for the knowledge organization of the future. As Sousa describes, "It provides a very clear picture relating the external environment to critical organizational aspects and the emergence of an intelligent organization. People understand it conceptually (and this is the main power of the model). However, empirical evidence on the possible causal relationships outlined in the model through, for example, structural equation modeling would make it even stronger [and] having more case studies from different organizations would make it more tangible and easier to incorporate in MBA programs."

Snowden (Snowden, 2003; Snowden & Boone, 2007), perhaps best known for his ground-breaking work in cognitive complexity (naturalizing sense-making) and narrative, is the originator of the Cynefin Model in support of managing organizational complexity and, more recently, the designer of the SenseMaker® software suite, application of his sense-making theory which is currently employed in both government and industry to handle issues of impact measurement, narrative based KM, strategic foresight and risk management.

Burstein co-developed a task-based knowledge management (TbKM) approach that addresses the practicalities of a particular work task driven by a specific objective (Burstein & Linger, 2011). The framework focuses on pragmatic outputs and conceptual outcomes, with the two nested interrelated layers explicitly documenting knowledge work related to *thinking*, *doing*, and *communication* (Linder et al., 2013). As Burstein points out, "My research (and practitioner) approach to KM is based on the focus on *knowledge practice*, not knowledge per se." Burstein has applied the TbKM theory to many case studies, always with success.

As an academic and an international consultant who actively supports application of his theories and models at the level of knowledge cities, Carrillo has developed a unified theory of value as a basis for knowledge-based development. The Knowledge-Based Value Systems (KBVS) Management Model starts by defining management and knowledge, with management the deliberate act resulting in a value increase. Knowledge is an act (process) that involves three necessary elements: an *object* of knowledge (that which is known), a *subject* of knowledge (her/him who knows) and a *context* of knowledge (that which determines the meaning and value of knowing. On this basis Carrillo distinguishes three core knowledge management processes. See Figure 3 below.

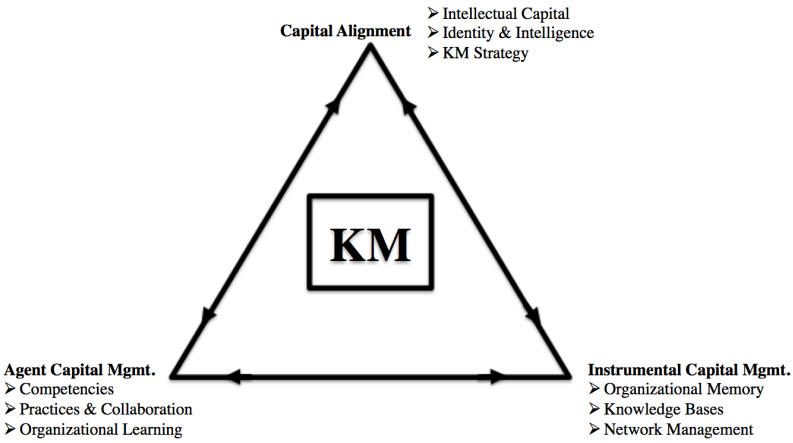

Figure 3. Three core KM processes

Source: Francisco J. Carrillo (used with permission).

Based on 23 years work at the Center for Knowledge Systems, Tecnológico de Monterrey, México, this model has been applied to assess and develop the knowledge capital base of organizations and cities, including development of a taxonomy of capital accounts for knowledge cities and the criteria for the Most Admired Knowledge City (MAKCi) international awards (Carrillo, 2002; 2004). See also Carrillo (2014). Inspired by the MAKCi framework, Batra has developed a Knowledge village Capital Framework in the context of rural habitats of India, and then adapted this to a global model that could be applied wherever substantial rural populations exist. The framework identifies seven types of capitals (identity, intelligence, relational, human, financial, material and innovation) and develops a perceptual scale to measure the degree to which a particular type of capital has been attained in a particular village or clusters of villages (Batra et al., 2013; Batra, 2007; 2012).

As Batra (Sampler Call, 2014) observes, there is a plurality of KM concepts, theoretical approaches and frameworks that have evolved over time. "In fact, there appear to be as many KM approaches and frameworks today as there are well-known KM practitioners." This may be a KM truth.

Exploring two early KM frameworks

Two KM frameworks that came to the fore and achieved almost cult status, sometimes with very little empirical/evidential underpinning (Lambe, 2014) are the DIKW (Data-Information-Knowledge-Wisdom) Hierarchy (Cleveland, 1983; Zeleny, 1987; Ackoff, 1989) and the SECI (Socialization, Externalization,

Internalization and Combination) Model (Nonaka & Takeuchi, 1995). Batra (Sampler Call, 2014) says that KM frameworks such as SECI and DIKW form the backbone of KM theory and practice, attaining cult status because they provide some of the most basic concepts of KM.

As pointed out by Prusak (Sampler Call, 2014), these early models filled a vacuum left by the lack of frameworks and approaches in KM as a whole. They were pushed by consultants and academics, and strongly promoted in conferences and publications. Prusak notes that this isn't all bad. "Even though there may not be much empirical evidence for these methods, they can spur useful conversations and sometimes even new ideas. It's easier to discuss a method than a blank page or some random unassociated data."

Saint-Onge (Sampler Call, 2014) recognizes these early frameworks as drawing interesting distinctions, but feels they "were not effective in serving as the foundation for the development of a knowledge strategy." The difficulty Sousa (Sampler Call, 2014) has with these models is the lack of empirical studies to establish possible causal effects between KM interventions/models and improvements in objective organizational performance.

At an historical time when few managers grasped the concepts of complexity, Snowden (Sampler Call, 2014) feels that the quick embracing of these early theories was due to a desire for simplistic hierarchies and linear models, which was a regrettable reality. Pasher (Sampler Call, 2014) agrees. "These models belong to the same category as the IT KM solutions—the category of quick fixes which rarely achieve lasting results ... [and] feeds the cult status of SECI and DIKW."

We explore these two early frameworks below in more detail.

The DIKW Continuum. The DIKW (Data-Information-Knowledge-Wisdom) continuum, an early model adopted by many practitioners in the mid-90's, actually had its origins the previous century in the work of Harlan Cleveland entitled "Information as a resource". In this work Cleveland changed the sequence in T.S. Eliot's 1934 poem *The Rock* to read: "Where is the wisdom we have lost in knowledge?/Where is the knowledge we have lost in information?" (Cleveland, 1983).

Batra (Sampler Call, 2014) feels that "The distinction between data, information, knowledge and wisdom is the fundamental query of any student of KM." While acknowledging that the framework is far from perfect—particularly in understanding the term wisdom in terms of the KM literature—he feels that "the DIKW hierarchy holds a prime place in the domain of KM and rightly so, despite the apparent ambiguities between various terms of the hierarchy." Further, Batra notes that today the distinction between the terms information and knowledge is becoming blurred. "Data is now being given a prime position as a key strategic resource for business firms

as compared to knowledge, since analytics, particularly big data analytics, provides the capabilities of real-time analysis of large populations of data with high volumes, velocity and variety through machine learning." This is the development of higher-order patterns, the underpinning of theories, ever-changing in a changing world as new patterns emerge.

During the 90's, Tom Stonier, a theoretical biologist, was developing a workable theory of information, and along the way he discovered new relationships between information and the physical universe of matter and energy (Stonier, 1990; 1992; 1997) (see the earlier section on foundational definitions). Simultaneously, an intense interest in neuroscience research was spurred onward by the creation and sophistication of brain measurement instrumentation such as functional magnetic resonance imaging (fMRI), the electroencephalograph (EEG), and transcranial magnetic stimulation (TMS) (George, 2007; Kurzweil, 2005; Ward, 2006). For the first time we could see what was happening in the mind/brain as we process information and act on that information. Recall from our earlier discussion of decision-making in the mind/brain that there is no cause-and-effect relationship between information and knowledge; knowledge is an emergent phenomenon. It is the interaction and selection (complexing) among many ideas, concepts and patterns of thought, all consisting of information, that create knowledge.

During this same time period the body of research focused on wisdom was rapidly expanding. For example, the works of Holliday & Changler (1986); Erikson (1998), Sternberg (1990), Jarvis (1992), Kramer & Bacelar (1994), Bennett-Woods (1997), Merriam & Caffarella (1999) all take the position that wisdom is grounded in life's rich experiences. Levitt (1999), Trumpa (1991) and Woodman & Dickinson (1996) see wisdom as a state of consciousness, with several authors linking the qualities of spaciousness, friendliness, warmth, softness and joy. These characteristics break the continuum suggested by the DIKW model. As Peter Russell explains,

Various people have pointed to the progression of data to information to knowledge ... continuing the progression suggests that something derived from knowledge leads to the emergence of a new level, what we call wisdom. But what is it that knowledge gives us that takes us beyond knowledge? Through knowledge we learn how to act in our own better interests. Will this decision lead to greater well-being, or greater suffering? What is the kindest way to respond in this situation? Wisdom reflects the values and criteria that we apply to our knowledge. Its essence is discernment. Discernment of right from wrong. Helpful from harmful. Truth from delusion. (Russell, 2007)

Around the turn of the century, the U.S. Department of the Navy (DON) placed knowledge at the beginning and wisdom near the end of their change model based on the seven levels of consciousness (Porter, et al, 2003; Bennet

& Bennet, 2004). The change model consists of the following progression to facilitate increased connectedness and heightened consciousness: (1) closed structured concepts, (2) focused by limited sharing, (3) awareness and connectedness through sharing, (4) creating concepts and sharing these concepts with others, (5) advancement of new knowledge shared with humanity at large, (6) creating wisdom, teaching, and leading, and (7) creating (and sharing) new thought in a fully aware and conscious process. In this model, prior to reaching wisdom at level 6, there is the insertion of value (framed in the context of the greater good). Value was absent in the discussion of knowledge in support of the earlier levels of the model since the positive or negative value of knowledge is situation-dependent and context sensitive. The implication is that as knowledge sharing increases and consciousness awareness expands around the value of this focus on, and application of, knowledge theories and frameworks, there is recognition that these theories and models (higher order patterns) and what is learned from their application in a specific context may prove useful for other organizations, communities and/or cities. This is the concept of the "greater good" that moved knowledge toward wisdom. See Figure 4 below. For an in-depth treatment of this model, see Bennet & Bennet (2004).

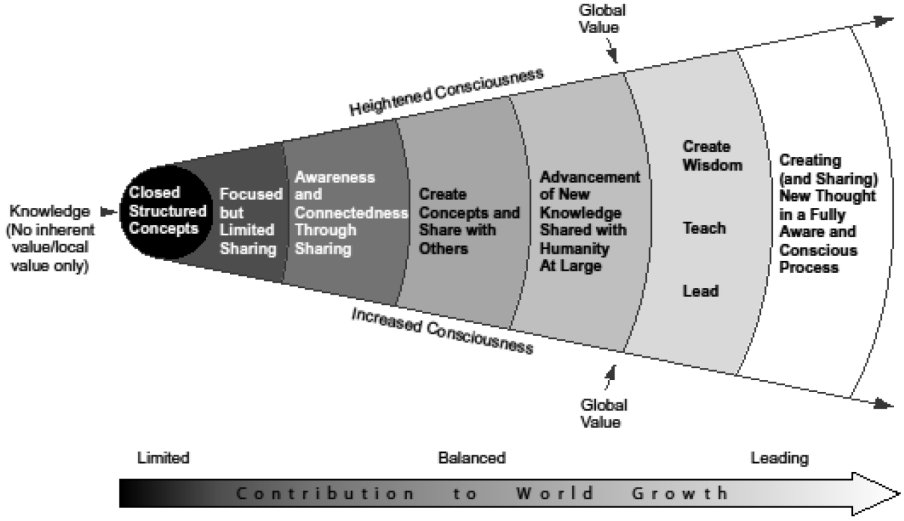

Figure 4. Value statement in terms of the DON change model

Source: Alex Bennet (used with permission).

In a literature review of wisdom, Bennet & Bennet (2008d) clearly relate the concept of wisdom to tacit knowledge and also to the phenomenon of consciousness while acknowledging that there is something more, that is, a link between knowledge comprehension and moral development as a precursor to wisdom (Noi, et al, 2007). Costa describes this "something more":

Wisdom is the combination of knowledge and experience, but it is more than just the sum of these parts. Wisdom involves the mind and the heart, logic and intuition, left brain and right brain, but it is more than either reason, or creativity, or both. Wisdom involves a sense of balance, an equilibrium derived from a strong, pervasive *moral* conviction ... the conviction and guidance provided by the obligations that flow from a profound sense of interdependence. In essence, **wisdom grows through the learning of more knowledge, and the practiced experience of day-to-day life—both filtered through a code of moral conviction**. [emphasis added] (Costa, 1995, p. 3)

As all of this thought and research became increasingly available to KM practitioners, they had the opportunity to carefully re-examine these early models. Snowden (Sampler Call, 2014) points out: "DIKW is ontologically and epistemologically flawed; it is not consistent with modern cognitive neuroscience or epistemology." The early theory of a DIKW continuum was clearly the beginning of a longer conversation, one that—similar to other models used by KM practitioners—*needed to integrate theories and research findings emerging from other fields of study to address its validity and usefulness to the field of KM.* In other words, the framework became a catalyst for a discussion involving both theory and practice.

The SECI Model. a second theory that stands out in terms of being embraced by KM practitioners during the 1990s is the theory of organizational knowledge creation (better known as the SECI model) which describes the four modes of knowledge conversion (socialization, externalization, internalization and combination) (Nonaka & Takeuchi, 1995). Containing both epistemological and ontological dimensions, this model focuses on how knowledge is created and how the knowledge-creation process is managed. Five enabling conditions were identified that drive the knowledge spiral (intention, autonomy, fluctuation and creative chaos, redundancy, and requisite variety) and a five-phase integrating model of the process was developed (sharing tacit knowledge, creating concepts, justifying concepts, building an archetype, and cross-leveling knowledge).

While there is a significant amount of criticism published regarding this model (Bratianu, 2014; Gourlay, 2014; Andreeva, 2014; etc.), in this paper the diverse thoughts of the Sampler Group will be offered to explore its effectiveness. For example, Dhewa, a participant in our Sampler Group,

finds this model useful. "Given that knowledge is a very broad subject, KM frameworks like the SECI are very useful because they try to generalize worldviews. Without a generalized worldview, each person's definition of knowledge will complicate conversations. KM frameworks are a critical starting point. What has made the SECI model something like a dominant force is its simplicity and focus on use of knowledge as opposed to philosophical arguments on the definition of knowledge."

Batra (Sampler Call, 2014) thinks that the transformation taking place between tacit and explicit knowledge in any firm through the spiral of SECI is a fundamental KM concept, "without which there can be no KM." He adds that the empirical underpinning of this framework is evident since it actually evolves out of the practices followed by a well-known Japanese company in creating new knowledge. Similarly, Batra thinks that the Buckmann Labs framework explaining the distinction between KM Infrastructure, Infostructure and Infoculture has also achieved cult status and, more recently, the framework for the MAKE (Most Admired Knowledge Enterprise), both of which are totally embedded in empirical work.

Saint-Onge (Sampler Call, 2014) found the SECI model useful in making the *distinction between* tacit and explicit knowledge, but said that it offered "very little guidance on how to leverage these two types of knowledge." This led him to the conclusion that a complete theory of knowledge needed to encompass both stocks and flows. He feels that "tacit knowledge is most effectively accessed through collaboration where people are helping one another resolve real life issues." Similar to Prusak's earlier observation, Saint-Onge believes these models served as a springboard on the discovery journey of open-minded KM practitioners.

Rao (Sampler Call, 2014) sees a long shelf life for the SECI framework, "because a lot of it seems applicable from a business context and can be mapped on to specific activities as long as the focus is predominantly on present/past practices and not as much on innovation." He says that most companies he has come across prefer a P-P-T framework (people, process, technology). Since "many practitioners prefer to read business books, not academic literature" he says the frameworks in the books *Common Knowledge* (Dixon, 2000), *Working Knowledge* (Davenport & Prusak, 2000) and, more recently, *The New Edge in Knowledge* (O'Dell & Hubert, 2011) are quite popular.

Snowden (Sampler Call, 2014) describes SECI as "a categorization model based on manufacturing case studies in a specific cultural context ... [that] have value in that context but do not, and should not, be allowed to scale." Burstein notes that the fact that the SECI was mostly successful in Japan and in manufacturing was not communicated well in professional literature. Hence, when these and similar frameworks failed when implemented in a different

context, the impact is detrimental for the level of trust practitioners have for academic models.

In more recent work, Nonaka (2012) details the concept of wise (phonetic) leadership which cites the SECI spiral as the source of innovations in any kind of organization. In this issue of the *Journal of Entrepreneurship, Management and Innovation* appears a well-written and solidly referenced paper on how to apply the SECI model to the armed forces. The author, well-versed with the context of the military organization and with the conceptual ability to apply second-order patterns within this context, provides insights regarding the process of knowledge creation in the military setting. This paper—entitled "Knowledge creation in military organizations: How to apply the SECI model to the armed forces"—offers the opportunity for the reader to decide how well the SECI model scales to a military organization.

As with the DIKW continuum, the SECI framework has acted as a boundary object between KM theory and KM practice. Boundary objects often express or contain tensions between the communities or practices that they mediate. On the one hand it is held to have facilitated practical approaches, while on the other hand, it illuminates theoretical shortfalls.

KM theory emerging

All this theory development does not negate the fact there was a growing desire by academics and practitioners alike for some **KM overarching theory (**Stankosky, 2005; 2011; Lambe, 2011). As KM's potential to help achieve individual and organizational success was recognized—with different sets of tools and processes linked to KM in different contexts and situations—there was an expanding need to train new practitioners. Yet the same characteristics that supported success in "seasoned" practitioners who could draw on previous knowledge presented barriers and difficulties for new practitioners entering the field. How to produce consistent results without consistent theories or models in the field? And from that viewpoint, what theories or models could be used to educate/train new practitioners?

Saint-Onge (Sampler Call, 2014) agrees there is nothing as useful as a well-grounded theory. "KM practitioners who do not have a framework to use as a guide for orchestrating their efforts will very likely waste a great deal of time and energy." He adds quickly, "Of course, the framework must be based in the reality of the context in which they operate." Saint-Onge feels that the research that has been conducted so far has thrown relatively little light on the key dynamics involved in building a vibrant, productive knowledge exchange in organizations, and is too limited in scope to provide effective guidance to KM practitioners. "We are still lacking a comprehensive

framework based on systematic research." Here, Bohm would caution that theories, as knowledge, are ever-changing forms of insight. "What prevents theoretical insights from going beyond existing limitations and changing to meet new facts is just the belief that theories give true knowledge of reality (which implies, of course, that they need never change)." (Bohm, 1980, p. 6) This would also refer to our personal theories based on justified true belief. See the earlier discussion on Knowledge (Informing).

Recognizing that KM practitioners emerge from various disciplines—the areas of work within which KM is applied—Saint-Onge points out that these disciplines tend to influence KM practitioners' choice of theoretical approaches and frameworks. For example, economists bring theories from their discipline or sub-disciplines into KM practice. Carrillo (Sampler Call, 2014) tends to rely more on theoretical frameworks developed outside the KM field insofar as these bear more relevance to knowledge phenomena. These areas include Empirical Epistemology, Behavioral Economics, Decision-making, Theories of the Firm, Consciousness, Science of Science, Value Field Theory, and Development Theory. See Carrillo (2001, 2002, 2004, 2014).

Greenes (Sampler Call, 2014) finds that theory from neuroscience, learning, behavior and other related fields impact his thinking. Wenger-Trayner's social learning theory is the foundation of the KM Communities of Practice movement (Sampler Call, 2014). Visualized as a matrix approach to implementation—with KM crossing functional areas and a myriad of thought leaders emerging within the functional context of organizations—this is consistent with the results of the KMTL Study described later in this paper.

In 2007 a global survey of over 200 KM professionals sponsored by the Information and Knowledge Management Society of Singapore (iKMS)—referenced here as the iKMS Global Survey—identified the need (and desire by some practitioners) for an **inter-connected theoretical base**. Results from the iKMS Global Survey described KM as prone to two significant but connected implications:

"1. *Lack of coherence*: arising from the lack of an integrated theoretical base, and resulting in an inability to educate KM professionals effectively [and] develop a suite of substantive theory and evidence-supported practices ...

2. *Poor execution*: arising from poorly prepared and supported KM practitioners and low levels of continuity of personnel within KM initiatives ..." (Lambe, 2011, p. 194)

Of course, there may be other factors involved. For example, Prusak (Sampler Call, 2014) feels that KM practitioners—especially in the U.S.—distrust theory and have little interest in it. While this distrust may be the product of anti-intellectualism in the U.S. culture as a whole, Prusak thinks it is also the association of theory with wooly-minded academics who have

no "real life" experiences and a subsequent lack of understanding of how organizations actually work. Snowden (Sampler Call, 2014) pushes the envelope even farther, saying that KM practitioners today are seeking security in structured roles. "They are no longer interested in *why* things work but just want a simplistic recipe." Noting that too many people who have stayed in the field are pandering this approach, Snowden uses direct and colorful language to express his passion: "Then we get the complete nonsense of SharePoint, which to knowledge management is what 'Sick Sigma' is to innovation. KM has been dumbed down for dummies and it shows in the interests of its practitioners."

Wenger-Trayner (Sampler Call, 2014) agrees that there may be a tendency to hang on to simple models that have intuitive appeal, and notes that this is not limited to the field of KM. "The human world is a complex system with lots of dimensions, so simple models are attractive. They can serve the purpose of organizing one's thinking in manageable ways." He continues that this can prove very useful, especially for people in business who need to make quick arguments about complex processes, but then cautions, "the power of simple models is also their danger ... They can become something that people apply repeatedly, almost as a *substitute* for thinking rather than a *tool* for thinking."

Greenes (Sampler Call, 2014) says that he has been able to use a few simple self-grown frameworks to guide, tailor and align his KM approaches with his KM customers. "I deliberately keep them simple to help engage and meet non-KM experts where they are at, typically reframing them in the language of the people I'm trying to assist." This simplicity enables him to be agile in their application. "At a high level, they fit every organization and situation. I mean, come on, how can a simple framework of five integrated elements of KM—Culture, Process, Content, Technology and Structure—*not* be applicable?" He adds, "I actually think it can apply to probably every discipline! It's how you tailor what makes up each of the five elements to each organization that is each KM practitioner's special sauce."

Carrillo (Sampler Call, 2014) feels that most practitioners lack the background and motivation to dive into the epistemological and scientific foundations of knowledge-based events. In turn, this seems to be reciprocated by a disconnect between academic KM research and KM practice. "Although there is no lack of alternative KM frameworks," says Carrillo, "seldom are these built on explicit scientific grounds, their knowledge claims are hardly falsifiable and rarely, if ever, are these put to rigorous scientific testing."

In a study of KM professional groups in Australia, Booker et al. (2013) say that an outcome of the fixation with scientific rigor is that academics often develop knowledge that is of little value in practice. This research indicated

that, "Few practitioners directly apply a recommendation from a research article in their practice." (Booker et al., 2013) Further, it was found that most practitioners stay up to date on developments in their field through the KM community via online forums and groups, and that while KM practitioners are knowledgeable about books, and use tools for finding and retrieving academic articles, they prefer to talk to other KM practitioners or colleagues for day-to-day information on KM practice. Note that while this sample group was relatively small and limited to KM practitioners in Australia, there was a high level of consistency in the responses.

As a designer, advisor, speaker and attendee at conferences around the world during the latter 90's and now well into the new century, the work of other KM practitioners was a common topic of conversation. While initially the search was for new case studies, as the years passed there was a noted repetitiveness in the focus of the presentations, that is, similar actions with similar results. While this would appear to bode well for the development of an overarching KM theory, this does not appear to be the case. These are the "recipes" described by Snowden (Sampler Call, 2014), who feels that the academic community failed KM by not engaging until there were cases to study. He says that both academics and practitioners need to get rid of their obsessions with treating KM projects as rats in a maze with a false model of causality which is contextually limited. "Practitioners need to break their dependency on recipes and start to read and study more widely and apply that learning in safe-to-fail experiments that in turn they reflect and report." For example, Snowden is currently working in New York with the United Nations Development Program (UNDP) and various development experts to look at how to measure and scale success in the Development Sector. Pushing for co-evolution between theory and practice, Snowden is bringing in post-design thinkers from MIT and biologists from the Rosen School to meet with Cognitive Edge partners to create a new science-informed approach to the problem. "We need more of that and fewer cases," he emphasizes.

Demonstrating the diversity of thought about and approach to the field, Rao (Sampler Call, 2014) says that while practitioners may trust frameworks, they do not want to spend too much time on the philosophical or semantic aspects of KM. "They want something more practical, implementable and measurable, especially with some results demonstrable in the near term." Prusak (Sampler Call, 2014) thinks that KM articles that are purely "words about words" without referring to any practices are mostly worthless. "KM could stand many more cases, ethological studies, maybe even autobiographies or biographies. Anything but models spun out of thin air."

While Prusak (Sampler Call, 2014) does refer to some KM theories in his work, he prefers to use theories from economics and sociology, or political

theories. He admits that he has "more often used *stories* from the well-known KM theorists than their theories." Anyone who has heard Prusak speak can attest to the strength of the stories he shares. Batra (Sampler Call, 2014) notes that case studies are a combination of success stories and not so successful ones that can't be attributed to a specific KM theory.

Saint-Onge (Sampler Call, 2014) agrees that KM research should definitely become more practice oriented. "Researchers have to collaborate with practitioners and tackle questions that are central to the development of an effective knowledge strategy in different contexts." a scan of the theories, frameworks and publications generated by our Sampler Group shows that—complete with stories and case studies—this is exactly what is happening in this small group of KM academics and practitioners.

The KMTL study

The KMTL Study, conducted almost a decade ago, shows that the contours and dynamics of this tension and interplay between theory and practice were already emerging. The purpose of the study was to explore the aspects of KM that contributed to the passion expressed by KM thought leaders. In this section we discuss the themes that were already emerging in 2005, together with relevant insights from the 2014 Sampler Call.

The KMTL Study involved 34 KM thought leaders spanning four continents. Initial contacts were to those who appeared most often in KM literature and appeared at conferences to share their work (see the description of thought leader detailed under Definitions). Five of these recommended additional participants, who were then contacted. An overall weakness of the study is the potential for selection bias. While all individuals approached met the thought leader criteria, it was ultimately the self-selection process of their agreement to participate that drove the sample group used. All but one person approached participated; and those thought leaders interviewed later in the process continued to make suggestions of additional candidates such that time constraints became the primary limiting factor.

Three of the 34 thought leaders participated in a pilot study; and 31 in the primary stage of research. The format of the interviews was either face-to-face, a teleconference or in written format as determined by location and participant preference. The longest teleconference was four hours; the shortest two hours. Face-to-face interviews often extended through a meal. a standard open-ended format of questioning was used; with stories, anecdotes and narratives solicited beyond the answers to the questions. This qualitative approach allowed subjects to describe their own behaviors and experience in the language native to that experience. Transcripts of face-to-

face and telephone interviews were reviewed by participants, and follow-on telephone conversations provided clarifications (Bennet, 2005). In-depth quantitative and qualitative analyses were performed.

In the KMTL Study response, Knowledge Management was seen as a perspective, a movement, a field (not a discipline) with values and value. Definitions of the field provided by 28 responders were almost as diverse as the responders themselves in terms of focus. For example, one responder said "managing the environment in which knowledge can be created, evolved, exchanged and applied into products and services that benefit a constituency" while another said, "the art of creating value by leveraging intangible assets." Still another called it a human capability of taking a concept with some relevance into a new concept or mental model that has the potential to provide a better approach, a better solution, an improvement (Bennet, 2005). Loosely grouped in an attempt to understand their intent, eight of these definitions speak to creating/managing an environment or context; seven are more descriptive in nature, including processes that are a part of knowledge strategies; four focus more on effectiveness, improvement and value added; five focus on the concept of knowing; three see the field as a strategy; and another as an opportunity for good conceptual blending.

Similarly, while thought leaders consistently expressed a passion, an excitement about the field and the potential offered by this focus on knowledge, there was no consistency on *what to call the field*. In fact, 71 percent (24 out of 34) did not like the term knowledge management. Using terms that can help us define and make sense of the field, the diverse names forwarded included: knowledge awareness, connecting, ecology, emergence, environment, evolution, innovation, management, navigation, networking, sharing, strategy and transfer as well as collective intelligence, collective wisdom, competence learning, learning architecture, organizational and organizational learning. As early as 1998, Carrillo (a participant in the Sampler Call, 2014) forwarded the possibility that KM "could become a self-conscious and dynamic field of *collective wisdom*." (Carrillo, 1998, p. 2). As a member of the KMTL Study population, Wiig offered that,

"Successful 'KM' is a *mentality* of how to deal with knowledge-related issues and activities, investments and the like for the purpose of promoting everything from learning to sharing but also for promoting innovation." (Bennet, 2005, p. 106)

This response begs the question: Is it important that we use the same terminology to describe this focus on knowledge? Sousa (Sampler Call, 2014) sees KM as a fundamental organizational instrument providing meaning to the work we do, and most importantly *why* we do it. "Since it is through knowledge that we make sense of the world around us—and the role we and

our organizations play in that world—KM becomes a strategic instrument to provide purpose to both the organization and the individual." As a European, Sousa observes a trend towards a more hands-on consulting and change approach whereby consultants take the role of facilitator, establishing connections, making tacit knowledge explicit, tapping into unexplored areas of knowledge, raising awareness of the knowledge that exists in the organization, etc. "Interestingly, many of these consultants are not even aware of KM models or even of KM as a discipline, they just intuitively feel that this *focus on knowledge flows* makes sense and that change in the traditional top-down approach and expertise-based consulting (generating reports and recommendations) is not sufficient."

Characteristics of the KM field emerging from the KMTL Study thought leader responses are introduced below. Note that these characteristics are written from the viewpoint of KM thought leaders., summarize their collective thought, and are written using the words and phrases provided by these thought leaders. For more depth on these responses, see Bennet (2005).

The field is inclusive, open minded, and encourages diversity and new ideas. KM as a field is open and inclusive, and appears to offer something for everyone. The diversity of ideas, theories and solutions emerging do not seem to be in competition with each other, rather they represent a library of possibilities available to a kaleidoscope of customers, offering the opportunity for widespread participation and contribution from many individuals, cultures, and nations. Prusak (Sampler Call, 2014) recognizes the value of this diversity of ideas. "I do strongly believe that the unit of analysis when working with knowledge is an aggregate (a network, a practice, etc., but not 'eat all the enterprise')." While Prusak wouldn't call it a theory, he applies this belief to his work unceasingly and punctuates, "It works or I wouldn't continue to use it."

KM is self-referential, with reinforcing feedback loops. The KM field has the unusual and interesting property of being self-referential with respect to its own practitioners. The nature of the practitioner's work and the processes involved in sharing that work with others are the same as the content of the KM field itself. All three of these involve learning, creating, sharing and applying knowledge. This self-referencing acts as a regenerative feedback loop in which the results of practitioner's work impacts organizations and other workers which then reinforces the practitioner's learning, knowledge, social interaction and capacity to share further work. As Pasher (Sampler Call, 2014) explains,

I never develop anything alone. I always happily collaborate with others, just as I do in this paper. I collaborate with clients and colleagues from

a variety of disciplines. I look for inspiration from the sciences and the arts, from "deep smarts" and from novices. Every perspective has a contribution *into creating a Life Long Learning experience for me and my clients which enables innovation and renewal* [emphasis added] This is the essence of KM for me.

Greenes (Sampler Call, 2014) says that he's blessed with a high success rate of applying his simple frameworks, which obviously reinforces his continued reliance and comfort on the frameworks he knows best. For example, in 1999 *Fortune Magazine* identified Greenes as the world's leading money-maker in the field due to his business impact in British Petroleum, and under Greenes' leadership BP won their first Most Admired Knowledge Enterprise award. Greenes acknowledges that "most of that is due to generous co-learning with the people I've worked with over the years (both fellow KMers and customers alike) ... and some tenacity on my part."

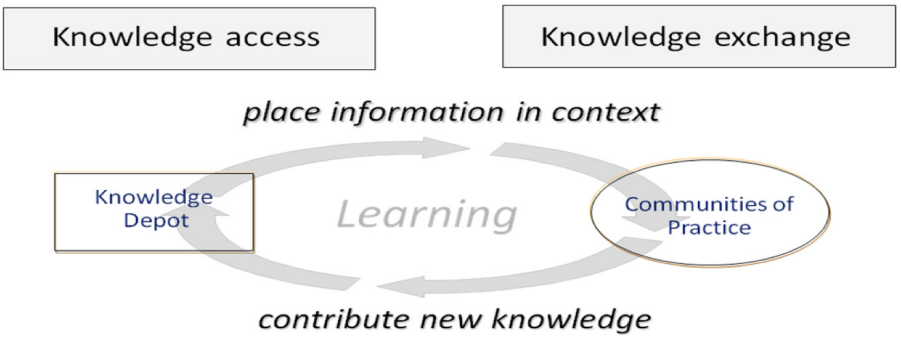

Figure 5. Striking a balance between knowledge access and knowledge exchange

Source: Hubert Saint-Onge (used with permission).

This balance of knowledge access and knowledge exchange lies at the heart of the framework used by Saint-Onge (Sampler Call, 2014), which serves as a model for determining how to build both the technology and organizational systems required for such a platform to thrive and contribute to the success of the organization. "As a matter of principle," explains Saint-Onge, "I believe that an effective knowledge management strategy has to strike a balance between *knowledge access* (the ability to store, search, access information) and *knowledge exchange* (the collaborative generation of knowledge in response to productive inquiry among colleagues)." In the knowledge architecture, knowledge access is codified and stored, tends to be more static, is driven by accessibility and retrieval, and is centrally available

to all individuals. There are built-in collaborative spaces for knowledge exchange, which is interactive and dynamic and driven by productive inquiry. Figure 5 below is the framework that represents this theory.

The KM field encourages autotelic work or flow experiences. KM has the inherent ability to offer thought leaders environments and situations that result in autotelic work or flow experiences (Czikszentmihalyi 1990, 1996, 2003). In the KMTL Study this current of energy and moments of high enjoyment, considered over time, is very close to what was identified as passion in terms of thought leader response.

Practitioners who are thought leaders in the field expressed a great deal of satisfaction from their work and feel that it is very beneficial to them personally as well as to organizations and society as a whole (Bennet, 2005). In the KMTL Study interviews, KM thought leaders frequently touched on their feelings and the *excitement* that came from *learning, creating knowledge, helping others, and experiencing the awareness of "what it means to be alive"* or *"livingness."* For example, Madanmohan Rao (a participant in the KMTL Study and Sampler Call, 2014) said, "I personally believe that one of the few things that outlasts us human beings after our deaths is the knowledge that we leave behind [and] ... embedded in the knowledge movement is some kind of a spiritual wonder of what this world is about." This was expressed by Pasher (Sampler Call, 2014) as replacing the concept of the organization as a machine with the concept of the organization as a living organism, a complex adaptive system, which "leads most of our KM efforts in the direction of Communities of Practice and Communities of Passion, where people share knowledge and help each other to solve problems." She acknowledges inspiration from Wheatley (2006) who forwards *whatever the problem, community is the answer*. Similarly, many of the KMTL thought leaders emanated the excitement of being able to help individuals, organizations, and nations—and perhaps mankind—*learn, grow and make a difference*. As one thought leader proposed, **the foundation of KM lies at the core of humanity**, **knowledge,** and this alone creates passion in many (Bennet, 2005). The thought leaders who are actually engaged in the field of KM strongly exemplify a model of scholar practitioners (continuous learners), *for whom there is a repetitive or long-term state of flow*, that is, the autotelic work experience.

The overlap between knowledge management and learning at both the individual and organizational levels is not surprising. Recall that as defined earlier in this paper, learning is the *process for acquiring knowledge*, the capacity to take effective action. This is why theories developed in support of organizational learning provide some of the best current theory related to KM. For example, Amy Edmondson, a professor at Harvard, with her doctoral students has amassed a great deal of knowledge on how teams

learn, learning from failure, the role of leadership in team learning, and the role of psychological safety in creating knowledge. As Dixon (Sampler Call, 2014) shares, "Her [Edmondson's] work is firmly based in practice—on research conducted in the field" drawn largely from the seminal work of Chris Argyris (1999; 1995) on organizational learning and Karl Weick (2001; 2000) on sensemaking. Graduate students around the world are reading these theorists and using their ideas to inform current practice.

A second example of this overlap is the seminal theoretical contributions forwarded by Etienne Wenger-Trayner, best known in the KM field for his work related to communities of practice (Wenger, 2000; Wenger et al., 2002). Wenger-Trayner (Sampler Call, 2014), who describes himself as a social learning theorist, reminds us that **KM theories are learning tools**.

In the social sciences, theories are not true or false in the sense of being confirmed by data in a direct way; theories are useful ways of understanding the world, which lead those who use them to **ask certain questions and see certain possibilities for action**. Theories are thinking tools. So the empirical validation of models is more complex because it has to do with the investigation and refinement of practice.

KM is a complex adaptive system with many possibilities and opportunities. Specifically, complex adaptive systems "consist of a number of components, or agents, that interact with each other according to sets of rules that require them to examine and respond to each other's behavior in order to improve their behavior and thus the behavior of the system they comprise" (Stacey, 1996, p. 10).

KM did not have a single leader or guru as was evident in earlier management initiatives such as TQM and BPR. As Snowden (Sampler Call, 2014) describes, "There were a lot of intelligent people coming together from different backgrounds to create what became a movement. KM was unique in not being from one person/group based on a pseudo-empirical study. Instead, it came from multiple backgrounds and disciplines." Because of this KM does not have a consistent objective, a specified process, or a restricted domain of interest. Being flexible and robust, the field (in the form of its practitioners) has adapted to—and addressed—issues and opportunities without being constrained by rigid practices or unquestioned edicts. Aided by the breadth and scope of the field and the variety of potential applications, practitioners have been free from imitation and constraints, relatively independent on their focus while simultaneously interdependent in terms of learning from each other and creating new knowledge, and pursuing many different areas that can be brought together to focus on meta-knowledge and its application to individual and organizational performance.

A potential negative aspect of these perceived business-driven new beginnings of the KM field is the inability to capitalize on a rich inheritance of scientific, technical and political foundations. As early as 2001, Carrillo (a participant in the KMTL Study and Sampler Call, 2014) stressed that the KM profession needed to become aware of its legacy in regards to reflective human understanding. "Once conscious about the conditions that can either enhance or prevent its own development, it can take the actions necessary to master its destiny." (Carrillo, 2001, p. 3-4) Conscious awareness enables choice.

Leadership of the field has been (and continues to be) distributed, self-organizing, collaborative, and natural—just as are many KM activities such as knowledge sharing, communities of practice, and networking. This diversity has *encouraged continuous learning* and adapting to local needs and contexts as various methods and approaches are tested and evaluated.

Greenes (Sampler Call, 2014), an early pioneer in KM, describes a continuous cycle of learning and adaptation:

My saving grace is when I experience something that works and is different than the way I know it, I always change. Learning from experience and impact, especially when it's painful, is something I've always done, even before KM. I suppose it's part survival and performance genes, and part of value programming from birth. But it's also the way most people really learn. From a KM perspective, this is the reason it's so important to capture the pain *and* gain when harvesting knowledge and experience for others to learn from.

As Battram said, "complex behavior need not have a complex explanation, and order will emerge from 'self-organization'." (Battram, 1996, p. 125) Considering the self-organization in the field of KM, we can see that the subject matter (knowledge) and its corollary (learning), coupled with the objectives of improving organizational performance, have provided a direction and focus for the field without constraining it, thus the field is continuously emerging rather than being designed or planned.

From this viewpoint, overarching theories were not necessary for practitioners to achieve success. Prusak (Sampler Call, 2014) says, "I have worked with about 100 organizations and they were all alike in some ways and all different in others so theories that are universal regarding KM aren't always too useful." Prusak does agree, however, that there are tools and methods that stay valuable for all of them. Examples are knowledge networks and transaction cost theories regarding knowledge transactions. He adds, "Most of the useful theories I have found valuable in KM work come from the social sciences rather than business or management thinking."

Adapting practices and processes from other fields that make sense for the situation at hand, practitioners develop their own KM theories/models as they recognize patterns emerging in their interactions with individuals and

organizations they support. For example, Dixon (Sampler Call, 2014) points out that in recent years as many KM practitioners have been newly appointed to the KM role without exposure to what has happened in the past, they also work from a theory, one derived from their own experiences, often in another field such as IT or Human Resources. "Over time, as they test their theory in practice, they find out what works and what does not work in their organization and, through trial and error, may arrive at a viable theory, at least for the particular context they are in." As Dixon continues, they may even publish a book about it, but "it is a theory based on an n of 1. It is useful as a case study and, if combined with a meta analysis of many such case studies, could build a general theory."

As higher-order patterns, theory can emerge from various levels of focused attention. For example, when the Center for Army Lessons Learned (CALL) first started collecting best practices and lessons learned, it was difficult to recognize patterns, but as hundreds of events and their context were captured*, second-order patterns began to emerge* which became helpful in understanding other disparate-appearing issues and situations, at times even providing a level of outcome prediction. Today this is the recognized power of big data.

After Action Reviews (AARs) are the pragmatic tool (process) used by CALL to collect lessons learned. The concept is that key questions are answered by engaged stakeholders following every event or situation to assess the context of the event and capture the learning that has occurred. Held immediately after an event with all personnel involved, key questions might include: What did we intend to do? What actually occurred? What went well, and why? What can be improved, and how? AARs serve as real-time on-going assessment vehicles as well as to build understanding in those who participate and those who later read and analyze them (Bennet & Bennet, 2007).

The Singapore Armed Forces (SAF), a MAKE (Most Admired Knowledge Enterprise) Asia and International winner for the past four years, has become a leader in KM by identifying, adapting and expanding best practices from around the world. These practices then serve as a springboard for innovation. For example, SAF expanded the After Action/Action Learning process to include three phases: Before Action Learning (BAL), During Action Learning (DAL) and After Action Learning (AAL). During BAL the group identifies what it thinks will happen and why and how it will happen, including bringing in individuals and teams to share previous linked experiences in context. In DAL the group stops and evaluates what has happened, how it differs from what was expected, and then incorporates any real-time needed changes from the original action plan. After the action is complete, a third learning review (AAL) occurs to assess overall performance and what lessons have

been learned. These results are then forwarded to a lessons learned center for review, storage, linking, and use in training other soldiers.

This same model (pattern) can be and is applied in organizations with diverse missions. For example, the Knowledge in Action Operating Model applied to the pharmaceutical industry by Mountain Quest Institute and Avedisian Management Consulting is shown in Figure 6 below.

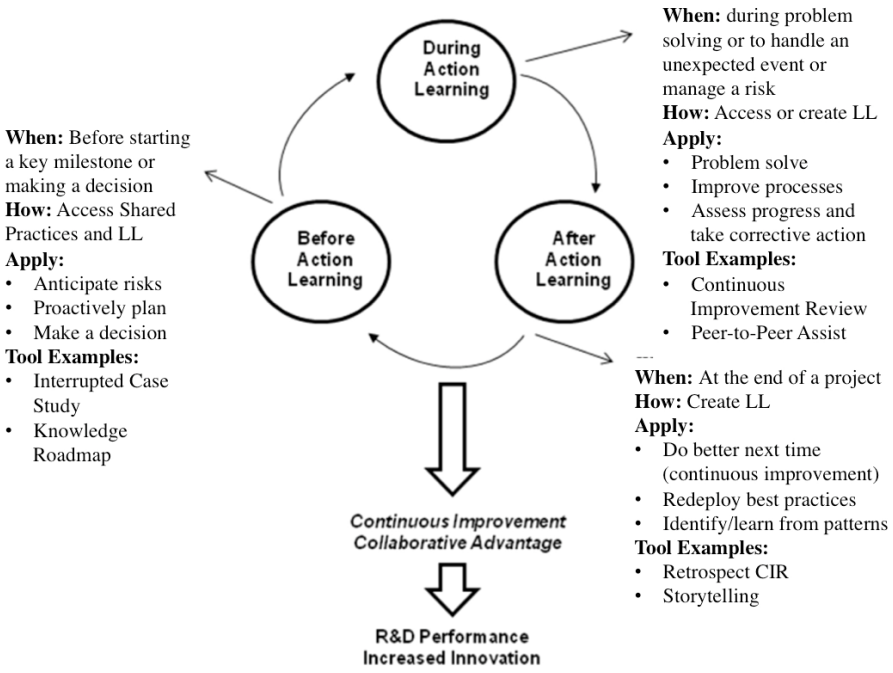

Figure 6. Applying the BAL, DAL, AAL model

Source: Alex Bennet and Joyce Avedisian (used with permission).

Note the emphasis on decision-making and innovation which is consistent with Snowden's belief that *decision support and innovation are the legitimate goals of KM* (Sampler Call, 2014). Further explication of the tool examples is available from the authors.

Concluding thoughts

In 2005 when Dalkir published the textbook, *Knowledge Management in Theory and Practice*, he began the Foreword:

Knowledge management as an organizational innovation has been with us for more than a decade. **As a discipline, it has reached a state of maturity** [emphasis added] where we can now discern the principles, practices, and

tools that make it unique. As a discourse, it has engendered new concepts and categories for us to make sense of the many important ways that organizations use knowledge to create value. (Dalkir, 2005, p. xiii)

Conversely, in the introduction of a 2013 research paper, Booker et al. states, "KM is a **young multi-disciplinary field that has not reached academic maturity** [emphasis added]" (2013, p. 1). Again we see a diversity of opinion, which is what we are coming to expect from this marvelous human capacity we call knowledge! Never was the term "context-sensitive and situation-dependent" more meaningful than when recognized as reflecting both the external environment and internal workings of the decision-making mind/brain.

When the DON developed its first IM/IT/KM Strategic Plan which would be submitted to the U.S. Congress, it was necessary not only to ensure that this was collaboratively created—bringing in every level of the organization—but that the highest level goals be broad enough to drive action without limiting the scope of that action. While one integrated whole, it was recognized that different parts of the DON enterprise had different foci, different goals and responsibilities coming from different competency and experiential bases and biases. What DON was after was a *connectedness of choices*, that is, to ensure at the highest levels the enterprise was heading in the same overall desired direction to achieve its mission (Bennet & Bennet, 2004).

Are we insinuating that there are some overarching goals—complete with overarching theories—that are driving the KM field? Are we suggesting there *is* a connectedness of choices? Possibly. Dhewa (Sampler Call, 2014) feels that researchers and practitioners working at the interface of KM research and practice can help in synergizing these two strands, and believes that competing sources of knowledge are giving rise to this trend. Add "and collaborative" after "competing" and we agree.

While there is perhaps no *single* overarching theory that could be agreed upon in the field of KM (not a new finding), there is also no single paper that could begin to touch the myriad of ideas, models and theories that have emerged—and continue to emerge—in the field. While our Sampler Research Call participants pointed out that some KM practitioners seek simple, structured solutions, there are few of these, if any, that hold the potential for effective action in context-rich, varied and uncertain situations. Yet there is no doubt that as second-order patterns are recognized and theories emerge, these theories can be of service to the field when combined/complexed with a deep knowledge of the context of the situation in which and to which they are being applied. This is the continuous Knowledge (Informing) and Knowledge (Proceeding) looping of the decision-making and action process.

Recognizing that this paper draws from a small sample which can only provide a limited focus on an information-rich field that has been described as a complex adaptive system encouraging a diversity of ideas, what are some conclusions? In summary,

Every decision-maker has a self-organizing, hierarchical set of theories (and consistent relationships among those theories) that guide their decision-making process. This means that every KM practitioner is ultimately acting based on their personal theories, whether based on theories they have created or their belief in the frameworks/models/theories provided by others.

The KM field is continuously shifting and changing, with new ideas emerging as KM practitioners discover and address context-rich situations and opportunities. And as an associative patterner, the human mind is uniquely prepared to address and respond to these challenges.

As with the field itself in terms of definitions, theories and practice, there is a diversity of opinion about the need for and value of developing an overarching theory for KM. Indeed, as emerged in the KMTL Study, the question could be asked, would such a theory expand or limit the field?

There are many theories from other disciplines—and frameworks and models that support their application—that can be successfully applied in the KM field. These second-order patterns, together with the frameworks and case studies and stories that support them, offer potential resources for KM practitioners as situations and contexts change.

The diversity of opinion provided by Sampler Call participants is consistent with the results of the earlier KMTL study and, specifically, with looking at the field of KM as a complex adaptive system with many possibilities and opportunities.

The really good news is that anyone remaining in the KM field over time is a learner. Learning is necessary to provide the flexibility needed to achieve sustainable success in knowledge work which is context-sensitive and situation-dependent. Further, consistent with the KMTL Study findings regarding the passion and excitement generated by this field (Bennet, 2005), there is a trend for those who become immersed as practitioners and move into KM thought leader roles to become scholar/practitioners, taking their experience into University settings to share with future KM-related academics and practitioners. Such is the case with the author, many of the individuals who participated in the 2005 KMTL Study, and with many of those responding to this Sampler Research Call. Take a moment to scan the short descriptions of participants at the end of this paper. Academics are practitioners, and practitioners support—or become—academics. Prusak is an excellent example. Recognized as an early KM leader (Bennet, 2005), over the past two decades Prusak has taught as a visiting professor at 38 universities throughout the US, Europe and Asia.

As humanity enters a new era of social connectivity and interaction, knowledge, at the very core of our existence, is playing a large role, and the unknown future offers exciting potential. Somewhere along the way, we as KM academics and practitioners need to find the balance we are seeking between the conscious awareness/understanding of higher-order patterns (theories) and the actions we take; between the need for overarching theory to guide us and the experiential freedom necessary to address context-rich situations. The KM coffer is full and becoming fuller, with new ideas continuously merging into the flow of challenges and opportunities. We have all that we need—within and without—to fully engage that flow. The question becomes: How will we act on it?

Acknowledgements

With deep appreciation for their candor, participants in the 2014 Sampler Research Call who contributed to this paper are:

Surinder Kumar Batra is a Professor of Information Technology and Knowledge Management at the Institute of Management Technology (IMT), Ghaziabad, India. Prior to joining academia, he had 30 years of management consultancy. Dr. Batra is on the international advisory board of the World Capital Institute, a member of the scientific committee of the Information System Dynamics Project of CIGREF Foundation France, and a member of the scientific committee of the Sixth and Seventh Knowledge Cities World Summits.

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Francisco J. Carrillo is an international consultant in KM/KBD and Professor at Tecnológico de Monterrey (http://www.itesm.edu/), where in 1992 he founded the *Center for Knowledge Systems* (www.knowledgesystems.org). Dr. Carrillo developed the *Capital Systems Framework*, is President of the *World Capital Institute* (worldcapitalinstitute.org), Editor-In-Chief of the *International Journal of Knowledge-based Development*, serves on several international boards and advises cities on KBD policies.

Charles Dhewa is committed to exceptional achievements. He worked with the International Fund for Agricultural Development as KM consultant, is currently the Chief Executive Officer of Knowledge Transfer Africa (Pvt) Ltd based in Zimbabwe, and is focused on helping organizations to see knowledge linkages and possibilities in agriculture and rural development.

Nancy Dixon is a researcher and consultant working with clients to understand the impact of change initiatives they have employed. She is the author of eight books and over 50 articles on how organizations learn. Dr. Dixon is a former tenured Professor of Administrative Sciences at the George Washington University, and served on The University of Texas Human Resource Development Graduate Faculty.

Kent Greenes is Founder and President of Greenes Consulting, an organization dedicated to helping companies get work done smarter, faster and cheaper. He worked with British Petroleum for 17 years, leading the first global virtual teamwork and KM programs, and then joined SAIC as their Chief Knowledge Officer. Kent is on the faculty at California State University at Northridge and is an Executive in Residence at George Washington University. He is also Program Director the Conference Board's Learning & KM Council.

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Laurence (Larry) Prusak is a researcher and consultant who founded and directed the Institute for Knowledge Management, a global consortium of over 70 organizations engaged in researching and advancing the practices of KM and organizational learning through action research. He has worked with over 200 organizations and government agencies and is widely published as well as having taught and lectured at 32 universities.

Madanmohan Rao, an author and consultant from Bangalore, India, is the co-founder of the Bangalore K-Community, a network of KM professionals and formerly the communications director at the United Nations Inter Press Service Bureau in New York, vice president at India World Communications in Bombay, and research director at the Asian Media Information and Communication Centre in Singapore. He has given talks and lectures in over 80 countries and his KM consulting and workshop engagements have included Fortune 500 companies such as Perot Systems, Philips, Cap Gemini and Ernst & Young and government agencies.

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Abstrakt (in Polish)

Praca przedstawia różnorodność opinii odpowiadającą różnorodności teorii, schematów, analiz przypadków i historii związanych z obszarem Zarządzania Wiedzą. Na początku naszej pracy przedstawiamy podejście nazwane Sampler Research Call i 13 naukowców uniwersyteckich i praktyków zajmujących się Zarządzaniem Wiedzą z całego świata, którzy zgodzili się na wzięcie udziału w powyższym badaniu. Następnie podajemy podstawowe definicje i zwięźle opisujemy proces tworzenia wiedzy w umyśle ludzkim. Po krótkim (i zdecydowanie niepełnym) wprowadzeniu do literatury zajmującej się Zarządzaniem Wiedzą na przełomie wieków, podajemy schematy stosowane przez uczestników badania oraz dwa wcześniejsze schematy cieszące się statusem kultowych – kontinuum Dane-Informacje-Wiedza-Mądrość (ang. skrót DIKW) oraz model SECI (socjalizacja, eksternalizacja, kombinacja i internalizacja) widziane oczami uczestników badania. Następnie przedstawiamy wyniki badania MKTL (Liderów Myśli Zarządzania Wiedzą), sugerujące teorie zgodne z bogactwem i różnorodnością myśli zawartych w naszej pracy. Obszar Zarządzania Wiedzą przedstawiony jest jako złożony przystosowujący się system oferujący wiele możliwości i okazji. Wreszcie podsumowując, próbujemy, jako naukowcy i praktycy Zarządzania Wiedzą, znaleźć równowagę między świadomością i zrozumieniem częstych wzorców i działań podejmowanych przez nas; między potrzebą ogólnej teorii a wolnością doświadczenia konieczną do zmierzenia się z sytuacjami o odmiennym kontekście.

Słowa kluczowe: *wiedza, zarządzanie wiedzą, teoria, informacja, uczenie się, wiedza powierzchowna, płytka, głęboka, neuronauka, umysł, podejmowanie decyzji, wzorce,*

złożoność, liderzy myśli, praktycy, wiedza (procedury), wiedza (informowanie), model SECI, kontinuum DIKW, mądrość, badania nad zarządzaniem wiedzą, schematy zarządzania wiedzą.

Biographies

Alex Bennet is a Professor at the Bangkok University Institute of Knowledge and Innovation Management, and Co-Founder/Director of the Mountain Quest Institute located in the Allegheny Mountains of West Virginia, focused on achieving growth and understanding through quests for knowledge, consciousness and meaning. She is the former Chief Knowledge Officer and Deputy Chief Information Officer for Enterprise Integration of the U.S. Department of the Navy (the first government MAKE winner), simultaneously serving as internal consultant for the U.S. government and Co-Chair of the Federal Knowledge Management Working Group. As cited in the Distinguished Public Service Award from the Secretary of the Navy, Dr. Bennet led innovative Navy and Marine Corps enterprise knowledge technology and information management efforts that transformed the DON as it entered the 21st century. Dr. Bennet has authored hundreds of papers and co-authored five books with her partner, David Bennet, including a new theory of the firm based on the Intelligent Complex Adaptive System model for organizations; ground-breaking work with the government of Canada on *Knowledge Mobilization in the Social Sciences and Humanities: Moving from Research to Action*; and the latest thinking on complexity, knowledge and knowing introduced in *Decision-Making in The New Reality.* Dr. Bennet is a Delta Epsilon Sigma and Golden Key graduate with degrees in Human and Organizational Systems, Human Development, Management for Organizational Effectiveness, English Literature and Marketing; serves on multiple international advisory boards and committees; keynotes around the world; and believes in the multidimensionality and interconnectedness of humanity as we move out of infancy into full consciousness. Dr. Alex Bennet, Mountain Quest Institute, 303 Mountain Quest Lane, Marlinton, WV 24954 USA. Tel. (304) 799-7267. Email alex@mountainquestinstitute.com.

David Bennet is a scientist, engineer, educator, and humanist. As a Nuclear Physicist and Naval Officer he taught at the U.S. Navy Nuclear Power School, was a project director at the Office of Naval Research in underwater acoustics, and was technical director of two major weapons programs. Founding a professional services firm, he served as CEO, Chairman of the Board and Chief Knowledge Officer for many years. He is Co-Founder of the Mountain Quest Institute, a research and retreat center dedicated to research in—and the application of—knowledge and learning. He has facilitated over 100

workshops and meetings for government and private industry, and spoken at conferences around the world in the areas of knowledge management, organizational development, leadership and decision-making. Dr. Bennet is a Phi Beta Kappa, Sigma Pi Sigma, and Suma Cum Laude graduate with degrees in Physics, Mathematics, Nuclear Physics, Neuroscience and Adult Learning, Human Development, and Liberal Arts. He may be reached at dbennet@mountainquestinstitute.com.

Knowledge Creation and Conversion in Military Organizations: How the SECI Model is Applied Within Armed Forces

Andrzej Lis

Abstract

The aim of the paper is to analyze the knowledge creation and conversion processes in military organizations using the SECI model as a framework. First of all, knowledge creation activities in military organizations are identified and categorized. Then, knowledge socialization, externalization, combination and internalization processes are analyzed. The paper studies methods, techniques and tools applied by NATO and the U.S. Army to support the aforementioned processes. As regards the issue of knowledge socialization, counseling, coaching, mentoring and communities of practice are discussed. Lessons Learned systems and After Action Reviews illustrate the military approaches to knowledge externalization. Producing doctrines in the process of operational standardization is presented as a solution used by the military to combine knowledge in order to codify it. Finally, knowledge internalization through training and education is explored.

Keywords: *SECI model, military organizations, knowledge socialization, knowledge externalization, knowledge combination, knowledge internalization, counseling, coaching, mentoring, communities of practice, lessons learned systems, after action reviews, operational standardization, military training and education, military exercises.*

Introduction

Discussing dynamic organizational capabilities in the military context, Nonaka (2012, p. 19-30) develops the concept of wise (phronetic) leadership. The concept is based on his seminal model of organizational knowledge creation (SECI model) explaining the processes of knowledge socialization, externalization, combination and internalization (Nonaka, 1991; Nonaka and Takeuchi, 1995). Nonaka claims that the conversion between tacit knowledge and explicit knowledge integrates organizational creativity and efficiency. Therefore, the SECI spiral is the source of innovations in any kind of organization, including armed forces.

The SECI framework is inseparable from the Nonaka's concept of Ba originating from the Japanese philosophy. According to the concept, knowledge is generated within relationships. Ba describes the relationship space establishing the foundation of the flow and conversion of knowledge. Nonaka and Konno (1998) identify the four types of Ba: originating, interacting, cyber and exercising. Representing the knowledge socialization phase, originating Ba is characterized by face-to-face relationships of individuals who "share feelings, emotions, experiences, and mental models". Interacting Ba supports the conversion of knowledge from tacit to explicit (externalization) through sharing and analyzing mental models of other people. In the case of cyber Ba, the combination of explicit knowledge is supported by IT tools. Exercising Ba facilitates knowledge internalization through training.

Nonaka's views triggered the inspiration to ask the question: how do military organizations apply the SECI model to create knowledge and innovations? The aforementioned statement of the research problem determined the following operational objectives of the paper: (1) to identify knowledge creation activities in military organizations and to categorize them in accordance with the SECI model; (2) to identify methods, techniques and tools applied by military organizations to support the processes of knowledge socialization, externalization, combination and internalization.

The paper consists of the introduction, five sections and conclusions. The first section analyzes the approaches to knowledge management and knowledge cycle in military organizations. The subsequent sections discuss the four knowledge creation processes according to the SECI model (socialization, externalization, combination and internalization). The survey of the literature and military publications (i.e. doctrines, directives, manuals, handbooks) was the main research method applied to achieve the aim and objectives of the study. The research attention was focused on the solutions and approaches applied in NATO and the U.S. Army. Owing to the unlimited distribution of the paper, only unclassified sources were used for analysis. Moreover, the author's experience in implementing knowledge management solutions in the Polish Armed Forces as well as observations and insights shared by other military personnel contributed to the project.

Knowledge management in military organizations

The imperative of managing knowledge in an efficient and effective way is extended far beyond business organizations. Managing knowledge and information as well as organizational learning are considered as the prerequisites in military organizations. Therefore, the armed forces pay more and more attention to knowledge management issues. As observed

by McIntyre, Gauvin and Waruszynski (2003, p. 38) knowledge management in military organizations is based on the same assumptions as corporate knowledge management. The difference is in the context, content and pace and that is why military organizations require: "knowledge processes that are robust and reliable within operational contexts"; "knowledge content and intellectual assets that are focused, precise and reliable, with suitable recall levels" and "knowledge creation and conversion processes that match the pace of operations". Members of military organizations often operate in high-risk and high-stake situations in dangerous environments. In combat, which is an extreme case, soldiers risk their lives fighting directly with enemies. They bear the responsibility for the accomplishment of operational aims and objectives as well as for their subordinates and colleagues. They often encounter extreme terrain and climate conditions. They are expected to operate and make the best possible decisions in highly uncertain situations. Therefore, soldiers need knowledge which is deeply embedded in the context of the operation area. They need knowledge which can be practically applied to solve the problems they encounter. They need knowledge and expertise to be available immediately when needed in order to respond properly to emerging threats and challenges. As a result, it should be highlighted that although knowledge management in military organizations derives from business, it is more akin to the approaches typical of such organizations as firefighting brigades, disaster relief teams or emergency medical service.

Both organizations under the study have developed institutionalized knowledge management solutions. According to the NATO Bi-Strategic Command Information and Knowledge Management Directive, knowledge management is defined as "a multidiscipline approach to achieving organizational objectives by making the best use of information, expertise, insights and best practices (Bi-SC 25-1, 2008, p. 1.11, as cited in Byrne and Bannister, 2013, p. 74). The U.S. Army manual on Knowledge Management Operations (FM 6-01.1, 2012, p. iv) explains the military understanding of knowledge management in a short phrase "Know, Show, Grow!". "Know" means tacit "head knowledge" of military personnel. "Show" stands for "knowledge that is written down and documented (explicit knowledge) to be shared with others". "Grow" denotes "collaboration toward innovation which sparks new knowledge". It should be emphasized that the U.S. Army "Show" goes far beyond explicit knowledge included in documents and publications. Armed forces are action-oriented organizations which highly value knowledge contributing to the achievement of aims and objectives. Therefore, all knowledge management efforts in military organizations are expected to focus on applying knowledge into practice. For instance, the Allied Joint Doctrine for the Conduct of Operations (AJP-3B, 2011, p. 4-19)

highlights that lessons learned should contribute to the improvement of the way of doing and performance of the armed forces. “Showing value of the Lessons Learned capability to the force” is enumerated among the key success factors in U.S. military Lessons Learned programs (Lis 2012b, p. 27-28). What is also important, actions and decisions are driven both by tacit and explicit knowledge of a doer or a decision maker applied in a particular context.

Recognizing the value of the practical aspect of knowledge, both organizations under the study strive for becoming learning organizations. The NATO Bi-Strategic Information and Knowledge Vision declares that “the NATO Military Structure will transform into a Knowledge Centric Organization (KCO) that deliberately and systematically exploits NATO information and expertise, and proactively manages its information and KM processes. The NATO strategic commands will promote an organizational culture that fosters information and knowledge sharing and treat information, expertise, experience, and Best Practice as valuable assets, as a fundamental capability required to achieve decision superiority” (Bi-SC IKM Vision and Strategic Concept 2007, as cited in Hutson, 2011, p. 48-49). Similarly, as officially declared in the U.S. Army manual on Knowledge Management Operations (FM 6-01.1., 2012, p. 1.13), knowledge management is to facilitate “the transformations of Armed forces into knowledge-based organizations [which] integrate best practices, the most effective and efficient method of achieving any objective or task, into operation or training”. The vision of the army as a learning organization attracts the attentions of researchers who discuss and reexamine it (cf. Wheatley, 1994; DiBella, 2010). What is more, both organizations under the study are famous for their learning concepts and tools such as Lessons Learned and After Action Review, which will be discussed in details in further sections of the paper.

Both organizations under the study highly appreciate organizational learning and they strengthen close links between managing knowledge and their key activities. The knowledge management cycle which can be observed in military organizations (Figure 1) highlights the role of organizational learning and the use of knowledge to achieve organizational aims and objectives in operations and exercises. Military organizations codify their knowledge in doctrines, manuals, instructions and other publications. The explicit knowledge embedded in these documents is transferred to the troops through training and education. In the peacetime, training is considered as one of the core business activities of any armed forces, besides the participation in operations formerly defined as “military operations other than war” (MOOTW) such as peace operations, combating terrorism, humanitarian assistance, arms control etc. (cf. JP 3-07, 1995). Knowledge, skills

and competencies acquired by military personnel in the processes of training and education are verified in military operations and exercises. Nowadays, the scope of military engagements encompasses the variety of operations such as: stability operations, civil support, foreign humanitarian assistance, recovery, non-combatant evacuation, peace operations, combating weapons of mass destruction, CBRN (chemical, biological, radiological and nuclear) consequence management, foreign internal defense, counterdrug operations, combating terrorism, counterinsurgency and homeland defense (JP 3-0, 2011, p. I-15). It should be highlighted that in all types of operations, regardless of their character, affective drivers to learn are much stronger than in training. Therefore, operations are the contexts of paramount importance for military knowledge management and learning. Identifying and learning lessons from operations and exercises update the knowledge base of military organizations. Reviewed knowledge triggers the development of new concepts. Simultaneously, military publications are updated in order to keep pace with changes in the armed forces and the environment. In effect, the knowledge management cycle is closed.

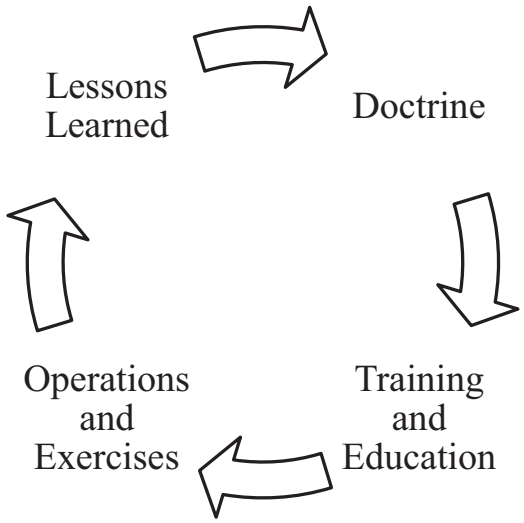

Figure 1. Knowledge management cycle in military organizations

Sometimes, when military organizations operate in highly turbulent environments, lessons learned are directly translated into changes in training programs or even in the way of conduct of operations. Special forces are the branch of the armed forces famous for learning and innovations regarding tactics and weaponry which shortcut a typical "lessons learned to doctrine

to practice" loop. Special forces are often the leaders in the implementation of effective learning and knowledge sharing initiatives in their armies. The paramount importance of sharing tacit knowledge for tactical innovations is also recognized by other armed forces which support communities of practice and professional forums such as CompanyCommand in the U.S. Army or the U.S. Air Force Knowledge Now platform.

When studied thoroughly, the aforementioned elements of the knowledge management cycle in military organizations can be categorized in accordance with the SECI model. Military organizations have developed techniques and tools corresponding to the four knowledge creation activities represented in the model (Figure 2).

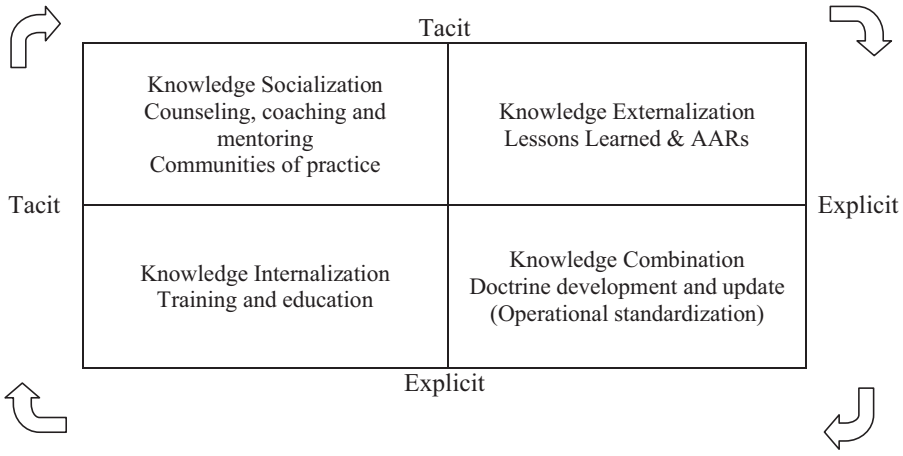

Figure 2. The examples of SECI processes in military organizations

Source: Own study based on the SECI model by Nonaka (2012, p. 21).

In subsequent sections the four SECI processes identified in military organizations will be discussed. Counseling, coaching, mentoring and communities of practice will be studied from the perspective of their potential for supporting knowledge socialization. The analysis of Lessons Learned systems and After Action Reviews will illustrate the military approaches to knowledge externalization. Producing doctrines in the process of operational standardization will be presented as a solution used by the military to combine knowledge in order to codify it. Finally, knowledge internalization through training and education will be explored.

Knowledge socialization through counseling, coaching, mentoring and communities of practice

Socialization is the process of conversion from tacit knowledge to tacit knowledge which occurs through social interactions such as apprenticeship and mentoring. Socialization is facilitated by teamwork, sharing experiences, informal communication and open workplace without barriers (Byrne and Bannister, 2013, p. 76). In order to foster knowledge socialization among their members military organizations promote the practices of counselling, coaching and mentoring. The military highly values the community (of practice and interest) concepts. Moreover, some features of socialization processes are embedded into the procedure of After Action Review which will be studied later in the section relating to knowledge externalisation.

According to the US doctrine on Army leadership (ADP 6-22, 2012, p. 8) counseling, coaching, and mentoring are considered as some of the tools used by a leader to provide feedback and develop other members of military personnel. As such tools they might be used to transfer tacit knowledge of a counselor, a coach or a mentor to a less experienced member of military personnel. Having the same aim, all the three aforementioned techniques differ from each other as regards to their detailed purposes, time perspective, the feedback provider or the type of interaction between participants.

Counseling is defined as "a standardized tool used to provide feedback to a subordinate" (AR 600-100, 2007, p. 5) or "the process used by leaders to guide subordinates to improve performance and develop their potential" (ADRP 6-22, 2012, p. 7.10; cf. FM 6-22, 2006, p. 8.12). Counseling is focused on the past performance and ways to improve it in the future. Within the counseling process, the interaction occurs between a leader and their subordinate. While counseling, leaders support their subordinates in identifying strengths and weaknesses, developing and implementing improvement plans, and assessing their outcomes. Subordinates are expected to be active members of the counseling process and seekers of constructive feedback. The US Army Field Manual on Army Leadership (FM 6-22, 2006, p. 8.12) identifies three types of counseling: event counseling, performance counseling and professional growth counseling.

As stated in the US Army Doctrine Reference Publication (ADRP 6-22, 2012, p. 7.10) "coaching refers to the function of helping someone through a set of tasks or with general qualities". It is a role of a coach to support a person being coached in understanding their current level of performance and developing their knowledge, skills or competencies. Coaching is focused on the present time perspective. According to the US military regulations, in their work coaches should apply the following guidelines: focusing goals, clarifying the leader's self-awareness, uncovering potential, eliminating

developmental barriers, developing action plans and commitment, following-up through an interaction and feedback from a person being coached (FM 6-22, 2006, p. 8.13-8.14; cf. ADRP 6-22, 2012, p. 7.10-7.11).

Mentorship is defined as "the voluntary developmental relationship that exists between a person of greater experience and a person of lesser experience that is characterized by mutual trust and respect. The focus of mentorship is voluntary mentoring that extends beyond the scope of chain of command relationships and occurs when a mentor provides the mentee advice and counsel over a period of time" (AR 600-100, 2007, p. 6). Contrary to counseling and traditional belief, the mentorship interaction is not limited to a superior-subordinate relationship and it may occur among the soldiers of different ranks. In initiating the mentorship relation the need of pro-active attitude of a less experienced soldier is highlighted. According to the Army Mentorship Handbook (2005, p. 14-15), there are five key success factors of effective mentoring relationships: respect, trust, building partnership, realistic expectations and self-perception and time necessary to develop relationships.

As regards the time perspective, mentoring is oriented to the future and to the development of the mentee potential. Therefore, the role of a mentor changes over the time to meet the changing needs of the mentee's learning and growth. The mentorship program starts from the prescriptive stage, when a novice in the army needs a coach, a motivator and a teacher. Then, in the persuasive stage the roles of a counselor and a guide become the priorities to support the mentee to answer questions and face challenges. In the collaborative stage a mentor and a mentee work together to solve problems. a mentor is to take on the responsibilities of a career advisor and a role model. Finally, in the confirmative stage, an experienced mentee is supported by a mentor with their wisdom or professional expertise and insight (Army Mentorship Handbook, 2005, p. 21-23).

As already mentioned, military organizations are action-oriented and they highly value "hot", practical knowledge learned from the field which is situation-dependent and context sensitive. Such knowledge is particularly important in operations where soldiers' lives are at the stake. Operating in risky, uncertain and stressful situations where "no doctrinal or clear-cut answers" are applicable, as highlighted by Dixon (2007, p. 14) "conversation with those facing similar issues is an essential means of deepening one's own thinking about important subjects". Therefore, soldiers need mechanisms to communicate, to share their problems and worries and to learn from each other quickly and effectively. Communities of practice are the example of such a solution used by both commanders and the rank and file. "Communities of practice are groups of people who share a concern, a set of problems,

or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis" (Wenger, McDermott and Snyder, 2002; quoted after: Jashapara, 2004, p. 203). CompanyCommand (CC), the U.S. Army community of practice integrating captains in charge of a company (a unit of about 150 troops) command, may be an interesting example illustrating this approach to knowledge socialization in military organizations. The community was established in the 1990s as a voluntary initiative of young U.S. officers in order to learn from each other. In 2000, the forum launched its website to connect their members and facilitate communication. The role of the CompanyCommand professional forum was officially recognized by the Army which provided organizational support for the community. The idea of the organization is very accurately explained by Dixon, Allen, Burgess, Kilner and Schweitzer (2005, p. 1) in their seminal study of the CompanyCommand case: "The cutting-edge knowledge of the Army resides in the minds of leaders at the tip of the spear. Connecting these leaders in conversation brings together the Army's greatest knowledge resources, unleashing the power of the Army profession to improve combat effectiveness".

When studied from the perspective of the internal knowledge market effectiveness (cf. Davenport and Prusak, 1998, p. 28-30), all the techniques discussed above facilitate knowledge transactions between knowledge sellers (experienced members of military personnel) and knowledge buyers (who need to be counseled, coached, provided with mentor's advice or updated with the edge-cutting knowledge from the field). The need to seek advice and counsel in order to benefit from the experience of others is highlighted by the founders of the CompanyCommand professional forum, in their book on military leadership (Allen and Burges, 2001, p. 3-4). Counseling, coaching and mentoring are the examples of institutionalized procedures fostering organization members to transfer knowledge through socialization and mechanisms established in order to improve the effectiveness of knowledge markets in military organizations. Communities of practice connect soldiers and give them the chance to exchange their lessons, opinions and insights. Simultaneously, all the aforementioned solutions enable military organizations to preserve knowledge and experience of their members (organizational memory). It is very important due to the fluctuation of personnel resulting from position rotations and frequent deployments to various areas of operation.

Knowledge externalization through Lessons Learned (LL) and After Action Reviews (AAR)

Externalization is the process of knowledge conversion from tacit to explicit. Through externalization observation and best practices captured by a serviceperson are shared with other members of military organizations. Byrne and Bannister (2013, p. 77) enumerate the following externalization techniques: writing notes, brainstorming, encouraging a learning environment. In military organizations, Lessons Learned systems and After Action Reviews are the most common tools used to externalize the knowledge of their members.

According to the Allied Joint Doctrine (AJP-01(D), 2010, p. 5.2.) Lessons Learned and the review of doctrines are enumerated as the last stage of a NATO joint operation. It means that knowledge acquired by the troops during the operation is required to be externalized, to be transferred from tacit knowledge of operation participants to explicit knowledge available to all military personnel in doctrines, directives, manuals and other publications. Lessons Learned make a kind of a bridge between tacit knowledge experienced and acquired by the personnel and explicit knowledge embedded in military doctrines. As stated in the NATO Allied Joint Doctrine Publication for the Conduct of Operations (AJP3(B), 2011, p. 4.19) "the purpose of a Lessons Learned is to learn efficiently from experience and to provide validated justifications for amending the existing way of doing things, in order to improve performance, both during the course of an operation and for subsequent operations".

Military organizations have always valued lessons learned from wars, operations and battles and they used such lessons to change their strategies and tactics, to improve organizational structures and to modernize armaments. Mains and Ariely (2011, p. 165-176) discuss interesting examples of lessons learned and applied by the U.S. Armed Forces from World War II to Iraqi and Afghanistan operations and by the Israeli Defense Forces during the Second Lebanon War. Recognizing the increasing role of organizational learning, starting from the 1970s and the 1980s military organizations have institutionalized their lessons learned practices. The armed forces established structures responsible for lessons learned e.g. the U.S. Center for Army Lessons Learned (see more Lackey, 2003, p. 79-87) or the Joint Analysis and Lessons Learned Centre, which is the leading agent for organizational learning in NATO. Procedures for identifying and learning lessons as well as toolboxes supporting these processes have been developed (cf. Jabłoński and Lis, 2012, p. 170-182). According to the NATO model of the lessons learned system, the three aforementioned elements (i.e. structures, process and tools) create the pillars of the "Lessons Learned house". Nevertheless, in order to be

efficient and effective, the Lessons Learned capability should be established on the foundation of positive mindset and engagement of all military personnel and the positive leadership of military commanders. Knowledge and information sharing makes the capstone of the "Lessons Learned house" (The NATO LL Handbook, 2011, p. 9). As proved by the author's research (cf. Lis, 2012a, p. 82-93; Lis, 2012b, p. 21-34) positive organizational behaviors and related issues such as organizational culture, organizational climate and leadership are the key success factors for learning lessons by military organizations. Applying the systems approach, military organizations build up and strengthen their Lessons Learned capabilities through the development of DOTMLPF-I capability components i.e. doctrine, organization, training, material, leadership, personnel, facilities and interoperability (cf. Hallet, Mota, Pinot, Smack and Soegaard, 2009, p. 41-44).

When studied thoroughly, the scope of the Lessons Learned procedure goes beyond knowledge management combining organizational learning with change management. The procedure of Lessons Learned includes identifying lessons, assigning action and implementing the change (Milton, 2010, p. 16-20). This generic procedure is followed by the models of Lessons Learned processes used in military organizations. For instance, the NATO Lessons Learned process consists of six steps including observation identification, analysis, endorsement, implementation and validation of remedial actions, and the dissemination of observations and lessons learned (The NATO LL Handbook, 2011, p. 11).

The After Action Review is considered to be one of the most effective techniques supporting organizational learning and lessons learned programs. The After Action Review procedure originated in the U.S. Army in the 1970s and significantly contributed to the post-Vietnam War transformation of the U.S. military. As observed in the U.S. Army Lesson Learned handbook "[within] the U.S. Army, no concept is given more credit for changing the way it trains or fights than the AAR process. AARs help provide soldiers and units feedback on mission and task performances in training and in combat. They identify how to correct deficiencies, sustain strengths, and focus on the performance of specific mission-essential task list training objectives" (Establishing a LL Program, 2011, p. 63).

After Action Review is "a verbal, professional discussion of a unit's actions that typically occurs immediately after a training event, combat operation, or other mission that determines what should have happened, what actually happened, what worked, what did not work and why, and the key procedures a unit wants to sustain or improve" (Establishing a LL Program, 2011, p. 63). In this paper the AAR procedure is categorized as a tool for knowledge externalization. Nevertheless, it should be made clear that After Action

Review combines various knowledge creation and conversion processes. First and foremost, it enables the military to externalize their knowledge. The whole After Action Review process, and its modifications such as Before Action Review (BAR) and During Action Review (DAR), are built on the value and methodology of Lessons Learned. The potential of the procedure to convert tacit knowledge into explicit knowledge is even more visible when externalized knowledge is codified as an After Action Report – "a written report that is typically submitted after a training, combat operation, or other mission that normally documents a unit's actions for historical purposes but also provides key observations and LL" (Establishing a LL Program, 2011, p. 63). Nevertheless, both socialization and internalization processes are embedded into After Action Reviews, too. Conducting an analysis of what happened, what was effective and what still needs an improvement, soldiers share their tacit knowledge (socialization). Simultaneously, through discussion and analysis the military theory in the context of real life lessons from the battle or training, military personnel increase their understanding of explicit knowledge included in military doctrines, directives and manuals (internalization).

The After Action Review procedure was imported to the business environment in late 1980s by Shell Oil at the suggestion of a retired general Gordon Sullivan, then a member of the company's board (Darling, Perry and Moore, 2005, p. 86). Nowadays, the AAR is widely recognised as an effective tool of organizational learning. Discussing the building blocks of the learning organization, Garvin, Edmondson and Gino (2008, p. 112) point out the U.S. Army After Action Review as an example of the best known example of concrete learning processes and practices. Davenport and Prusak (1998, p. 8-9) highlight the After Action Review's contribution to "ground truth" considered to be a component of knowledge. "Ground truth", which is a term borrowed from the U.S. Center for Army Lessons Learned (CALL), means "knowing what really works and what doesn't" or "the rich truths of real situations experienced close up: on the ground, rather than from the heights of theory or generalization" (Davenport and Prusak, 1998, p. 8). What is more, as highlighted by one of the experts reviewing the paper "CALL went beyond capturing Lessons Learned to exploring patterns across Lessons Learned, that is, higher-order patterns that provided insights beyond the context and situation from which they were learned". Consequently, the state of knowledge is shifted from "knowing what really works and what doesn't" to "knowing when it works and when it doesn't". Such a change results from analyzing the observations captured by soldiers in the field and building the army knowledge base through organizational learning processes.

Summing up, it can be observed that military Lessons Learned systems are traditionally perceived as formal approaches oriented at collecting lessons in databases. Nevertheless, the reality is far more complex. Certainly, Lessons Learned databases are still in use but the armed forces are more and more oriented to sharing lessons through Internet portals and connecting their personnel through formal networks. The extending popularity of After Action Reviews is another landmark of knowledge externalization processes in military organizations. The AAR procedure offers an organized and methodological approach to solving real life problems faced by military organizations and their members. It can be applied both in a formal or informal way. The aforementioned advantages increase the AAR's potential as a technique of knowledge processing.

Knowledge combination through operational standardization

Combination means the transfer from explicit to explicit knowledge through categorizing, storing, sorting and updating knowledge, information and data (Byrne and Bannister, 2013, p. 77). In the military context, knowledge externalized through Lessons Learned processes is combined with other pieces of information, knowledge and expertise in order to produce military doctrines, manuals and other publications which standardize the way of conducting operations and doing business by military organizations.

NATO standardization is defined as "the development and implementation of concepts, doctrines, procedures and designs in order to achieve and maintain the compatibility, interchangeability or commonality which are necessary to attain the required level of interoperability, or to optimize the use of resources, in the fields of operations, material and administration" (AAP-42(B), 2011, p. 22). Operational standardization relates to military practices and it is applicable to "doctrines, tactics, techniques, procedures, training, reporting, maps and charts". Material standardization covers "consultation, command and control (C3) systems, weapon systems and subsystems, interfaces, assemblies, components, spare parts and consumables, including ammunition, fuel, and supplies". Administrative standardization deals with "terminology, finances, human resources and military ranks" (AAP-3(J), 2011, p. 12).

NATO standardization process is "the sequence of activities consisting of the identification and validation of the standardization requirements as well as the achievement of the related standardization tasks, resulting in the production of the NATO standardization documents, followed by their ratification or approval, their implementation or adoption and their maintenance throughout their life cycle or their disposal" (AAP-42(B), 2011,

p. 23). Generally, there are two ways to initiate the NATO standardization process: the top-down approach triggered by the NATO defense planning process and the bottom-up approach resulting from the need identified through the externalization of knowledge, i.e. by Lessons Learned procedures. When submitted, a standard proposal is validated. Then, a standardization task is realized through one of the following options: selecting and updating existing NATO standardization documents, developing a new NATO standard, selecting an appropriate non-NATO standard or developing/revising a dual-use standard in cooperation with civilian standardization organizations. When drafted, a NATO standard undergoes the procedures of ratification and approval by NATO member countries. While the endorsement process is completed, standardization documents are promulgated and distributed. The implementation process starts the life cycle of documents which are reviewed and updated when necessary (AAP-3(J), 2011, p. 21-47).

Knowledge acquired by military organizations and their members is combined into doctrines and other publications. Therefore, from the perspective of managing a knowledge cycle and creating knowledge, doctrine development is an important area of interest of this study. As highlighted in the preface to the NATO publication on allied joint doctrine development (AAP-47, 2013, p. III), "the planning, execution and support of military operations require clearly understood and widely accepted doctrine. This is especially important when operations are conducted by Allied and coalition forces. So, as NATO continues to transform its capabilities to meet the security challenges of the evolving environment, it is necessary for the Alliance to adapt its doctrine accordingly". The NATO Glossary of Terms and Definitions (AAP-6, 2013, p. 2-D-9) defines doctrine as "fundamental principles by which the military forces guide their actions in support of objectives. It is authoritative but requires judgment in application". NATO doctrines focus their attention on procedural knowledge, explaining how to conduct operations by "capturing and promulgating commonly agreed principles that guide the employment of NATO military forces in a coordinated action towards a common objective" (AAP-47, 2013, p. 1.2.). Joint doctrines establish "a link between the 'ends' (what must be accomplished and the 'means' (capabilities) by providing the 'ways' (how) for joint forces to accomplish military strategic and operational objectives in support of NATO's goals" (AAP-47, 2013, p. 1.3).

The strategy of knowledge codification through doctrines, manuals and other publications is widespread in military organizations. Such an approach enables military organizations to provide clear guidelines for all the members from rank-and-file soldiers up to general officers. The codification of knowledge and procedures supports coordination between units, the components of armed forces (e.g. land forces, air forces, navy, special forces

or marines) and the national contingents of coalition or alliance member countries. Nevertheless, in highly turbulent environments, it is a real challenge for military organizations to keep their doctrines updated. For instance, during military operations when tactical innovations must be captured and disseminated very quickly, lessons learned are translated directly into changes in training programs or even in the way of conduct. In such situations, a gap in the knowledge management cycle emerges. Therefore, when the situation is stabilized, military organizations make efforts to fill the gap. Therefore, the process of doctrine development through knowledge combination cannot be a one-time activity but it should be rather a long-term effort focused on continuous learning and incorporating new lessons into documents.

Knowledge internalization through training and education

Internalization is the process of creating new tacit knowledge from explicit knowledge. Learning and understanding explicit knowledge is related to practicing and repetition, experience and expertise and creating know-how (Byrne and Bannister, 2013, p. 77). In military organizations, education and training are considered as the key solutions supporting the internalization of explicit knowledge by their members. Military organizations highly value the role of training, perceiving it as the foundation for an efficient and effective conduct of operations.

The NATO education and training activities encompass four following areas: education, individual training, collective training and exercises. Education is defined as "the systematic instruction of individuals in subjects that will enhance their knowledge and skills, and develop competencies". Individual training includes "all instructional activities that provide the knowledge, skills and competencies required in the performance of assigned duties". Education and individual training make the foundation of military training. When the individual training is completed the attention is focused on collective training oriented to "procedural drills and the practical application of doctrine, plans and procedures to acquire and maintain tactical, operational and strategic capabilities". Then, the capabilities of headquarters and military units are trained and tested in military exercises which are the fourth element of the education and training system (Bi-SC 75-2, 2013, p. 9; cf. Bi-SC 75-3, 2013, p. 1.3; Bi-SC 75-7, 2013, p. 1.2). The aim of military exercises is to "ensure that HQ and formations are efficiently and effectively trained to fulfill their missions within the given readiness criteria" (Bi-SC 75-3, 2013, p. 1.3).

Taking into account the increase in the depth of knowledge, military education and training are delivered through the following forms and activities:

elearning, residential training and courses, key leader training, training events and exercises (Bi-SC 75-2, 2013, p. 37). Military organizations recognize the growing potential of electronic learning (elearning). In December 2011, NATO issued an official e-learning concept. Due to technological changes and lessons learned from practice, the document has been reviewed and updated. Nowadays, the 4th edition is in force. According to the e-learning concept (2014, p. 7-10), NATO applies and develops the following e-learning technologies and solutions: advanced distributed learning (ADL), computer-based training (CBT), immersive learning, mobile learning (m-learning), transmedia (collaborative) learning and blended learning combining the strengths of e-learning and traditional residential education and training (cf. BiSC 75-2, 2013, p. 38; Bi-SC 75-7, 2013, p. 3.3-3.4, J4-J9). Residential courses offer a traditional way of education and individual training. Combining lectures with practical classes they cover both theoretical and practical aspects. The role of key leader training is to develop and enhance the key military leaders in their preparation for deployment to operations. Training events include battle staff training (BST), pre-deployment training (PDT) and train-the-trainers courses (T3C). The aim of battle staff training is to improve the headquarters' capabilities in mission-essential tasks integrating several functional areas. Pre-deployment training is focused on preparing individuals and units to the specific tasks and missions during the pre-planned operations. The following forms of pre-deployment training are recognized: individual PDT, key leader training (KLT) and mission rehearsal exercise (MRE). NATO military exercises can be conducted at four levels: strategic, operational/joint command, tactical/component and tactical/unit. The exercises may be of the following form: command post exercises (CPX) aimed at the training of HQs, live exercises (LIVEX) used to train forces in the conduct of operations or exercise study (map exercise, war games, discussion groups, seminars, operational analyses). Due to the advancement in information technology, military exercises may be conducted as computer-assisted exercises (CAX) applying modeling and simulation (Bi-SC 75-2, 2013, p. 38-41).

As the case of NATO shows, military organizations highly value training, education and exercises, which are perceived as key military activities during the peacetime and the prerequisites to prepare troops to conduct military operations in an efficient and effective manner. From the perspective of knowledge conversion processes, training and education activities enable military personnel to internalize knowledge, to change explicit statements included into military doctrines and manuals (knowing what) into tacit knowledge (knowing how). Moreover, collective training and military exercises stimulate learning processes at the team and organizational levels and they enable troops to test and validate their knowledge, skills and competencies.

Conclusion

The paper contributes to the knowledge management special issue of the Journal of Entrepreneurship, Management and Innovation through exploring the relationships between the theory of knowledge conversion and the learning practices applied in military organizations. Although the SECI framework and its assumptions are criticized by some researchers (e.g. Gourlay, 2003; Gourlay, 2006; Powell, 2007), the model is considered to be one of the more pervasive approaches in the field of knowledge management. The findings from the analysis prove that the SECI model is applicable to managing knowledge creation in military organizations under the study. NATO and the U.S. Army have developed and applied a bunch of techniques and tools to convert their knowledge resources:

- from tacit knowledge to tacit knowledge (socialization) e.g. counseling, coaching and mentoring, communities of practice;
- from tacit knowledge to explicit knowledge (externalization) e.g. Lessons Learned systems and After Action Reviews;
- from explicit knowledge to explicit knowledge (combination) e.g. the processes of operational standardization and doctrine development;
- from explicit knowledge to tacit knowledge (internalization) e.g. the variety of training and education forms including individual training and education, collective training and military exercises.

The combination of the aforementioned techniques and tools enables military organizations to benefit from both the knowledge personalization strategy and the knowledge codification strategy. Military organizations need both of them. On the one hand, knowledge personalization based on socialization processes and sharing tacit knowledge is particularly important for "fielded warfighters" who need tactical innovations and "hot" knowledge which is context-sensitive and situation dependent. On the other hand, the military needs lessons from the field to be identified and learned by a wider community of users (externalization) as well as rules and governing principles to be codified in military doctrines and manuals (combination) and then acquired by the troops through training (internalization).

The identified toolbox of methods, techniques and procedures used to socialize, externalize, combine and internalize knowledge confirms that the military organizations under the study apply a comprehensive approach to managing what they and their members know. Nevertheless, the findings resulted from the analysis of official documents should be verified empirically in practice, which is a field for further exploration. Such a study is to be oriented to the identification of gaps between normative assumptions and the reality of knowledge management in military organizations as well as

lessons learned and best practices which could be transferred to other types of organizations.

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Abstrakt (in Polish)

Celem artykułu jest analiza procesów tworzenia i konwersji wiedzy w organizacjach wojskowych. Do analizy zastosowano model SECI wykorzystywany w organizacjach biznesowych. W artykule, po pierwsze, dokonano identyfikacji i kategoryzacji działań ukierunkowanych na tworzenie wiedzy organizacyjnej w środowisku wojskowym. Następnie szczegółowej analizie poddano wybrane techniki i narzędzia wykorzysty-

wane do socjalizacji, eksternalizacji, kombinacji i internalizacji wiedzy w NATO i Armii Stanów Zjednoczonych. Omówiono zastosowanie counsellingu, coachingu i mentoringu do pobudzania i wspierania procesów socjalizacji wiedzy. Wskazano na rosnącą rolę odgrywaną w środowisku wojskowym przez wspólnoty praktyków. Przedstawiono rozwiązania wspierające eksternalizację wiedzy takie jak systemy wykorzystania doświadczeń (Lesssons Learned) i procedura After Action Review. Poddano analizie standaryzację operacyjną jako przykład procesu kombinacji wiedzy ukierunkowanego na kodyfikację dostępnej wiedzy w formie doktryn i wojskowych dokumentów normatywnych. Wreszcie skoncentrowano uwagę na szkoleniu i kształceniu w organizacjach wojskowych, które to procesy mają służyć internalizacji wiedzy przez członków organizacji.

Słowa kluczowe: *model SECI, organizacje wojskowe, socjalizacja wiedzy, eksternalizacja wiedzy, kombinacja wiedzy, internalizacja wiedzy, counseling, coaching, mentoring, wspólnoty praktyków, systemy wykorzystania doświadczeń, after action review, standaryzacja operacyjna, szkolenie i kształcenie wojskowe, ćwiczenia wojskowe.*

Biography

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Models, Metaphors and Symbols for Information and Knowledge Systems

David Williams

Abstract

A literature search indicates that Data, Information and Knowledge continue to be placed into a hierarchical construct where it is considered that information is more valuable than data and that information can be processed into becoming precious knowledge. Wisdom continues to be added to the model to further confuse the issue. This model constrains our ability to think more logically about how and why we develop knowledge management systems to support and enhance knowledge-intensive processes, tasks or projects. This paper seeks to summarise development of the Data-Information-Knowledge-Wisdom hierarchy, explore the extensive criticism of it and present a more logical (and accurate) construct for the elements of intellectual capital when developing and managing Knowledge Management Systems.

Keywords*: DIKW, knowledge management, intellectual capital, organizational learning, systems, data, information, knowledge, wisdom, truth, records, evidence, belief.*

Introduction

Whenever we build systems or develop architecture or a framework for developing systems, it is critical to have a shared understanding of the style, design elements and building blocks that we are working with. Having a simple model of the relationships between data, information and knowledge is important to be able to promote a shared understanding of how the components of a knowledge management system connect and contribute to achieving the desired business outcome. The construct of the Data-Information-Knowledge-Wisdom (DIKW) as a hierarchy is not a preferred model to underpin the design, build and operation of knowledge management systems and may lead to poor design. The presumption that if you process enough data, a system will deliver information and then knowledge is challenged by many critics of the DIKW hierarchy model. However, a closer look indicates that the DIKW pyramid is merely a simple representation by others of the propositions put forward by Zeleny, Arkov

and Cleveland of a complex system where far more multifaceted interactions occur between the model elements.

This paper argues that it is a fallacy to believe that expensive and complex information systems will deliver valuable knowledge. Knowledge is created by people in contact with events in the physical world, including other people (and their ideas). Information and data assist the process and systems (with or without technology) and may be developed, combined or integrated to support the cognitive process.

This paper seeks to provide an alternative to the DIKW hierarchy and pyramid in the belief that it is not enough to criticise a model to make it less popular. Unless there are viable alternatives, then the first suitable model will continue to win the popularity stakes, a behaviour known as 'satisficing' (Simon, 1947). The popularity of the DIKW hierarchy is reinforced through its representation as a pyramid and an alternative graphical metaphor is proposed.

Discussion on the DIKW hierarchy

There are a number of papers summarising the DIKW hierarchy such as Sharma (2004) and Rowley (2007) with many similar references, but it is difficult to identify any single original source of the model. The literature research indicates that the model has evolved over time but we need to accelerate its evolution to provide for a rapidly changing future. This will help us to better organise and manage our intellectual assets. The article by Sharma (2004) appears to be well regarded as describing the origin of the DIKW hierarchy. However, his article is quite brief and misses some earlier references. Lambe's article on 'The unacknowledged parentage of knowledge management' (2011) is a far more comprehensive account of the history in this space and so is the paper by Rowley (2007). This paper highlights some of the significant writings to set the context.

The Data-Information-Knowledge-Wisdom (DIKW) pyramid has become popular in the information sciences as an expression of the logical relationship between these elements. The earliest found reference to the relationships between data, knowledge and wisdom is in T.S. Eliot's poem, "The Rock" (1934):

Where is the wisdom we have lost in knowledge?
Where is the knowledge we have lost in information?

Pigott, Hobbs & Gammack (2005) identified a 1957 US Department of Defence Conference on Data Systems Languages (CODASYL) to standardise industry usage of terms involving data and its relation to information but did not appear to come to any clear consensus about its utility.

Nicholas Henry (1974) is often cited as the originator of the DIKW hierarchy. He saw a critical need for the US Government to start managing knowledge and identified a difference between knowledge and data. He defined data as raw facts and information and knowledge as "data that changes us."

Berry and Cook (1976) stated that "knowledge, then, is defined to be the data, the relationships that exist among the data items, the semantics of the data (i.e., the use to which the information is to be put), and the rules and conditions which have been established as applying to the data of the enterprise. Knowledge involves the enterprise's awareness of the world around it and its understanding of the significance of certain pieces of information.. . Knowledge consists largely of the rules and special conditions which an enterprise uses to allow it to make sense out of the potentially vast sea of data which surrounds it, to limit the volume of data it collects, and to employ this data for useful purposes".

As stated earlier, Sharma (2004) provides a history of the Data-Information-Knowledge-Wisdom Hierarchy or 'Knowledge Hierarchy' as it is occasionally referred to. Sharma cited Cleveland as referring to an Information-Knowledge-Wisdom hierarchy as early as 1982 in a Futurist article.

Cleveland (1982) considered that data comes about through research, creation, gathering, and discovery while information has context. Data is turned into information by organizing it so that we can easily draw conclusions. Data is also turned into information by "presenting" it, such as making it visual or auditory. Cleveland also points to Eliot as the origin calling it "the T.S. Eliot hierarchy".

An early academic reference to the DIKW hierarchy was in 1987 and is attributed to Milan Zeleny, an American economist and Professor of Management Systems at Fordham University. Zeleny (1987 p. 60) proposed a scheme of progression from data to knowledge with each lower level subsumed by the one above it. In contrast to this he also observed that while data and information can be generated, knowledge and wisdom are human and context dependent and cannot be contemplated without involving human decision-making and judgement. Zeleny observed that "knowledge is contained in an overall organizational pattern and not in any of the components", such as an information system. He also described knowledge as a "self-producing and self-maintaining network of relations which are being continually re-created under permutations" and later described knowledge as "the process of active network configuration and reconfiguration of our human world of objects and their relations." The concept that knowledge is a process rather than a subject does not appear to be generally supported in other papers.

Zeleny (1987) attempted to put knowledge into context by describing the analogy of the data, information, knowledge and wisdom required to bake bread. Zeleny proposed a taxonomy of knowledge with analogies and metaphors for each DIKW element that describes the progression from data to knowledge and then to wisdom.

Table 1. Zeleny's Taxonomy of Knowledge

Element	Technology	Analogy	Management	Metaphor
Data	Electronic Data Processing	Elements	Muddling through	Know nothing
Information	Management Information systems	Ingredients	Efficiency	Know how
Knowledge	Decision support systems, Expert Systems and Artificial Intelligence	Choice of recipes	Effectiveness	Know what
Wisdom	Human systems Management and Management Support Systems	Choice of menu	Explicability	Know why

Source: Zeleny (1987).

Zeleny complicated the definitions by stating that "Data for some are information for others, one person's knowledge is the other's person's data". From this range of statements, which was provided with the aim of underpinning his arguments on decision-making, it is probable that there has been some misinterpretation and simplification by readers, leading to a perception that there is a linear and bounded relationship between data, information, knowledge and wisdom.

Sharma (2004) stated that in a personal communication with him in 2004, Zeleny proposed to add "enlightenment" on top of his DIKW hierarchy. Enlightenment, according to Zeleny is "not only answering or understanding why (wisdom), but attaining the sense of truth, the sense of right and wrong, and having it socially accepted, respected and sanctioned."

Debons, Horne and Cronenweth (1988) were possibly the first to present the hierarchy in a graphical form and used the metaphor 'Knowledge Spectrum' to refer to the model.

Sharma (2004) observed that Ackoff is often cited as being the earliest to mention the DIKW hierarchy in his 1988 Presidential Address to the International Society for General Systems Research. This address was printed in a 1989 article "From Data to Wisdom".

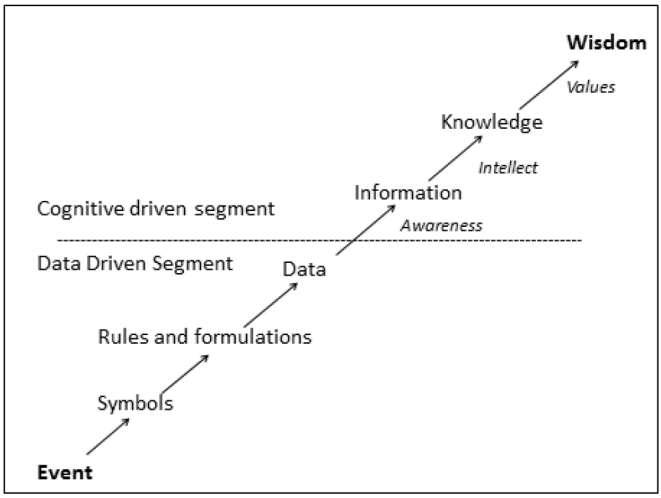

Figure 1. Knowledge Spectrum

Source: Debons, Horne and Cronenweth (1988).

Ackoff (1989) structured Data, Information and Knowledge into a hierarchical formation (but not as a pyramid) to better describe the relationship between the elements. In his address, he stated that "Wisdom is at the top of a hierarchy of types of content of the human mind. Descending from wisdom there are understanding, knowledge, information, and, at the bottom, data." Ackoff referred to the following definitions of data, information, knowledge and wisdom.

Table 2. Ackoff's definitions of data, information, knowledge and wisdom

Wisdom	Wisdom adds value, which requires the mental function that we call judgement.
Knowledge	Knowledge is know-how, for example, how a system works. It is what makes possible the transformation of information into instructions.
Information	Information is contained in descriptions, answers to questions that begin with such words as who, what, when and how many. Information is inferred from data.
Data	Data are symbols that represent properties of objects, events and their environment. They are the products of observation.

Source: Ackoff (1989).

Ackoff proposed the additional category of "Understanding" be built in to the model and structured as Data-Information-Knowledge-Understanding and Wisdom. According to Ackoff, understanding requires diagnosis and

prescription (interaction with the physical world with skills and knowledge) and that the DIKUW elements have a temporal dimension. He stated that information ages rapidly, like news, but that knowledge has a longer life-span. This statement is not supported with the value now seen in records and longitudinal data. Understanding "has an aura of permanence" and wisdom becomes a "permanent endowment of the race". As a result of Ackoff's work, a number of DIKUW models have sprung up as well.

Bellinger et. al. (2004) elaborated on Ackoff's model by suggesting that understanding is not a separate level, but rather that it supports the transition from each stage to the next. However this is still a linear relationship.

In addition to Sharma, Rowley (2007) has undertaken similar, but far more comprehensive research into the literature. Rowley also identified a model by Choo (2005) that defined the hierarchy as signals-data-information-knowledge. Choo contended that information flows from the external environment and is progressively assimilated and focused to enable sense making, knowledge building, and decision making.

The earliest verifiable depiction of a pyramid diagram found was by Hey (2004) as a symbol to represent the DIKW hierarchy (Figure 2). In the same year, Awad and Ghaziri also published a similar diagram. The pyramid is a powerful metaphor as it represents hierarchical strata, structure, stability, integrity, maturity, royalty, authenticity and age. The use of terms such as wisdom and knowledge in the graphic also indicate that that there is some degree of veracity to the model.

Figure 2. The knowledge pyramid

Source: Hey (2004).

Hey (2004) states that we make use of our physical experiences to help structure our thought on more complex abstract concepts. Metaphor helps us make sense of our experiences in 'knowing' by understanding it through

concrete experiences, objects or visual aids that we can relate to. This applies to the DIKW hierarchy as all of the elements of the hierarchy are abstract concepts, particularly knowledge and wisdom. To aid in making sense of these concepts, we use symbols and develop metaphors or models to better understand them.

Criticism

McDermott (2000) cites Einstein as stating "knowledge is experience, all the rest is information". It appears there are more critics of the DIKW hierarchy than there are exponents of it. But why does the model continue to flourish? Some of the critiques are described as follows.

Popper (1963) stated that it is absurd to start with pure observations (data and information) without anything in the nature of a theory and that data is of little value unless it is based on a hypothesis (knowledge). Popper (1979) proposed a view of the universe as comprising three different worlds. The first (World 1) consists of physical bodies and events. The second (World 2) is the world of cognition, perceptions and observations. World 3 is the world of the products of the human mind, such as languages, stories, religious myths, scientific conjectures or theories, and mathematical constructions, songs, symphonies, information, documents and data. This framework stands up to scrutiny and it is used to validate our proposed model later in this paper.

Alavi and Leinder (1999) cited Churchman (1971) in stating that "To conceive of knowledge as a collection of information seems to rob the concept of all of its life…. Knowledge resides in the user and not in the collection [of information]" and claimed it is how the user reacts to a collection of information that matters.

The Israeli researcher Zins (2007) and his colleagues analysed 45 sets of definitions for data, information, and knowledge to explore the fundamental meanings of the concepts. The study classified the definitions into five classes based on whether data, information, and knowledge are each conceived of as subjective or objective. The study summarised that, in most citations, data and information are characterised as phenomena in the universal domain, and knowledge is characterised as phenomena in the subjective domain, thus existing in separate worlds. Zins states that it is a 'fairy tale' to put data, information and knowledge in a logical hierarchy.

Frické (2009) is often cited as providing a comprehensive argument against structuring Data, Information and Knowledge into a pyramid formation. He described it as a "dated and unsatisfactory philosophical position of operationalim". He contended that the model promotes the view that collected data can be promoted to information and that it implies that information can answer questions. Frické argued that "this encourages the

mindless and meaningless collection of data in the hope that one day it will ascend to information" and then presumably on to knowledge and wisdom.

Jennex (2009) argued that the DIKW pyramid is too basic and fails to represent reality. He proposed that knowledge management with a focus on organisational learning should be included in this model.

Lambe (2012) stated that "data is the product of a knowledge-driven, purposeful piece of design work. The DIKW model implies the opposite, that knowledge is the product of a series of operations upon data."

Drucker (2011) stated that "Knowledge as normally considered by the intellectual is something very different from knowledge in the context of knowledge economy or knowledge work. For the intellectual, knowledge is what is in a book. But as long as it is in the book it is only information if not mere data. Only when a man applies the information to doing something does it become knowledge." Drucker observed that knowledge requires an external relationship to exist. Drucker is also cited (1995) as stating that "To put it in editorial terms, knowing how a typewriter works does not make you a writer. Now that knowledge is taking the place of capital as the driving force in organizations worldwide, it is all too easy to confuse data with knowledge and information technology with information."

Pigott, Hobbs & Gammack (2005) stated that the fundamental problem with the DIKW model is that data, information and knowledge are each defined only in the context of their relationships with the other two, and it is impossible to separate the terms from one other. Unless there is a frame of reference outside of the three definitions, it is not possible to tell them apart or measure them. Comments by Zeleny support this in his description of knowledge as not being able to "refer to a 'given and fixed' set of objects 'out there', which are to be simply 'captured', represented or modelled."

Davenport and Prusak (2000) provided definitions of data, information and knowledge that are not defined in the context of their relationships with the other two terms. This supports a view that there is a distinct separation of the elements.

Rowley (2007) recognised the value of the DIKW pyramid but questioned whether these articulations present an adequate distinction between data, information, and knowledge. She stated that the problem is that there is no consensus in the description of the processes that transform elements lower in the hierarchy into those above them, leading to a lack of definitional clarity. Also, there is very limited discussion on wisdom and it appears logical that wisdom should be removed from the model altogether. Rowley (2007) also stated that "If knowledge is a property of the human mind, with the potential for action, explicit knowledge cannot be any more or less than information."

So where does wisdom sit amongst all of this? Nürnberger and Wenzel (2011) stated that wisdom is commonly seen as a "peak of human performance that is based on excessive knowledge and judgmental capabilities". They proposed that wisdom could be considered as an extension of "intelligence" by the capability to use synthesis for problem solution. Therefore, a wise mind not only uses analysis, but also synthesis to choose behaviour appropriate to the situation to obtain a positive outcome. This is supported by the research into rapid decision-making in emergency services by Klein (1999) where he described a number of case studies where operators and leaders were able to rapidly make good decisions under considerable stress in life-threatening situations. Experience (contact with events or actions in the physical world) appears to be the contributing factor to the development of knowledge rather than an extensive amount of knowledge.

Legesse, Price and Murray (2012) claim their definition takes into account some neurological, cultural, religious, and philosophical aspects. They state that wisdom is "a demonstrated, superior ability to understand the nature and behaviour of things, people, or events ……. resulting in an increased ability to predict behaviour or events which then may be used to benefit self or others". Or, stated more simply, the ability to see patterns in complex situations and take action (before others). The definition and issue of wisdom in organisations appears to be a topic even more contentious and less mature than knowledge. Because of this immaturity and lack of common understanding of the term wisdom, it should not feature predominately in any organisational behaviour model at this time. Much of the discussion is consistent in identifying wisdom as a cognitive process or attribute, and this author would argue that it should be subsumed as an element of human capital in further discussions.

Notwithstanding the above criticisms, Zeleny, Arkov and Cleveland claimed that DIKW was a useful model, and predicated their observations with descriptions of the interactions and intellectual events that occur between the model elements and external interdependencies (events in the physical world). This is where Popper's model succeeds in bringing the physical world of events and actions into play as a potential component of an alternative model.

This paper argues that the criticism levelled at Zeleny, Arkov and Cleveland should not be that the DIKW hierarchy is wrong, but rather that the simplicity of the pyramid graphic (created by others) allows the audience to easily gloss over the external dependencies and to perceive the elements in a single plane or simple continuum, rather than the more complex and dependent arrangement that it should have represented. The DIKW hierarchy and the pyramid model place an emphasis on creating knowledge and wisdom

from information. The focus should be on using people's knowledge, their interaction with others, events, and information to achieve the objectives of the organisation.

Why is the DIKW pyramid so popular?

There are over 70 different versions of the DIKW pyramid found on Google images (searched December 2013). There is even a DIKW Academy in the Netherlands (http://www.dikw-academy.nl/) despite the substantial criticism of the model.

We argue that the DIKW pyramid has become so popular because people crave simple models to assist in understanding complicated, complex or novel constructs. We use models to represent situations or relationships so that we can predict what may happen or to transfer understanding. Models allow us to represent the real world or our conceptualisation in a cost-effective manner to transfer knowledge to someone else or create new knowledge through simulation or stimulation (internalisation).

Moore (email 2014) contends that the DIKW pyramid resonates with people because it is a quantitative visual artefact that supports the widespread belief that the volume of data in the world is significantly greater than the volume of information, and that there is more information than knowledge and wisdom. Moore considers that this is incorrect and that the capacity of the human mind across the population of the world is still greater than the amount of stored information. Therefore, to represent DIKW as a pyramid with less knowledge than data is a fallacy. We have only been managing large volumes of information for a few decades, so it stands to reason that we are not that good at it and feel overwhelmed with the recent exponential increase and are led to believe that there is considerably more information than knowledge.

Davenport and Prusak (2000) stated that the definitions of knowledge are not neat or simple. "Knowledge is a mixture of elements and is fluid as well as formally structured. Knowledge can be intuitive and therefore, complex, unpredictable and hard to capture in words or understand completely in logical terms." Therefore, simple models such as the DIKW pyramid promise to aid in our understanding of these complex concepts.

What is a model?

Coffey and Atkinson (1996) defined a model as "an intellectual construct in artefact form that provides an abstract, highly formalised, often visual yet simplified representation of a phenomenon and its interactions."

George Box with co-author Draper (1987) is widely quoted as stating "Essentially, all models are wrong, but some are useful." This statement

is now being challenged as a logical fallacy, particularly by the statistician community. Tarpey (2009) stated that the quote should be corrected to "All models are right... most are useless". a model is a representation of something else, usually to make the subject easier to understand. He argued that if the model was an exact replica, it would not be a model. Therefore, for a model to be right, it only has to represent the subject, to what extent is unclear and subjective. For example, we develop models to understand and predict climate change, DNA sequences and road traffic behaviour. Real world situations are subject to randomness and are complex and there is a trade-off between making a model that is cheap and easy to understand and a model that is accurate, but expensive and complicated. It is unrealistic to expect that cost effective and exact models can be developed that still convey concepts in a simpler form. Therefore, all models are subject to challenge, but effective models allow us to understand complex situations and make good (wise?) decisions within the necessary timeframe. With enough data, imperfections in any model can be detected. This is one of the reasons why sceptics are still able to challenge climate change models despite the overwhelming evidence.

So what makes a model effective or useful? Kano's model of customer satisfaction (Sauerwein et. al., 1996) can also be applied to consider the qualities of an effective model in general. The Kano model identifies three criteria for an effective model:

1) 'Must-be' requirement (is functional)
    - Is self-evident or obvious
    - Reflects the situation
    - Is functional and meets the basic needs
    - Translates concepts and arguments
    - Allows us to make sense of complexity
2) 'Attractive' requirement (provides customer satisfaction)
    - Is 'slick' cool or sexy
    - Is clear and simple to understand
    - Causes delight and 'excites' the user
    - Uses metaphors, symbols or graphics
    - Is quick to develop
    - Is cheap and flexible
    - Is transferable
    - Reduces risk
3) 'Logical' requirement (is accurate)
    - Is technically accurate (or close to)
    - Is measureable
    - Is able to incorporate data from past and current situations
    - Allows outliers or spurious data/facts to be identified
    - Is validated by use over time
    - Supports gaming, scenarios, extrapolation, simulation and analysis

The DIKW pyramid generally meets the first two of the three high-level criteria of being functional and attractive, but it is not logical. The challenge now is to develop a model that is more technically accurate, attractive and logical.

Alternatives to DIKW pyramid

There have been several attempts to develop alternate models, metaphors and graphics for representing the interdependencies between data, information, knowledge and wisdom. The first is the DIKUW model at figure 3 that adds the axis or element of "Understanding" into the model and incorporates a temporal concept of past and future. This model is reasonably clear but brings in a number of axes including a temporal element. It is considered to be functional, but again assumes that information comes from data and shows an axis going back in time. The model does incorporate the individual's understanding and derives context from the external environment.

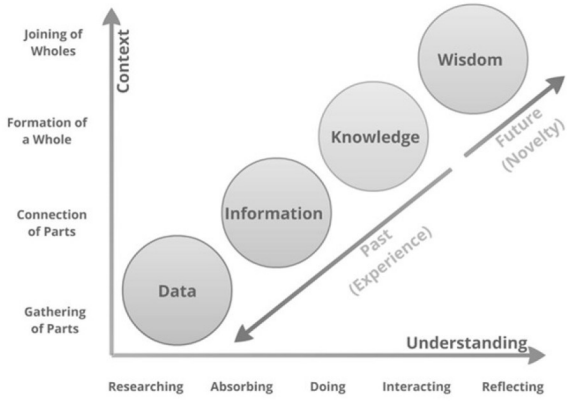

Figure 3. Model of Ackoff's DIKW hierarchy

Source: Esterbrook (2012).

The knowledge-information-data (KID) model proposed by Brodie and Brodie (2009) seeks to describe the interrelationships between the three elements when specifically related to engineering education and practice. It describes data as an underlying base supporting information with knowledge incorporated as a special form of information. Their paper admits that the distinctions between data and information are not clear cut. We argue that this is because data is a subset of information and knowledge is not.

The concept that knowledge is a subset of data is considered incorrect and is supported by most of the references cited in this paper. Where Brodie

and Brodie add value is in their recognition of the value and purpose of simple models in communicating concepts as shown in figure 4.

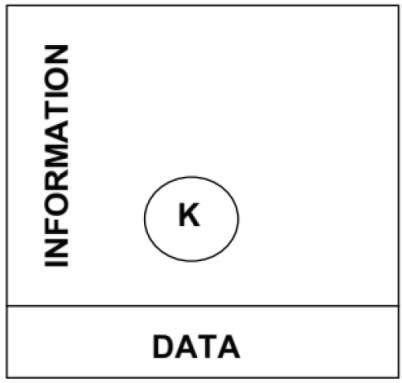

Figure 4. KID model

Source: Brodie and Brodie (2009).

The Infoengineering model at figure 5 describes information and knowledge as separate elements but also describes data as being quite separate from information. The assertion that "data is facts" is challenged as there is a copious amount of data that is incorrect.

This model appears to be clear, simple and functional. However, it assumes that information comes from data and excludes the impact of the physical world or events on the development of knowledge and decisions. The use of metaphor in the symbols to represent data, knowledge, information and decisions makes it quite attractive.

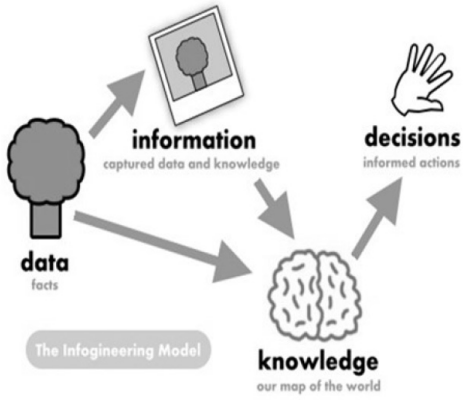

Figure 5. Infoengineering model

Source: Ingebrigtsen (2007).

Faucher, Everette and Lawson (2008) offered a new model (no graphic available) that they termed as Existence to Enlightenment (E2E) describing it as a "cognitive system of knowledge" that redefines the scope of knowledge management. They criticised the DIKW model and claimed that the boundaries are too difficult to define. They proposed a continuum with Existence at the lower end and Enlightenment at the higher end. While this is a move away from a hierarchical relationship among data, information, knowledge, and wisdom, this model still places DIKW on a single plane with no clear delineation. While simple, no graphic or symbol could be found to articulate their model, therefore rating lower on the Kano criteria of attractiveness as well as lower on accuracy.

The Noetic Prism (from the term 'res noetica', which literally means 'mental stuff') developed by Pigott, Hobbs and Gammack (2005) steps away from a continuum model and looks at Data, Information and Knowledge in three different planes. The Noetic Prism has three vertices of granularity, shape and scope with a vertical axis representing complexity. They claimed that only a small shift in perspective is required to translate existing terms to the context of the noetic prism (figure 6). They proposed that the granularity plane be used for Information, the shape plane for Data and the scope plane for Knowledge. This is an ambitious and logical attempt to break the concepts associated with the DIKW pyramid, but it is not clear how it can gain broad acceptance. In Kano terms it may be logical, clear and simple (attractive), but it is not that functional as there is too great a leap of understanding required to embrace and then use the model. The use of a prism as a metaphor probably creates more ambiguity than clarity.

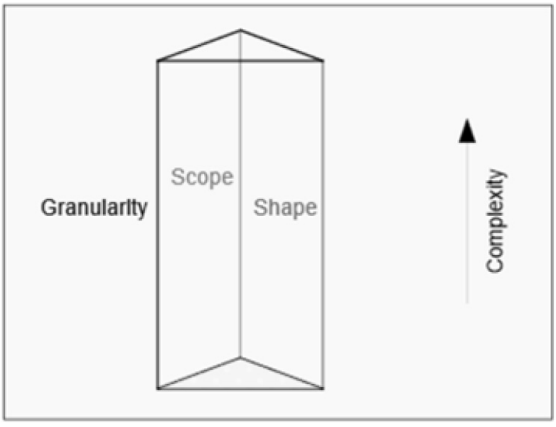

Figure 6. Noetic Prism

Source: Pigott, Hobbs & Gammack (2005).

The "Data to Wisdom" Curve (Pór 1997) shown at figure 7 depicts the hierarchy as a learning journey whereby we progressively transform the raw, unfiltered facts and symbols into information, knowledge, and eventually into intelligence and wisdom. It indicates a maturity or evolution from data and information to knowledge and wisdom over time and has less of a relationship between the elements. The Curve appears to be more an indication of where we are as a society. However, the explosion of data and information indicate that this curve might go the opposite direction. It is difficult to tell as there are too many variables on the chart and the model appears lower on the scale for logic, function and attractiveness, with no effective use of metaphor or symbol.

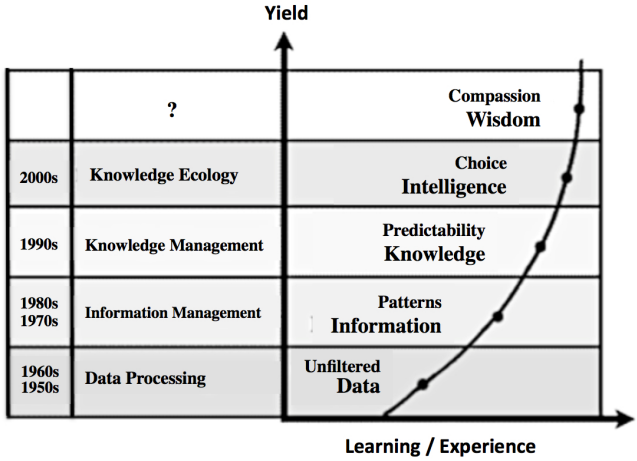

Figure 7. The data to wisdom curve

Source: Pór (1997).

Firestone (2001) proposed replacing the pyramid with a cyclical model (figure 8). In his Knowledge Life Cycle (KLC) model, information is not constructed from data as data is a subset of information. Firestone claimed that data and knowledge are made from pre-existing information, that is, "just information". Data, knowledge, and problems are used in the knowledge life cycle to produce more information and new knowledge. While attractive and somewhat functional, this model does not explicitly indicate the input of the external environment (apart from problems). The utility of the model becomes clearer when the knowledge life cycle is considered in the context of the 3 Worlds defined by Popper (1979). However, the depiction of "information" and "just information" creates some initial confusion when the graphic is considered in isolation.

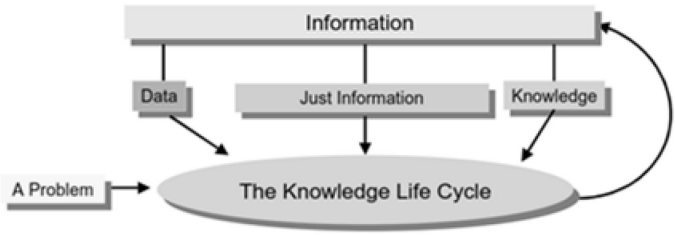

Figure 8. The Knowledge Life Cycle model
Source: (Firestone 2001).

Towards an alternative model

Popper's 3 Worlds concept (1979) provides an alternate and useful view on data, information and knowledge. Popper's 1979 lecture on human values proposed a pluralist view of the universe that recognised at least three different but interacting sub-universes. The First World deals with the physical world of objects, people and events. The Second World is the mental, cognitive or psychological world. Popper described the Third World as containing products representative of the human mind. This Third World includes stories, scientific theories, mathematical constructions, songs, paintings and sculptures. According to Popper's model, information is a representation of cognitive activity (knowledge) and is therefore a World 3 artefact.

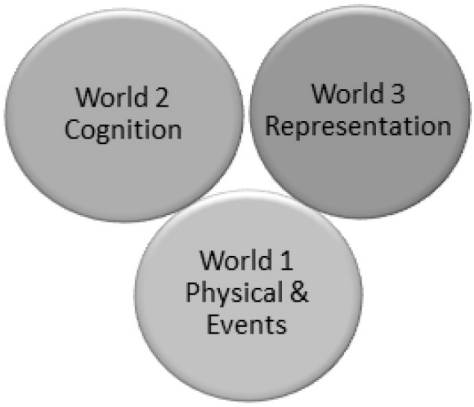

Figure 9. Popper's 3 Worlds

Popper contended that many of the objects belonging to World 3 belong at the same time also to the physical World 1. World 3 contains data and recordings, therefore representing events and objects in World One as well

as the cognition of World 2. Popper gives the example of Michelangelo's sculpture, The Dying Slave, as an object belonging to World 1 of and as an expression of Michelangelo's creative mind, therefore also belonging to World 3. While Popper has been instrumental in providing a different lens through which to view information and knowledge, we need a model that allows modern artefacts to better fit into a contemporary framework. This applies to electronic documents, optical media, video, software, artificial intelligence as well as art and music. Popper did not consider where software exists but we would suggest that it sits in World 3 and can act on the physical world without cognitive interaction from World 2. Artificial Intelligence is even more difficult to classify. As a result of the age of this model, a more contemporary alternative is now required.

Wiig (1997) argued that there is a considerable overlap of Intellectual Capital Management (ICM) with Knowledge Management (KM). ICM is relatively strategic and deals with intellectual assets such as intellectual property, structural capital (data, information and documents), organisational capital and other intangible assets. He stated that KM has a more tactical and operational focus. Therefore, Data, Information, Knowledge and Wisdom can be considered within the context of organisations and as a subset of intellectual capital.

Wiig's breakdown of intellectual capital into a series of overlapping facets is relatively complex. Seemann et. al. (2000, p3) suggested that intellectual capital can be expressed as three simpler classes:

1) Human Capital: An individual's capabilities
2) Social Capital: a capacity to collaborate
3) Structural Capital: The organization's processes, systems, & procedures

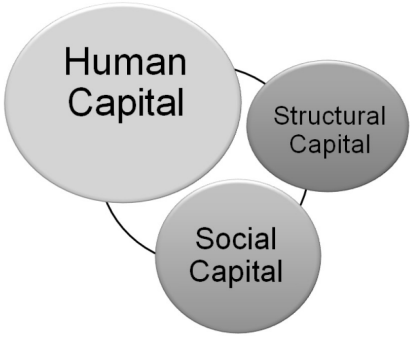

Figure 10. Key components of intellectual capital

We see that there is a reasonable alignment between these three classes of intellectual capital and Popper's 3 Worlds, reinforcing the insight that knowledge and information are worlds apart:

1) Social or Relational Capital – World 1 Objects and Events
2) Human Capital – World 2 Cognition
3) Structural (Organisational) Capital – World 3 Representations

Seemann et. al. (2000) argued that most definitions of intellectual capital fail to account for social capital, although Wiig (1997) clearly described something similar as customer capital. Seemann et. al. also stated that social capital is reflected in the ability of groups to form effective networks and collaborate. This collaboration occurs as events consisting of individuals interconnecting and it occurs in the Popper's World 1. Seemann et. al. described human capital as the "knowledge, skills, and experiences possessed by individual employees" and this aligns well with Popper's description of World 2.

Seemann et. al. also described structural capital as "basically everything that remains in a firm after its employees go home." It includes the explicit, rule-based knowledge embedded in the organization's work processes and systems, or encoded in written policies and training. This is generally aligned with Popper's World 3. Wiig (1997) classified this as organisational capital.

If we accept the argument that the three intellectual asset classes sit predominantly in three different worlds, it would be illogical to state that they can sit in a single plane or a hierarchy of relative value. It is apparent that each class is valuable in its own right and each may have different management strategies applied to it, to be able to increase the value gained from each asset class by an organisation. It would follow that human and social capital should be managed using knowledge management tools and techniques. Structural capital should be managed using information management tools and techniques.

From this perspective, there is then a clearer difference between information and knowledge and a more logical progression to better define, develop and operate a knowledge management system as distinct from an information management system.

Clarifying the terms

Jennex (2009) made a salient point that it is not productive for researchers or academics to overly focus on defining some of these terms as it distracts from the discussion on the subject. The Knowledge Bucket (Banks 2014) has a collection of over 60 definitions of knowledge management, all of which may be considered relevant and correct within their own contexts (also indicating the immaturity of the field).

As Liew (2007) observed, the difficulty is that many definitions define intellectual elements in terms of each other. For example, data is defined in terms of information, information is defined in terms of data and/or knowledge, and knowledge is defined in terms of information. The definitions become circular and obtuse. So while the definitions provided by many scholars and experts in the field are acknowledged as correct (because all models are correct), it is of greater value to adapt some definitions that place Data, Information, and Knowledge into a more logical (in the Kano sense) organisational construct.

Davenport and Prusak (2000) defined data as "discrete, objective facts about events". However, data may not always be factual, so we will adopt the definition by McDonald (oral information, 28 March 2014) defining data as the values of an attribute of an object (subject or event). Data is a subset of information, because it is usually a record of an action or of the cognition of a person in a structured format.

Information is considered to be "the representation of an action or a cognitive concept". Facts, records and evidence are also representations of cognition, an object or an action in the physical world and are therefore classed as information.

Knowledge in this context is "a fluid mix of framed experience, values, contextual information, and expert insights that provides a framework for evaluating and incorporating new experiences and information" (Davenport and Prusak, 2000)

As previously argued, wisdom is considered to be a subset of cognition (knowledge) and is less relevant to a management model. We only reference the term here because it exists in the current models.

Defining a better model

If we were to construct a model that better represented the relationships between Data, Information, Knowledge (and Wisdom), it would need to meet most of the following business rules or attributes (in addition to those of Kano's model):

- The relationships would be multi-directional as data informs the creation of knowledge, and knowledge is represented as information
- All elements would interact with actions or events in the physical world
- The elements would not sit on a continuum as they exist in different worlds
- Facts, data, records, evidence are a subset of information (structural capital)

- Truth and belief would appear as a subset of knowledge (human capital)
- Wisdom is shown to be less relevant and is a subset of knowledge
- Social capital is shown to be created during events or actions
- It should be capable of being easily drawn or replicated to compete against the DIKW pyramid graphic.

Therefore, the simplest relationship between data, information, knowledge and wisdom could look like a basic diagram as shown at figure 11. Symbols are used as metaphors to assist the audience in making sense of the concepts by understanding them through less abstract images that they can relate to. The challenge is not to make it too simple or allow space for misinterpretation. Data and wisdom are now shunted out of the picture.

In the model below, the term "Action" is used to represent the physical or social element because it is a less passive term than "Event" or a descriptor of a physical world. We want knowledge and information to result in actions and results for our organisation. This Action-Knowledge-Information (AKI) model represents the concept that knowledge is created from framed experience, values, contextual information and expert insights. Information is created as a representation of an action, object or a cognitive concept (knowledge). The model relates effectively to intellectual capital models by both Wiig (1997) and Seemann et. al. (2000) as well as the 3 Worlds models of both Popper and Firestone.

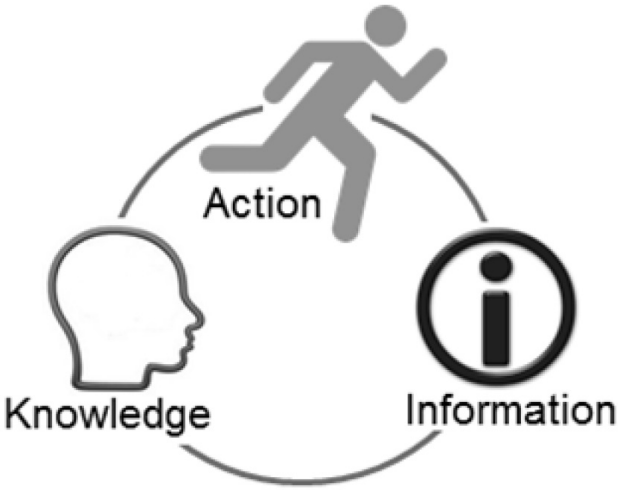

Figure 11. AKI: a preferred model of information and knowledge

Table 3 shows some of the elements that sit within the AKI Model. This allows the model to be unpacked and applied in a practical sense.

Table 3. Elements of the AKI Model

Action	Knowledge	Information
Social Capital	Human Capital	Structural Capital Facts
Places	Wisdom	Fiction
Events	Beliefs and values	Data
Objects	Emotions	Records
Gravity	Understanding	Evidence
Experience	Concepts and ideas	Artificial Intelligence
Relationships	Perceptions and insight	Designs
Innovation	Intent	Laws
Life and death	Skills	Procedures
Performance	Truth	Software
Time and Space	Culture	Art and music
Politics	Religion	

If we assess the AKI Model against the criteria for Kano's model we can see that the diagram is clear and simple to understand. It shows a relationship between actions, information and knowledge and that the three elements are connected but discrete. Table 3 shows where data and wisdom fit in to avoid the criticism of the model being incomplete. Their inclusion also opens the door for further work on the topic of wisdom in organisations into the future. The model translates concepts and arguments far more easily than a direct use of Popper's 3 Worlds.

The AKI model is quick to develop, is cheap, flexible and transferable. It is technically accurate (or close to) and allows outliers or spurious data/facts/object to be identified. It uses simple symbols to allow the audience to relate better to the abstract concepts it represents (but may possibly be oversimplified). The question is, does it meet the subjective criteria of causing delight and exciting the user? The challenge now is to test this model in the market and see if our design is viable.

Why this matters – implications for designing and developing systems

Confusion and debate surrounding the DIKW continuum has resulted in a lack of consistency in how KM systems should be developed and implemented. Davenport and Prusak (2000) stated that "confusion about what data, information and knowledge are – how they differ, what the words mean – has resulted in enormous expenditures on technology initiatives that rarely deliver what the firms spending the money needed or thought they were getting".

Wenger (1998) stated that traditional knowledge management approaches and systems attempt to capture existing knowledge within formal

systems, such as databases. This "externalisation" activity places a focus on managing the information rather than the knowledge. To systematically address the kind of dynamic "knowing" that makes a difference in practice requires the participation of people who are fully engaged in the process of creating, refining, communicating, and using knowledge.

The question now is to determine how the above model described at 11 would impact on designing and developing KM systems and what is the difference between an information management System and a KM System.

As well as differentiating knowledge from information and data (different classes of intellectual capital), we can use the AKI model to indicate the differences between management systems. This would enable us to better define an appropriate purpose for the system and utilise a suitable architecture. Without these, the likelihood of realising the expected benefits of the system from the resources invested is reduced.

The AKI model allows us to think of a KM system as a new species of communication and management system that is enabled by technology, is cognizant of information, and takes into account the complex nature of intangible assets, to support the flow of knowledge in organisations.

A system cannot function in one world alone and requires aspects from the other two worlds to operate effectively. We develop and employ information management systems and strategies to manage representations of cognition and events and objects. Therefore, an information management system aims to manage the structural capital of an organisation. This includes information, data, records and evidence. Electronic Document and Records Management, Content Management, Digital Resource Management and Intranets are examples of information management systems and they are good at supporting the management of the 'know when' and the 'know where'.

We define a KM system as a technology-based or non-technical interconnected group of functions that enables or facilitates either (or a combination of) the discovery, capture, integration, sharing or delivery of the knowledge required by an organisation to meet its objectives. It can comprise a part of a knowledge management initiative or strategy to improve the utility of an organisation's intellectual capital (McDonald and Williams, 2011). a KM system is more concerned about the 'know why', know who', 'know how' and 'know what'.

Most KM systems are dependent on information. Similarly, other systems are useless unless there is some 'know why' and 'know how' about the system and its subject. In his address to the National Press Club (8 May 2014) Dr Barry Kirby told the story of how a clean drinking water supply was installed in a remote village in Papua New Guinea by an overseas non-governmental

organisation to assist the village and reduce sickness. The water supply was turned off because no one taught the villagers how to use a tap and they would leave it running all day (Kirby, 2014). Information systems are similar. Users need to be given the knowledge of 'why' the system was set up, 'what' it is for and 'how' to use the 'tap'.

Because knowledge systems are different to information systems, it is logical that we should apply different systems, architectures and strategies. We develop and employ KM systems to increase the value we obtain from the human and social capital of our people rather than the value from our information (structural capital). Note that information (structural capital) assets are owned by the organisation but knowledge (human and social capital) assets are owned by people and are only potentially available for use by their host organisations, depending on how well people are managed.

Frank (2001, p2) states that a KM system should:

- have an emphasis on concepts and reason
- re-use existing knowledge
- integrate with information
- support awareness

While a valuable starting point, these appear to be principles rather than requirements of a KM system. a KM system should be deliberately developed and managed to support and enhance knowledge-intensive processes, tasks or projects. Such systems would include interaction with information, action and events, including interaction with other people.

Because recent advances in technology have enabled us to dramatically improve our ability to engage others across both time and space, we are continually tempted to think of a KM system as an information technology (IT) system. Zaharova and Galandere-Zile (2002) argued that "technology by itself does not constitute a knowledge management program. Technology is an enabler that can facilitate the management of an organisation's intellectual and knowledge-based assets, especially in large, geographically dispersed organisations."

In a KM system, the subject being managed is the social and intellectual capital of people associated with the organisation. KM systems should include tools, techniques and strategies tailored to specific business requirements. These may include techniques such as sense making, use of narrative, mentoring, communities of practice, knowledge cafes and after action reviews. Nearly 50 knowledge management techniques are identified in the Knowledge Bucket curated by Banks (2014). Tiwana (2001) stated that "it is vital to recognise that technology's most valuable role in knowledge management is broadening the reach and enhancing the speed of knowledge transfer".

An example of a KM system is the process that nursing staff employ for transferring knowledge about patients and the operation of the ward at the end of a shift. They rely on documentation and patient notes, which are often supported by information technology systems. However, the main knowledge transfer exists in the interaction between trained professionals with a common understanding and common objectives. The same may be seen where the knowledge of a community is handed down through story rather than through a platform such as Facebook. Similarly, an after action review system is capable of exposing and creating new knowledge for the benefit of the participants and the organisation. Technology should only be seen as a component of a KM system and of information management. By clarifying the differences between information and knowledge, the AKI model should assist business analysts and organisational developers to undertake system development using appropriate architecture.

Conclusion

Despite considerable criticism, the DIKW hierarchy continues to be popular within the general information management and technology community, primarily because few effective alternatives have been proposed. While early exponents of the hierarchical framework enhance their definitions with discussion about the dependencies between the elements and the outside world, a simplistic interpretation continues to pervade. Much of the criticism states that the hierarchy has oversimplified the complex nature of knowledge and that the elements should not be defined in terms of each element. Where many critiques of the hierarchy fall short is in still considering that the elements exist in a continuum and few propose an effective alternative to challenge the DIKW pyramid graphic. a simple (AKI) diagram with unambiguous symbols shows a more egalitarian relationship between the elements that is more accurate and is a viable competitor to the DIKW pyramid. This paper is the initial step in testing that hypothesis.

The debate, confusion and misunderstanding of the differences between data, information and knowledge means that we often attempt to manage knowledge with information management techniques and systems, and then are disappointed when the outcomes are not achieved. This paper uses the development of the AKI model to argue that:

1) knowledge is a different class of intellectual capital than information and data;
2) accurate models, metaphors and symbols allow us to more easily make sense of concepts;
3) a KM system is a new species of communication and management system specific to human and social capital; and

4) design and development of a KM system requires different architectures and strategies.

Acknowledgments

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Abstrakt (in Polish)

Przegląd literatury wskazuje na to, że Dane, Informacje i Wiedza są wciąż umieszczane w hierarchicznej konstrukcji, gdzie informacje są bardziej cenione niż dane i mogą być przetworzone w cenną wiedzę. Mądrość w dalszym ciągu jest dodawana do tego modelu, co zaciemnia całą kwestię. Model ten ogranicza naszą zdolność do logicznego myślenia o tym jak i dlaczego tworzymy systemy zarządzania wiedzą do wspierania i udoskonalania procesów, zadań czy projektów wymagających znacznej wiedzy. Artykuł ten próbuje podsumować rozwój hierarchii Dane-Informacje-Wiedza-Mądrość, przedstawia jego krytykę i proponuje bardziej logiczną (i dokładną) konstrukcję obejmującą składniki kapitału intelektualnego, która może być zastosowana przy tworzeniu i zarządzaniu Systemami Zarządzania Wiedzą

Słowa kluczowe: *DIKW (Dane-Informacje-Wiedza-Mądrość), zarządzanie wiedzą, kapitał intelektualny, organizacyjne uczenie, systemy, dane, informacje, wiedza, mądrość, prawda, dane archiwalne, dowody, przekonanie.*

Biography

David Williams's early background is in project management in the Australian construction industry on large projects such as Loy Yang power station in Victoria, the Australian Submarine Construction Facility in South Australia, Bruce Stadium and New Parliament House in the ACT. He joined the Department of Defence in 1989 on the New Submarine Project before working across Defence in the management fields of human resources, information, knowledge, quality, risk and enterprise architecture. David has also worked as a management consultant in facilities management and enterprise architecture. He was previously the information architect for the Department of Employment and Workplace Relations. David has managed and implemented several major procurement projects in government departments for both services and solutions including projects for the Energy Security Programme. David has introduced a Project Management Office into the Department of Human Services and is now delivering services back into

government departments on a consulting basis in decision support systems and procurement management practices. David has a Diploma in Engineering, a Graduate Diploma in Public Sector Management and a Master's degree in Project Management. He is the President of the actKM forum Community of Practice and is on the Board of the Institute for Information Management.

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Findings From International Surveys Providing a Snapshot of the State of KM From a Practitioner Point of View

Nicholas J Milton

Abstract

Data collected through an online survey and through a number of detailed company assessments throw light on the relative strengths and weaknesses of different elements of Knowledge Management (KM) frameworks as applied globally. The online survey - a quick self-administered test, shows the strongest elements within the framework to be Technology and Behaviors and Culture. The weakest elements are KM Governance and KM Roles. The assessment - a detailed diagnostic process based on in-depth interviews, shows the strongest elements within the framework to be Technology and the Discussion of Knowledge. The weakest elements are KM Governance and KM Roles. a comparison of the results from the two sources is reassuringly close. More data may allow a more detailed analysis. Preliminary results suggest that national culture may influence the development of Knowledge Management Frameworks, with a correlation between strong Individuality and weak KM Governance and Roles.

Keywords: *Knowledge Management Survey, Knowledge Management Assessment, Knowledge Management Benchmark, Knowledge Management Framework, Knowledge Management Roles, Knowledge Management Technology, Knowledge Management Governance*

Introduction

Research, albeit often unstructured, is part and parcel of the knowledge management practitioner's life, particularly for knowledge management consultants. Every engagement with a client is an experiment and a data point. The consultant is constantly looking for evidence and information on approaches to knowledge management, successful and unsuccessful alike. He or she needs to know what succeeds in knowledge management terms and what fails, in order to be able to transfer that knowledge to future clients. An effective knowledge management consultancy that has operated successfully for many years therefore has built up a body of empirical knowledge which may be extremely useful.

Seldom is that knowledge shared. It is treated as competitive advantage: guarded by secrecy and non disclosure agreements. Also, unlike academic research, there may be no hypothesis to be tested, and no consistent data set to be interrogated. The dataset remains empirical and unstructured.

The case study presented in this chapter is an example of data and experience collected over a number of years, but is unusual in having been built around systematic data collection from a number of clients. One of the services that the author's company provides to organizations is an assessment and benchmarking service. This is provided in two forms: a free online self-benchmark survey, and a detailed interview-based analysis the organizational frameworks applied to knowledge management. Enough data have been collected now from these two forms of survey to draw some tentative conclusions about strengths and weaknesses in knowledge management.

This is not an academic study, but an empirical study based on practical experience, presented in a descriptive way. The study includes no literature survey, no research methodology, and no statistical testing. The results should therefore be taken as empirical results; hopefully interesting for practitioners and serving as an insight to researchers.

Survey methods

Survey data on the completeness of organizational knowledge management frameworks has been collected in two ways.

Firstly, a number of on-line knowledge management surveys are available at http://www.knoco.com.au/surveys/. One of these is a survey of knowledge management maturity, which looks at the development levels of several of the key components of a knowledge management framework. Participants were invited to take part in the survey through messages on Linked-In, and through a regular Knowledge Management newsletter sent to a sign-up mailing list of over 3000 people. Data were collected over the period from December 2012 to March 2104.

The survey rates KM maturity against 10 elements, assigning marks from 1 to 5 as participants select one from a number of statements for describing different maturity or development levels. The 10 elements are listed below, and the five statements for each element which describe the maturity levels are shown in Table 1:

- Learning Before
- Learning During
- Learning After
- Communities of practice (CoPs)
- Ownership of Knowledge (k ownership)

- KM roles
- KM technologies
- Behavior and culture
- Governance
- Business alignment

In addition to the maturity data, the survey also records the geography and the industry segment of the organization which the respondent is describing. To date, 248 responses to this survey have been received over a period of 16 months.

Secondly, the author's company has, for the past decade, offered an assessment service for clients. This is a detailed diagnostic assessment of the current status of the knowledge management framework within the client organization, which allows it to be benchmarked against knowledge management peers. Currently we have assessment data from over 50 assessments, each one representing an organization, or a team, department or division within an organization. Each of these assessments is covered by confidentiality agreements, so the name of the companies involved, the results of individual surveys or comments from interviewed staff cannot be published.

The Assessment model is based on assessing the effectiveness of the flow of knowledge from one person, team, department or project to another, and the assessment framework is a combination of two basic Knowledge Management models:

1) a model derived from the SECI model of Nonaka and Takeuchi (1995), which considers the four transitions of knowledge:
   - The transfer of knowledge from tacit to tacit states, through Discussion
   - The transfer of knowledge from tacit or explicit state, through Capture
   - The transfer and refinement of knowledge within the explicit state, through Synthesis
   - The transfer of knowledge from explicit to tacit state, through access and re-use.
2) a model of four enablers for knowledge management:
   People (roles and accountabilities)
   Processes
   Technology
   Governance, including clarity of expectation, performance management and support.

Table 1. The elements of the self-assessment survey of KM Maturity

Column1	Score 1	Score 2	Score 3	Score 4	Score 5
Learning Before	Learning before' never occurs. All new pieces of work are based on what the relevant staff already know.	Learning before' is rare. Only a few projects or pieces of work will learn from others before they start	Learning before' happens some of the time. It is neither unknown behavior, nor is it routine or expected. It occurs on an ad-hoc basis, or locally within the firm.	Learning from others before you start' is accepted behavior for most pieces of work. It is however not required behavior, nor is there the requirement to act on the knowledge received.	,Learning from others before you start' is part of required business process and occurs as routine for all significant projects or new pieces of work. Any knowledge so acquired is acted upon.
Learning During	Learning during' never occurs. Teams talk about delivery and challenge, but never about learning or knowledge.	Learning during' is rare. Only a very few managers and team leaders discuss what a team is learning.	Learning during' occurs locally within the organization, being applied at certain levels and not at others, or for certain tasks.	Learning during' is accepted behavior for most pieces of work, and is practiced at most levels, but is not applied routinely, or is not embedded into business process.	Learning during' is part of required business process and occurs by default in all projects, at all levels. Any knowledge discussed in the team is acted upon, and forward plans updated as a result.
Learning After	Learning after' never occurs. Any reviews of delivery, performance or projects have no element of knowledge capture.	Learning after' is rare, and relies on the enthusiasm of the project leader or team leader. Results are often not easy to find or not easy to use.	Learning after' either occurs locally within the firm, being applied at certain levels and not at others, or is widespread but gives results which are far from ideal from the point of view of re-use of knowledge.	Learning after' is accepted behavior for most pieces of work, and is practiced at most levels with reasonably good quality results, but there is room for improvement.	Learning after' is part of required business process and occurs by default in all projects, at all levels. The process is an effective one, and the output is good quality lessons and actions which will improve the way work is done in future.
Communities of practice (CoPs)	There is no sharing of knowledge through practitioner networks.	Communities of practice' and knowledge-sharing networks are rare. Either networking is not a standard business process, or the majority of networks do not function as knowledge-sharing mechanisms.	Either ,Communities of practice' or knowledge-sharing networks are in place for some business activities, or else there are many networks but the delivery of value through these networks is questionable.	Communities of practice' are accepted mechanisms for knowledge sharing for many key business activities, but by no means all.	Communities of practice' exist and are maintained, monitored, facilitated, and actively used, for all key business activities at all levels, and add real value through problem-solving and sharing best practices

Ownership of Knowledge (kownership)	None of the companies key knowledge is stored or available for future re-use.	Key knowledge has been collated and made available for a small proportion of business activity, but may not be clearly owned or updated.	Collections and summaries of key knowledge have been created and are owned on an ad-hoc basis for some business activities. Re-use of this knowledge is variable.	Collections and summaries of key knowledge, guidance and best practices exist for most key business activities, but by no means all, or else are not routinely updated.	Collections and summaries of key knowledge, guidance and best practices are in place and are maintained, owned, updated (by or on behalf of the communities of practice), and actively used, for all key business activities in the organization.
KM roles	There are no defined knowledge-related roles, and no assigned knowledge accountabilities in the organization.	Explicit knowledge roles are rare in the organization. Few business units or functions have defined accountability for knowledge.	Some Knowledge roles are developed within the company (for example CoP leaders, CoP facilitators, Process owners, KM champions).	Many or most business units have somebody with a defined accountability for knowledge management, many or most CoPs have a leader/ facilitator, many or most key processes or practices have a dedicated Subject Matter Expert.	Knowledge roles are established in all business units, in all communities of practice, and for all areas of critical company knowledge. There are one or more support teams for knowledge-related accountabilities.
KM technologies	There is no technology available for communicating or sharing knowledge with others, or for finding stored knowledge.	Some limited technology infrastructure exists, such as search engine and email, but nothing for effective collaboration, networking or sharing.	There is a general infrastructure of supportive technologies, covering search, collaboration and knowledge organization, but it is by no means easy or possible to share or find knowledge across the entire company.	The technology infrastructure largely supports KM, within reasonable Web 2.0 functionality, but some barriers still exist for effective networking, publishing and finding published knowledge, or finding knowledgeable people.	A full suite of high-quality technology exists for all staff to communicate and network company wide, to freely share and store written and recorded knowledge, and to easily find stored knowledge and knowledgeable people and networks

Behavior and culture	The behaviors and the attitudes of the management and employees are opposed to the free sharing of knowledge. There is rivalry and internal competition within the organization.	There are some rare people who are open to sharing and reusing knowledge across the organization. However the default behavior is still hoarding, internal competition and reinvention of solutions.	Knowledge sharing and learning from others is neutral behavior. It is neither seen as desirable nor undesirable. It occurs in some areas of the organization, but not others.	There is a general freedom in the sharing of knowledge throughout the organization although some pockets of resistance remain and by no means is everybody open to sharing and receiving knowledge.	The behaviors and the attitudes of the employees are entirely conducive to the free sharing of knowledge. Knowledge sharing and learning from others is „the way we work in this organization"
Governance	There is no link between knowledge management and reward/recognition, and no formal or informal expectations for knowledge management activity or behaviors	There are some isolated attempts to performance-manage KM, such as awards nor articles in internal communications, but these are rare.	Some aspects of Knowledge Management are embedded into corporate process, and so have become expected behavior.	Knowledge management is fully embedded into corporate process. In some cases there is a link between KM expectations and reward and recognition.	Knowledge management expectations are clear to everyone. KM performance is measured, and KM behavior is rewarded as part of normal rewards and recognition.
Business alignment	Knowledge management is treated entirely separately from the normal activities of the business.	Generally the knowledge management activities of the company are not linked to business priorities, with a some exceptions	Knowledge management is loosely linked to business processes, business targets and business needs. Some business areas or projects have defined Critical Knowledge Areas, which they manage proactively.	Knowledge management is generally linked to business needs, many or most units and projects have defined their critical knowledge areas, and many or most areas of company-strategic knowledge are owned and managed (e.g. by communities of practice)	Knowledge is treated as a key operational and strategic resource. Most or all departments and projects focus on knowledge critical to them, and all areas of strategic knowledge are proactively managed (e.g. through networks, communities, and/or practice owners).

Source: Available online at http://www.knoco.com/knowledge-management-downloads.htm.

The effectiveness and completeness of the Knowledge Management framework and the client organizations is therefore measured against 15 elements, shown in Figure 1:

	Discuss	Capture	Synthesise	Access and re-use
Roles	Roles for managing and facilitating discussion of knowledge	Roles for ensuring and facilitating capture of knowledge	Roles for knowledge synthesis	Roles for ensuring and access and re-use of knowledge
Processes	Processes for discussion of knowledge	Processes for capturing knowledge	Processes for synthesising knowledge	Processes for access and re-use of knowledge
Technology	Technologies to enable discussion of knowledge	Technologies to enable capture of knowledge	Technologies to enable synthesis of knowledge	Technologies to enable access and re-use of knowledge
Governance	Clear expectations for knowledge management activity	Performance management of knowledge management activity	Support for knowledge management activity	

Figure 1. Fifteen elements for KM Assessment Source

The presence and performance of each of these elements within the client organizations is determined through structured in-depth diagnostic interviews of a range of staff. The interviews, which last approximately an hour, take each interviewee through open and closed questions around culture, people, process and technology facets of KM, using a standard protocol. The interview may be performed face-to-face, or by telephone if face-to-face is impossible.

The current status of each of the 15 points as described in each interview is given a mark out of 5, depending on the level of completeness of that element, as follows:

1) this element is completely absent or ineffective,
2) this element is slightly addressed,
3) this element is partly present with significant room for improvement,
4) this element is largely present with some room for improvement,
5) this element is fully in place.

The results of the assessment are reported back to the client, together with a comparison against the best in class, and a list of all of the possible interventions to complete the clients knowledge management framework. By “best in class” we mean organizations with a long history in Knowledge Management, a published record in delivering business results through Knowledge Management, and consistent recognition in schemes such as the Most Admired Knowledge Enterprise awards[1]. In addition to this client-tailored report, the number of repeat assessments allows a comparison across multiple organizations to look at patterns of poorly developed and well developed Knowledge management elements.

1 (http://www.knowledgebusiness.com/knowledgebusiness/Screens/MakeSurvey.aspx?siteId=1&menuItemId=43)

Analysis and study

The following results from the survey and from the assessment are presented for discussion. The demographics of the online survey participants are presented below in Tables 1 and 2. Please note, the survey allows participants to describe themselves as researchers (people who are visiting the survey out of interest, rather than to benchmark their organization), though providing a tick-box labeled "I am a KM Consultant / Student/ Researcher and the results should NOT be used in Benchmarking". These results have been removed from the dataset described in Tables 1 and 2 and shown in Figures 2, 3 and 7, leaving 149 responses which are believed to represent reliable data.

Table 2. Country demographics for respondents to the online survey

Country	Number of responses
Algeria	1
American Samoa	1
Angola	1
Argentina	2
Australia	22
Azerbaijan	4
Belgium	12
Canada	9
Chile	1
China	3
Denmark	4
Ethiopia	1
France	3
Germany	1
India	4
Indonesia	1
Jordan	1
Kuwait	1
Latvia	1
Luxembourg	1
Malaysia	3
New Zealand	1
Norway	1
Portugal	1
Saudi Arabia	1
South Africa	4
Sweden	5
Switzerland	1
Thailand	1
UAE	2
UK	18
US	23
Multinational or unknown	13

Table 3. Industry demographics for respondents to the online survey

Industry sector	Number of responses
Agriculture, forestry and fishing	5
Construction	5
Education and Training	11
Electricity, Water and Waste	8
Financial and Insurance Services	9
Health care and social assistance	4
Information, media and telecoms	10
Manufacturing	5
Mining, oil and gas	32
Other services	9
Professional, scientific and technical	24
Public administration and safety - defense	15
Retail trade	1
Transport, postal and warehousing	1
Multi-industry or unknown	10

The average scores (between 1 and 5) for the different elements of Knowledge Management measured by the online survey are shown in Figure 2, where 5 is a high level of maturity, and 1 is a low level.

The following observations can be made:

- Average scores are moderate to low. Although some individual responses include scores as high as 5 for some elements, and some scores as low as 1, the data-set taken as a whole suggests that Knowledge Management is not yet a fully mature discipline.
- The highest score is for Technology, by a significant margin.
- The second highest score is for culture and behaviors. Culture, long considered to be the biggest barrier to Knowledge Management, no longer seems to be the biggest issue.
- The lowest score, by a very long way, is for Governance.
- The second lowest is for Roles.

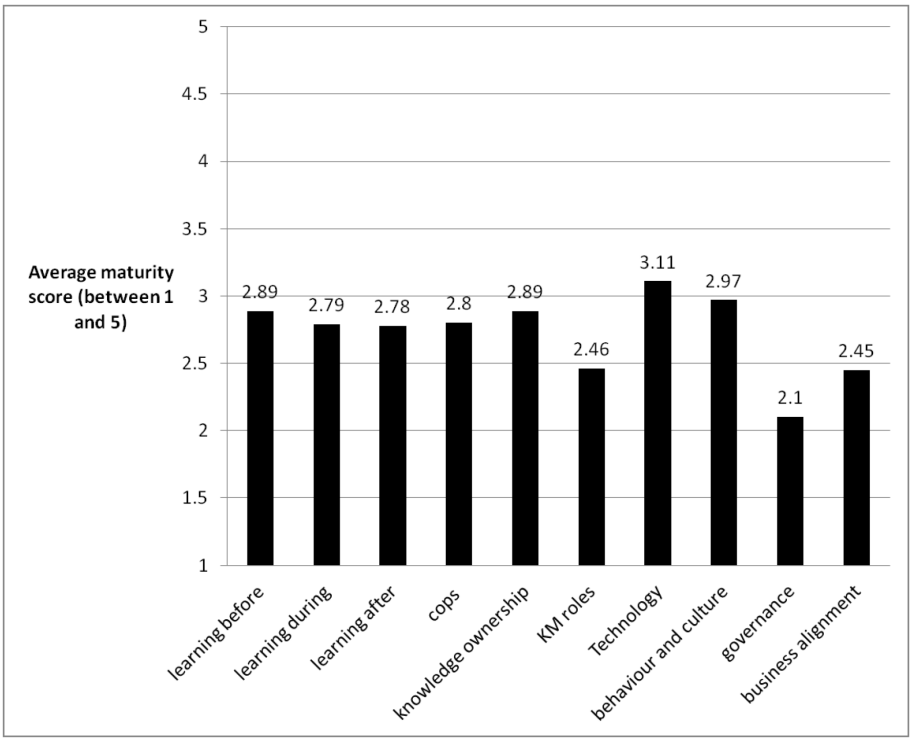

Figure 2. Average results for the ten elements of the online survey

Figure 3 shows the results for six countries - those 7 where we have 5 or more entries to the survey/ The overall KM Maturity scores for these countries are in the following order, from highest to lowest:

- Belgium
- Sweden
- Australia
- Canada
- USA
- UK

All 6 countries see the same dip on the graph related to KM governance and business alignment, and USA, Canada and Australia see a similar dip on KM roles.

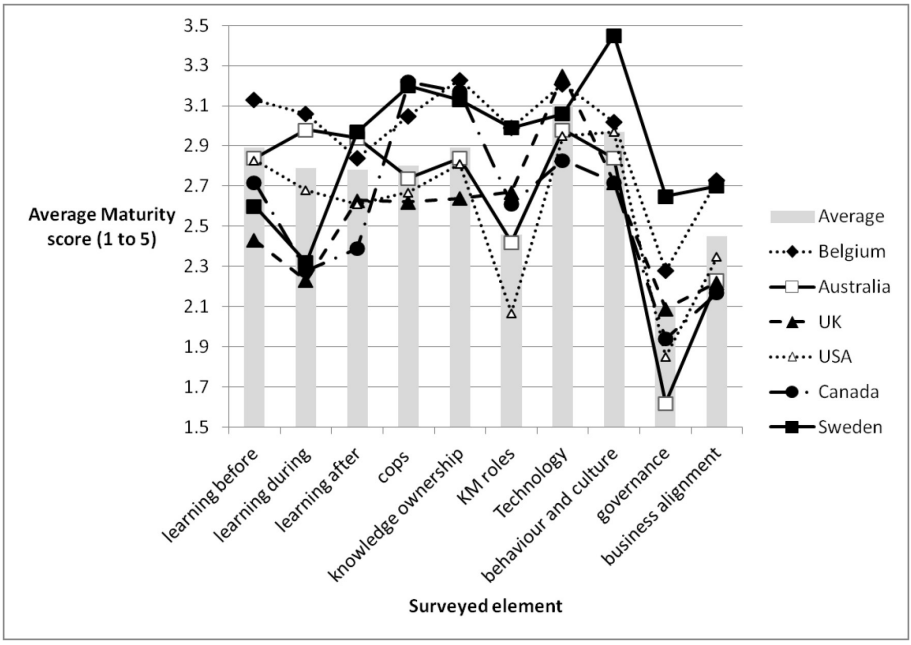

Figure 3. Survey results for 6 countries

The demographics for the Assessment are shown below in Tables 4 and 5.

Table 4. Country demographics for sample sets for the Assessment

Country	Number of Assessments with the country sample set
Angola	1
Argentina	1
Australia	2
Azerbaijan	4
Belgium	2
Brazil	1
Canada	1
Chile	1
Kuwait	1
Malaysia	1
Norway	1
Oman	1
Saudi Arabia	1
South Africa	2
Sweden	5
Thailand	1
UAE	2
UK	10
US	2
Multinational	18

Table 5. Industry demographics for sample sets for the Assessment

Industry sector	Number of responses
Construction	2
Education and Training	1
Electricity, Water and Waste	2
Financial and Insurance Services	1
Manufacturing	9
Mining, oil and gas	30
Professional, scientific and technical	1
Public administration and safety - defense	6

The average results for the 15 components of Knowledge Management measured by the Assessments are shown in Figure 4.

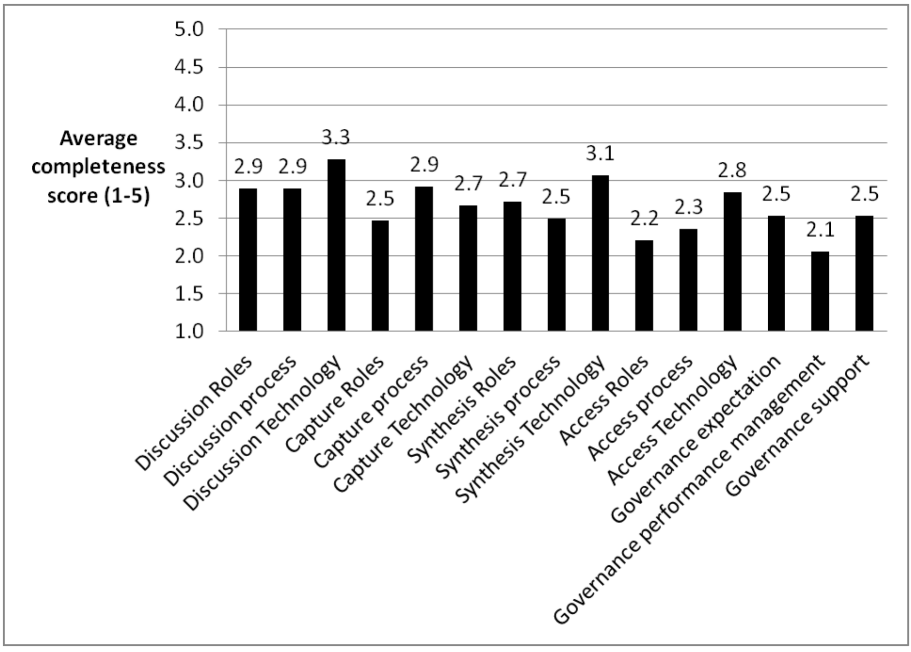

Figure 4. Average results for the fifteen elements of the assessment

The following observations can be made:

- As previously, the average scores are moderate to low. Although some individual responses include scores as high as 5 for some elements, and some scores as low as 1, the data-set taken as a whole suggests that Knowledge Management is not yet a mature discipline.
- The highest scores are for Discussion Technology and Synthesis Technology.

- The lowest score is for the Performance Management element of Governance.

These 15 elements can be grouped into the four transitions of knowledge described above as based on the four quadrants of the SECI model, and also into the four enablers mentioned above. The results of these groupings are shown in Figures 5 and 6.

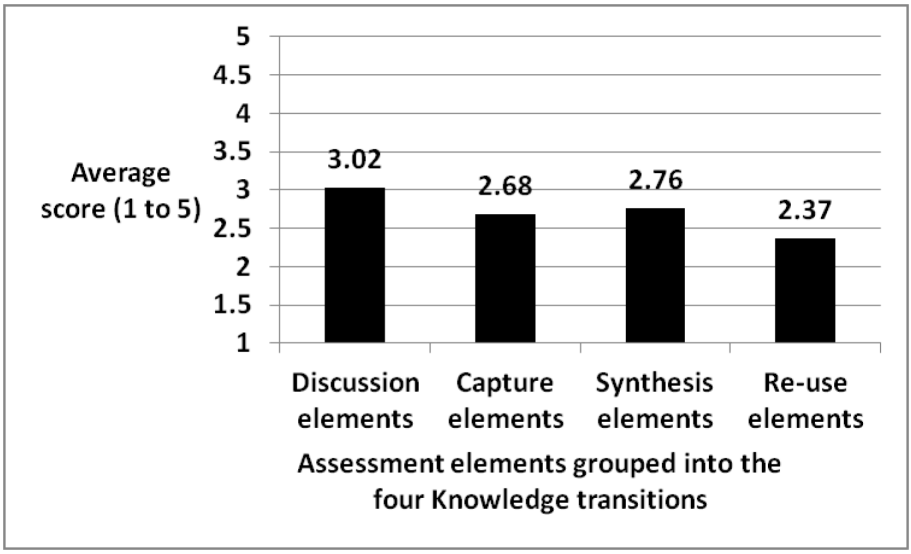

Figure 5. Average results for the fifteen elements of the assessment

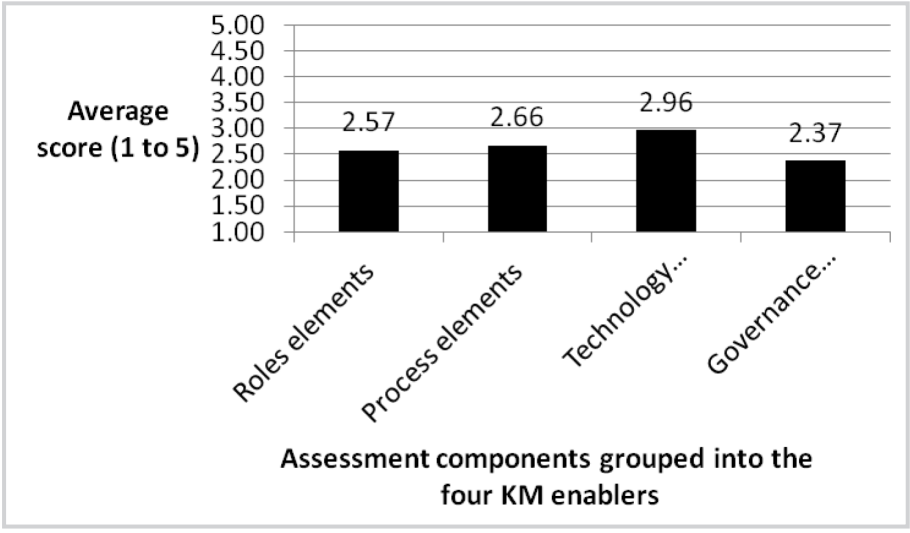

Figure 6. Average results for the fifteen elements of the assessment

These figures illustrate two more points;

- The discussion transition (tacit to tacit) is on average the strongest, with roles, technologies and processes most often in place. The weakest transition is knowledge Access and re-use (explicit to tacit).
- The Technology enabler is the strongest of the four, with Governance being the weakest and Roles the second weakest.

There is some equivalence in content between the Online Survey and the Assessment, as shown in table 6 below.

Table 6. Equivalence of Assessment components and Survey elements

Assessment Component	Survey element
Discussion Roles	CoPs
Discussion process	CoPs
Discussion Technology	Technology
Capture Roles	KM roles
Capture process	Learning After
Capture Technology	Technology
Synthesis Roles	Knowledge Ownership
Synthesis process	
Synthesis Technology	Technology
Access Roles	KM Roles
Access process	Learning Before
Access Technology	Technology
Governance expectation	
Governance performance management	Governance
Governance support	

This equivalence therefore allows data from the two datasets to be directly compared, as shown in Figure 7 below.

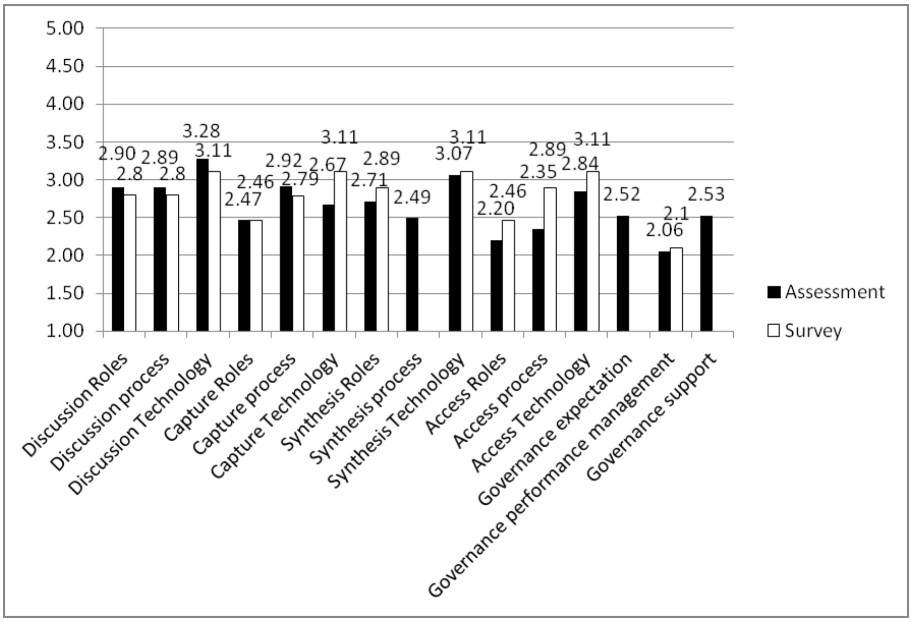

Figure 7. Comparison of the scores from the assessment and survey, for equivalent components

Discussion

The results from Figure 7 suggest that the Survey and the Assessment are measuring the same things in a similar way, despite very different data-gathering methods. Scores are similar, and trends within the scores are similar. This similarity reinforces the assumption that the data are real, and reflect the reality of Knowledge Management initiatives.

The main conclusions to draw from the data at this stage are as follows:

- Firstly, technology is a relative strength in the Knowledge management approaches applied to date(Figures 5 and 2).
- Secondly, the Discussion of Knowledge is a relative strength (Figure 5) reflecting the popularity of Communities of Practice, and the availability of Social technologies.
- Thirdly, the greatest weakness in all the data-sets is Knowledge Management Governance - the leadership and support structures that provide the reason and the reward for doing Knowledge Management. This is clear in Figure 2 and Figure 6, and further illuminated in Figure 7, where the lowest scoring, and therefore least effective, element of KM is Performance Management. This element

represents the way that Knowledge Management is measured and rewarded, and is one of the elements that drive the behaviors and cultures.

- Fourthly, both Figure 6 and Figure 2 point out the weakness of the Knowledge Roles element.
- Fifthly, the weakest of all the Knowledge Management transitions is Knowledge re-use - the transition from documented knowledge to "knowledge in action" – i.e. knowledge in people's heads and consciousness which helps them make the correct decisions.

With more assessments and surveys over time, we might be able to interrogate the data more finely, and speculate on why some effects have been observed.

The correlation between the assessment and the strategy suggest some level of empirical support for the utility of the SECI model of Nonaka and Takeuchi. This model forms one dimension of the Assessment matrix shown as Figure 1, and the independent corroboration of the survey results with the Assessment results suggests that the this model may have utility as a way of analyzing the components of a Knowledge Management Framework.

The strengths and weaknesses identified through the data may be used to infer potential areas for organizations to address as part of Knowledge Management implementation. If companies wish to improve beyond their current maturity level or framework completeness, then acquiring more and better technology should perhaps not be the primary focus, as Technology seems seldom to be the weakest element. There are many other, much weaker elements which will need to be addressed before Knowledge Management will add value.

Governance is a crucial element that seems to be a generic weakness, and without there is no organizational drive towards doing KM, and KM remains an unmeasured, unrewarded optional component. Similarly without clear roles and accountabilities (another common weakness) nobody is clear what they are supposed to do in Knowledge Management terms, which often results in jobs not getting done, and people waiting for others to take the lead. Finally Knowledge re-use is a common weakness which many organizations may need to address, as any efforts in knowledge capture and synthesis are wasted effort if that knowledge does not get re-used.

The availability of international datasets such as these, collected by practitioners over a number of years, offers a valuable opportunity for research. Research programs to date tend to be case-based; rigorous short-term in-depth investigations - often survey-based - with the aim of answering specific questions. Consultant practitioners on the other hand collect data on a very long term basis, across multiple organizations, sectors and countries,

although seldom testing hypotheses from the data with academic rigor. There is surely an opportunity for collaboration between research and practice to make better use of practitioner datasets.

Perhaps the most valuable fruits of this collaboration might lie in the ability to test more systematically some of the models and heuristics being applied by practitioners. Experienced Knowledge Management practitioners "know" what works, but this knowledge is often empirical practical knowledge with no sound basis in theory. Models such as SECI have proven valuable in explaining Knowledge Management, and in developing frameworks such as shown in Figure 1, to categorize and assess Knowledge Management in action. The data presented here provides a cross-check on that framework and seems to support its validity or utility, and further studies would be welcome to provide testing and a theoretic underpinning for practitioner heuristics.

Conclusion

Data gathering over many years on the strengths and weaknesses of elements of a Knowledge Management framework have allowed these to be aggregated and compared. Technology seems to be the strongest most mature factor in Knowledge Management programs worldwide, and of the four Knowledge Transitions, the strongest is Tacit to Tacit discussion (roughly equivalent to the Socialization element of Nonaka and Takeuchi, 1995). The weakest elements are Governance and Knowledge Management roles, and the weakest of the four Knowledge Transitions is Access and Re-use (roughly equivalent to the Internalization element of Nonaka and Takeuchi, 1995). Datasets such as these suggest a potential avenue for collaboration between practitioners (rich in data, but untrained in academic rigor) and academia (with rigor, but often short of data).

References

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Abstrakt (in Polish)

Dane zebrane w badaniu internetowym oraz z kilku szczegółowych ocen firm rzucają nowe światło na relatywne mocne i słabe punkty różnych elementów schematów zarządzania wiedzą o globalnym zastosowaniu. Badanie internetowe – szybki test do samodzielnego wypełnienia, pokazuje, że najsilniejszymi elementami schematu są Technologia, Zachowania i Kultura. Najsłabszymi elementami są Ład i Role w Zarządzaniu Wiedzą. Ocena – szczegółowy proces diagnostyczny oparty na dogłębnych wywiadach, pokazuje, że najmocniejszymi składnikami schematu są Technologia i Dyskusja, zaś najsłabszymi Ład i Role w Zarządzaniu Wiedzą. Porównanie wyników uzyskanych z tych dwóch źródeł pokazuje jak bardzo są one zbliżone. Większa ilość danych może pozwolić nam na dokładniejszą analizę. Wstępne wyniki sugerują, że kultura narodowa może wpływać na rozwój Schematów Zarządzania Wiedzą, może też zachodzić korelacja między silnym Indywidualizmem a słabym Ładem i Rolami w Zarządzaniu Wiedzą.

Słowa kluczowe: *badanie zarządzania wiedzą, ocena zarządzania wiedzą, wzorcowe zarządzania wiedzą, schemat zarządzania wiedzą, role w zarządzaniu wiedzą, technologia w zarządzaniu wiedzą, ład w zarządzaniu wiedzą.*

Biography

Dr. Nick Milton is director and co-founder of Knoco Ltd, with 22 years history working in Knowledge Management. Working with Knoco Ltd, Nick has been helped develop and deliver KM strategies, implementation plans and services in a wide range of different organizations around the globe. He has a particular interest in Lessons Learned programs, and has managed major lessons capture programs, particularly in the area of mergers and acquisitions, and high technology engineering. He is the author of "Designing a Successful KM Strategy; a Guide for the Professional Knowledge Manager" (Information Today, in press), "The Lessons Learned handbook" (Woodhead publishing, 2010) and "Knowledge Management for Teams and Projects (Chandos Publishing, 2005), and co-author of "Knowledge Management for Sales and Marketing (Chandos Publishing, 2011) and "Performance through Learning – knowledge management in practice" (Elsevier, 2004). Prior to founding Knoco, Nick spent two years at the centre of the team that made BP the leading KM company in the world, acting as the team Knowledge Manager, developing and implementing BP's knowledge of „how to manage knowledge", and coordinating the BP KM Community of Practice. Nick blogs

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Active Learning Innovations in Knowledge Management Education Generate Higher Quality Learning Outcomes

Arthur Shelley

Abstract

Innovations in how a postgraduate course in knowledge management is delivered have generated better learning outcomes and made the course more engaging for learners. Course participant feedback has shown that collaborative active learning is preferred and provides them with richer insights into how knowledge is created and applied to generate innovation and value. The course applies an andragogy approach in which students collaborate in weekly dialogue of their experiences of the content, rather than learn the content itself. The approach combines systems thinking, learning praxis, and active learning to explore the interdependencies between topics and how they impact outcomes in real world situations. This has stimulated students to apply these ideas in their own workplaces.

Keywords*: knowledge, learning, education, systems thinking, design thinking, active learning interdependence, wiki.*

Introduction

Knowledge is a challenging concept to grasp and perhaps it is even more difficult to understand how and when to leverage it to create value. It is possible to have knowledge and get no benefit from it, just as it is possible to have knowledge and apply it in an incorrect manner or time to destroy value. The adage that ***"Knowledge is power"*** is true if one wants to secure political power over others. However, this is not an optimal approach to increasing performance and amplifying value. The perspective taken in the course described in this paper is ***"Knowledge is powerful, when shared and applied to generate sustainable mutual benefits."***

Knowledge Management (KM) as a professional discipline has come a long way over the past few decades, evolving through several generations of focus and effectiveness (Lambe 2011). Whilst the practice of knowledge management is now applied very well in some high performing

organisations (Cavaleri, Seivert & Lee 2005; Malhotra, Majchrzak & Rosen 2007; Shelley 2009), the practice of knowledge management education is still underperforming (Bedford 2013). Many KM courses remain focused on theoretical aspects within the context of a content-focused and teacher-centered traditional teaching approach.

This is a less effective way to learn the importance of knowledge than engaging students to experience application of theoretical concepts to real problem solving (Albanese & Mitchell 1993; Boud & Feletti 1997) and to students' own work environment. Problem Based Learning (Hung, Jonassen & Liu 2008) and Action Learning (Freeman et al. 2014; McIntosh 2010; Raelin 2006; Zuber-Skerritt 2002) are approaches that have been developed over time that can offer an alternative way for students to understand the concepts they are learning as they engage learners at a higher level of cognition than simply remembering facts (Bloom, Hastings & Madaus 1971).

This paper describes how innovations to the way the course is facilitated have enhanced how KM education is facilitated for a Masters level course at RMIT University in Melbourne, Australia. Over a seven year period, students have been engaged in an evolving development process, in which they are contributors in the exploration of how we come to know what we know and how we can learn to do this more effectively. Together, they seek to discover how knowledge is fundamental to almost everything we do; how we make decisions; and what influences what we think we know. The course participants gain this understanding by exploring some fundamental questions:

- How does one learn how to optimally create and apply knowledge to make a difference?
- How can one be more effective in the application of knowledge at a personal, team and organisational level?
- How do we collaborate to generate richer insights and make better sense of the world?
- What is already known and how do I build onto that within my own contexts?

These questions are core challenges that many knowledge initiatives face. They are often the sources of barriers to success in knowledge strategies in corporations. They enable the participants to think about the theoretical concepts in pragmatic ways and help them to devise better ways to apply the theory into practice in order to generate desired outcomes. They shift the mindset of the learners from existing knowledge capture and storage to using knowledge to generate value and stimulate cycles of knowledge creation. That is, they generate a demand for knowledge rather than just create a reservoir of knowledge – the latter has been the focus of many failed

KM programs (Chua & Lam 2005; Edmondson 2011; Mosier & Fischer 2011; Müller & Turner 2010).

Case background

This research reports on a case study in which the evolution of a postgraduate course in knowledge management has been an innovative, emergent and social process between the learning facilitator and cycles of course participants over a period of seven years. The evidence for the case involves collation of qualitative and semi-qualitative information to enhance the learning experiences in the course, originally called Knowledge Management, but changed to *Knowledge Driven Performance* (KPD) to reflect the true sense of the course as the emphasis and context changed.

In 2007, before the current course coordinator (and author of this paper) arrived, the course received poor feedback. It was judged by students as very content-focused, highly theoretical and not relevant to their professional development. The author, a knowledge practitioner working in industry at the time, was asked to redevelop the course to provide greater value to the students. The course was restructured to be highly collaborative and applied, based on learning literature and the author's experiences in engaging people in knowledge management initiatives in industry.

Aspects of this course that make it quite different from traditional content-based education include:

- It focuses on knowledge creation and application to generate value in real organisations.
- It is highly interactive and conversational about the sense and meaning of content in the context of the students, not about the content itself.
- Learning interactions are student-centred, emergent and social (as opposed to teacher led, rigid and content focused).
- All students can see the assignment submissions of all other students as they are generated through a collaborative wiki, where they connect their own research to other students' work through hyperlinks.
- Students are actively encouraged to help others but not permitted to actually change their peers' submissions. This happens through suggestions made in comments offered at the bottom of their wiki page (for which they get additional marks). The logic of this is that it prepares them for collaborative work in the workplace rather than reinforcing competitive behaviours.
- Grades are equally divided between group (40%) and individual (40%) work, with the remainder being for "collaborative participation" measured by supporting comments and contributions to discussions (face to face or on-line).

- Group assignments are conducted as a knowledge audit of real high performing organisations. Students are required to find knowledge gaps and recommend knowledge-based initiatives to improve performance and return on investment. Assessment of the assignments is done through formal business proposals and role-play presentations to the "CEO" (learning facilitator) and "Board" (class peers) of the organisation to seek funding for their initiatives.
- Students participate in reflective exercises in most weeks where they are asked to provide insights on the topic of the week, related to their own contexts.
- There is a strong "praxis" approach. This means maintaining a balance between theory and practice so that neither is seen as master. Optimal results come from blending both to support sense-making, decision-making, actions and reflection to reinforce learning.
- Reflective practice activities are conducted throughout the course, focused on how students have applied what they have learnt in their workplaces and to give them experience in cycles of multiple-loop learning. This provides greater insights on the application of what they have learnt and how they might gain more in the next application.
- Feedback for assignment submissions is specific and provides a rich balance between strengths and weakness of the paper (regardless of the grade). Feedback is viewed as the most critical element to improve student learning outcomes over the duration of the course.

The KDP course is an elective unit for a Masters of Business Administration (MBA) that emphasises the interdependence of many of the topics covered across the rest of the MBA. It has been designed to engage students in collaborative and social learning to enrich the student learning experience. Rather than being taught content, they are encouraged to constructively challenge each other's perspectives around topics, readings and concepts, through conversations. Knowledge Driven Performance is offered as an elective once per year with student numbers ranging from 20 to 35 during the time of this study. The course is equivalent of a 12 credit point course in a Masters level program and is usually delivered as a three hour interaction once per week for twelve weeks. Originally it was only offered as a face to face class, but since 2011 it has also been offered as a virtual course through Open Universities Australia (OUA) once per year. Student enrolments in OUA range from 20 to 50 and weekly topics are stimulated with a video and standard course materials loaded onto the Learning Management System (LMS) and supported by discussion forums and interactions via the Collaborate (conferencing) tool or Skype.

The course is structured into 11 topics and one final report presentation at the end. These are typically facilitated in one three hour session per week for 12 weeks in both face-to-face and on-line formats. The order of

topics (listed below) build like a jigsaw puzzle, starting with how knowledge informs strategy, through some theoretical concepts, then towards practical implications and how to apply them, and culminating in an integrative business proposal where the topics are brought together to enhance the performance of a real organisation (which may be their own workplace).

The order of course topics is:

- Foundations for Business Strategy: embedding knowledge principles into business practice.
- Making sense of a rapidly changing world: knowledge as the foundation of decision-making and future performance.
- Application of knowledge to create value: who has done this well?
- Conversations that Matter: interactive forum in which class participants discuss their individual topic with other students to generate dialogue around the links between knowledge related topics.
- Back to Basics: applying theories and approaches to enable improvement.
- Leveraging Intellectual Assets: process and governance.
- Leveraging Intellectual Assets: culture and structures.
- Support Tools: helping thinking people to be even more effective and efficient.
- Reflective Practice: understanding how reflection enhances learning.
- Sustained business continuity: integrating knowledge into the Learning Organisation
- Making a Difference: capabilities required for "Knowledge Leadership"
- Presentation of business proposals in a role play to "CEO" (teacher) and board (class).

Each week there is a brief coverage of the topic followed by activities to explore the topic, such as role plays, case studies, games or problems to resolve, videos to present challenges, and facilitated dialogue or reflections to share the ideas they have learned or applied in their workplace. The topics have a very pragmatic approach and leverage the knowledge in the room, thereby aligning with an andragogy learning approach (Knowles 1984; Knowles, Holton & Swanson 2011). The case studies and assessments reinforce this through their requirement to demonstrate the application of theoretical concepts to deliver desired improvement outcomes.

Course participants collectively build a repository of relevant resources as each one researches a different topic and then is challenged to link their topic to as many of the other topics within the context of their article (through the collaborative wiki) and to highlight how their topic is influenced by knowledge. Marks are increased for adding supporting comments to other participants to reinforce the value of shared knowledge to increase quality for everyone. Example topics in the wiki assignment include; Leadership,

Organisational learning, Ethics, Innovation, Capability development, Culture, Decision making, Succession, Induction, Data mining, Knowledge transfer, Codification, Community of practice, Mentoring, Sustainability, Complex adaptive systems, Reflective practice, Whistleblowing, Security, Knowledge audit, Knowledge mapping, Knowledge models, Personal KM, Design thinking, Sense making, Explicit and Tacit knowledge.

Methodology

The methodology in this case is to use student feedback to both evaluate and improve the course delivery. Course Experience Surveys (CES) are independently conducted by the university as a means of collecting anonymous student feedback on all courses. The CES includes free text comments and quantitative five point scale responses to questions. Results for "Overall Satisfaction Index" (OSI) and "Good Teaching Score" (GTS) are calculated as percent scores based on the proportion of students that "agree or strongly agree" with a series of statements and questions. OSI and GTS results for Knowledge Driven Performance are shown in Table 1, with comparisons to the average scores for the School in which the course was operated. This school's scores have consistently been several percent above the average scores for the rest of the University during the time discussed in this article.

Each semester, comments from students through the anonymous Course Experience Surveys (CES), unsolicited emails and feedback on in-class activities were reflected upon and the course adapted over time to increasingly incorporate active learning and focus on social aspects of learning. CES is not performed for the OUA version of the course but, reflective exercises performed in weekly activities, provide rich information about how the course learning is being applied in student workplaces (most virtual students are working part time and studying full time).

The key limitations of this research are that observations are subjective, direct impacts of interventions applied are difficult to measure and there is a chance of cognitive bias in interpreting results. To minimise the impacts of this, the design and approach of the course is actively discussed with students from the beginning, and throughout, the course. They are advised that reflective practice is a key aspect of knowledge management, learning and innovation and that the course is based on the very principles that it is trying to teach them. This is discussed in several of the reflective activities spread throughout the course to reinforce the learning and ensure that principles are being applied and generating the desired outcomes. Some of the feedback comments offered by students reinforce this as a key aspect of their learning experience in the course.

Active learning approach influence on course design and facilitation

In 2007, this course was delivered in a very traditional style of pedagogy. That is, it was teacher-centered and content-based and was not well received by the students as is shown in Table 1 below. In 2008, a new facilitator restructured the course into facilitated active learning to engage the students through a series of conversations around topics. Between 2008 and 2014, the course continued to evolve though innovative developments that focused on student-centered learning and application of the concepts in the students' own workplaces as much as could be achieved. The industry experiences of the learning facilitator (term used deliberately to highlight the differences to "teacher" or "lecturer") were leveraged to show the value of theory to practice and vice versa.

Although each week there are elements of theoretical content to be covered, the content is used as a stimulus for the conversations that participants use to explore for insights. The content is neither the main focus or purpose of the session. The course operates on the concept of praxis, which combines theory and practice in balanced ways to provide a deeper context and more pragmatic learning (White 2007). Students engage in conversations about the value created by applying the concepts rather than trying to remember the content itself. This innovative and practical method of learning was found to be highly engaging and effective for the students.

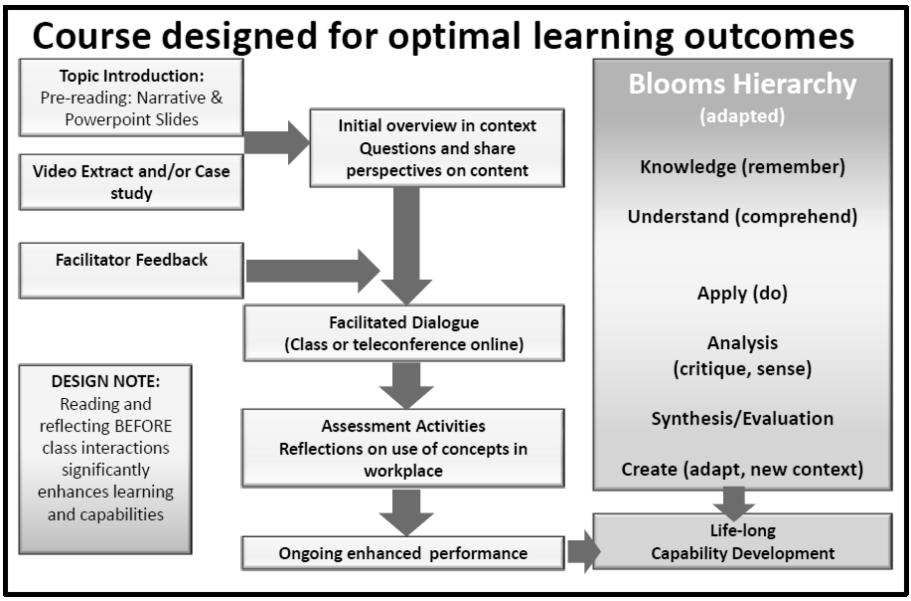

Figure 1: Structure of the active learning cycles deployed in the course for optimal and sustained learning

Course design changes were introduced to generate "work ready professionals" by engaging students in activities that they would be expected to do in the modern workplace. This direct experience of working with others to leverage diversity of perspectives helps them learn in a richer way. The course also specifically aligns with the RMIT University Graduate Attributes. How it aligns with the MBA program learning outcomes (bolded in the list below) is described immediately after each one:

- **Self-management** through understanding how to continuously develop through lifelong learning
- **Operational leadership through** research on real organisations and making proposals for improvement and specific knowledge initiatives to fill gaps
- **Contemporary business perspective** gained by dealing with complex contemporary organisational challenges
- **Analytical & technical competency** developed from analysis of case situations and synthesis of interdependent arguments shared through the collaborative wiki
- **Strategic decision making** happens every week through the dialogues in class and through the wiki or discussion board interactions
- **Corporate responsibility** is proactively embedded into the course content with questions and challenges and ethics is included as one of the wiki topics
- **Effective communication is reinforced with professional standards expected in both written and oral activities**, including assessed role plays where students present costed knowledge initiatives to the "CEO" (teacher) and board (other students).

In doing, so the course has specific learning outcomes that were directly relevant to contemporary knowledge-informed leadership and management practices. It also recognises that the process of learning itself is a significant capability that enhances the performance of professionals over time. Professional capability in the current professional context requires leaders and managers to anticipate more what is likely to happen, make sense of a range of possibilities and then prioritise decisions to optimise outcomes and generate sustainable outcomes. This requires a mature mindset that is comfortable with ongoing learning, complexity and uncertainty.

The idea that education is focused on remembering content is fine if the content is not rapidly changing, but this is not what our graduates need to be successful in their professional futures. To prepare them for a more productive and rewarding career, we need to embed the principles of andragogy (student-centred, teacher-facilitated) into their learning experiences, rather than apply traditional pedagogy (teacher-centred, content-focused) and this

enables them to approach unknown issues and find ways of dealing with them effectively (applying learning in action for novel situations).

Knowles (1984) described five key features of learners effectively engaged in andragogy style learning defining them as follows:

1) ***Self-concept:*** learners are self-directed and self-motivated rather than teacher dependent.
2) ***Experience:*** learners leverage the collective experience of all participants through shared challenges and constructive challenges to enrich the collaborative learning.
3) ***Readiness to learn:*** learners are actively seeking to develop themselves to be more capable, professionally and socially.
4) ***Orientation to learning:*** the learner perceives value in the ability to apply knowledge to immediate contexts. Accordingly they reorientate learning efforts from subject-centred to (real) problem-centred.
5) ***Motivation to learn:*** the motivation to learn is internal.

These five principles are explained at the beginning of the course to ensure students understand both the intent of the learning and what the expectations are. Assessment activities are aligned with this through the principles of constructive alignment (Biggs & Tang 2011) in which learning activities and assessment of them are designed with the learning outcomes in mind. This concept is combined with the objective that the course is developing effective leaders for an unknown future (Snook, Nohria & Khurana 2012) and to bring together the personal development of the person as a whole as shown in Figure 2. The concept of professional development extending beyond content and towards how we interact with each other has developed from earlier conceptual work of Polanyi (Polanyi & Grene 1969) and has been extensively discussed more recently by White (2007).

Each week a unit topic theme is introduced through a combination of an introductory topic narrative, a set of slides summarising key concepts, and additional details to fuel discussion including supplementary content (document extract or video) related to the topic.

Course participants are expected to review these materials before the class interactions, as they will be asked to engage in discussion about them. The dialogue works best when all participants are active in constructively challenging the materials and sharing their perspectives of what this means for them and their contexts. In face to face courses, these interactions occur in the classroom and in the virtual version of the course they happen firstly through the discussion forum and subsequently via the interactive dialogues in conferencing sessions using the Learning Management System functions.

This process, depicted in Figure 1, is designed to maximise the value that course participants receive from their investment in their education. The approach is emergent, but grounded in robust learning theory and the

practical experiences of the course facilitator. Another feature of the learning process is engaging learners in group discussion activities around challenges that occur in the workplace, thereby aligning with problem-based learning approaches (Hung, Jonassen & Liu 2008). The interaction between members of the classes is critical to the richness of the learning for all involved and is therefore an important element of the assessment.

Class participants are graded on the frequency and quality of their contributions to the learning experiences, both in the live interactions and through their supportive comments and challenges to each other's wiki pages. This is done to reinforce the importance of actively contributing to workplace dialogue and engaging in exchange of perspectives in a professional and constructive manner.

Figure 2 reinforces the importance of aligning learning activities with learning outcomes by applying the theories in practice. This model also highlights the relationship between behavioural aspects of engaging in learning (of both learners and facilitator) and the effectiveness of the learning outcomes.

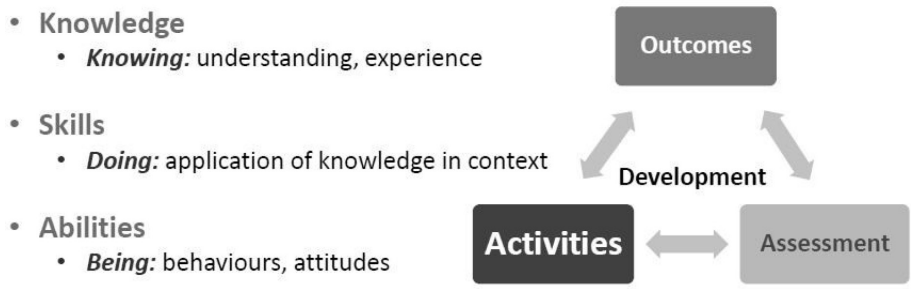

Figure 2. Constructive alignment of activities and assessment to meet learning outcomes and personal and professional development objectives

Findings

The Course Experience Survey (CES) results demonstrate that students respond very positively to the course approach. They provide further insights into what is good and what can be improved through specific comments in the survey as well as emails and in the interactive wiki. These interactions inspire the course facilitator to continuously improve courses and experiment with alternative activities to keep the course fresh and engaging. Examples of some changes made based on student feedback include doing a pitch of best ideas for each of their companies to share options for other groups,

recommendation of alternative high performing companies to research, and inclusion of polling for ideas and ranking responses in the online discussions. Ideas and techniques have also been shared with other teaching staff and these courses have seen increased CES scores.

The lower scores for shared classes highlight the challenges of instilling passion in other facilitators to deliver in an interactive way with rich feedback. Sharing the course was necessary as the original facilitator was spread across several other classes and was not able to deliver all components of the course. Similar impacts have been observed in some other shared courses, where increased interactive teaching has improved results, both in this school and also elsewhere (Freeman et al. 2014). Facilitative learning approaches work well when the facilitator is passionate. Whilst knowledge and activities can easily be passed to other facilitators, passion is more difficult to transfer. Student feedback in Table 2 highlights that the engagement level of the facilitator has an effect on their motivation to learn and the effort they invest in the learning and assessment activities as has been reported elsewhere (Albanese & Mitchell 1993; Boud & Feletti 1997; Freeman et al. 2014).

The lower OSI score in 2012 occurred primarily for two reasons. Firstly, the change to electronic submission of the CES survey caused a significant reduction in student feedback, making each one a higher proportion of the total. Secondly, in that semester the workload of the facilitator was very high, impacting on the time available to construct detailed feedback for assessments. Feedback is a critical element of learning and is very different to "marking", "corrections" or even "grading". These three activities are focused on assessment to the stated standard and this is important. However, the real learning comes from understanding WHY they received the grade they did, and why not higher or lower. Optimal feedback is balanced between what was delivered well and specific advice on how the submission could have been improved. This provides both encouragement to build confidence and also the foundation for improvement, both of which are essential for enhanced learning outcomes.

Table 1. Course Experience Survey results (student feedback) for Knowledge Driven Performance 2007-2014

Course Experience Survey score	**07**	Course restructure	**Evolution of the course towards interactivity**					
Year			'08	'09	'10	'11	'12	'13
KPD Good Teaching Scale %	**36**		**81**	**93**	**94**	**94**	**100**	***81**
KDP Overall Satisfaction Index %	36		78	100	100	100	86	*93
School MBA Average GTS %	**70**		**68**	**75**	****64**	**64**	**67**	**72**
School MBA Average OSI %	73		69	76	**74	69	69	79

* Shared teaching class, showing the power of interactive facilitation and use of stories.

** Major transition year for the school with significant disruption for students.
Note: Scores are percentage of students that agree or strongly agree with statements in an anonymous survey on the quality of teaching or their overall satisfaction with the course.

Examples of student feedback provided through the CES and unsolicited emails are included in Table 2. These highlight students engaged well with the interactive student-centred approach and saw value for their professional development and ongoing learning activities.

Table 2. Student comments supporting the course innovations and learning approach

I keep thinking about KM stuff all the time about how I can improve the process, connectedness etc...
My individual Wiki (assignment 1) prompted me to suggest some fairly radical new approaches within our organisation in regard to how we measure success.
I can see our explicit knowledge base building and most importantly everyone is enjoying the interaction, so I know that it will be a success for the long term. I also learnt a great deal from reading all the students' posts and I'm in deep admiration of some of the fine minds in this course.
Thanks for your teaching … I can tell you … I'm actually incorporating many of the KM practises learnt in this course into this business. So thank you. I know your task was enormous and I appreciate all that you have provided in KM.
It's been a pleasure to be part of your class. I hope students will continue to have the opportunity to learn from you and see the passion you have for the subject in the coming semesters. The influence our teachers have on our capacity to learn is highly underrated.
Thank you. I appreciate the feedback. Of all the subjects undertaken since commencing my degree, this has interested me the most. I am in the process of starting my own network and consulting business and would like to chat to you about frameworks, once I have finalised.
You engaged us not only during face-to-face sessions but also via emails, Skype, etc. I enjoyed the way you used simple examples or small games to demonstrate different elements of leadership as well as what we should improve to be better leaders. Group work and discussions were all very informative and knowledge-driven. Wiki site and TurnItIn® voice feedback were new and collaborative tools which I found very useful and effective.
I was very grateful to receive your constructive and thorough feedback on every assignment. As you can see, I learnt and tried to improve my work from your valuable feedback/comments.
I like this course for its highly interactive methodology and learning experience… made the course interesting, informative and enjoyable. Arthur's personal interaction on a professional level is what keeps us going and inspired.

Observations and discussion

The results highlight the benefits to the students of implementing an interactive active learning approach. Feedback has consistently been very high, even when other external factors have affected the learning environment (such as teachers less experienced in the andragogy approach, major restructuring of the school and changing the CES feedback submissions

to online). Adopting an interactive 'adult learning' approach helps students to gain a stronger sense of the meaning of the content, the theories and the contexts where KM is applied. It also enables richer dialogue and interactions between students.

Actively engaging learners in 'Peer to Peer' learning similar to that described by Knowles, Holton and Swanson (2011) has taken the learning experience to a higher level, resulting in deeper and wider understanding of the importance of each topic and the relationships between them. Student feedback shows that the way students are engaged in the KDP course motivates them to participate more actively and generates better individual learning outcomes. Another indication that the students valued the class interactions is that class attendance remained very high through the semester, despite the classes being recorded and being made available to listen to at a later time. This, and student feedback comments received, indicate that they enjoyed the nature of their engagement with their learning peers.

One advantage in interactive learning environments is that it enables participants to capitalise on the diversity of cultural backgrounds and destinations (MBA students at RMIT University typically come from many Asian and some European, American and African nations). This reinforces that learning quality is enriched through exploring options in a social discovery process of sharing perspectives to create a better future. Knowledge Driven Performance has an internationalised curriculum with case studies from many countries to enable students to engage with a range of contexts and include their own perspectives, as endorsed by Biggs and Tang (2011).

Deployment of activities such as case studies, games and role plays to explore the best and worst outcomes of complex scenarios assist with reinforcing the benefits of generating options for future realistic scenarios, rather than considering 'theoretical textbook' solutions. After each activity, participants reflect on what learning has occurred, reinforcing the activity's purpose and ensuring understanding is optimised. Critically reflecting on their peers' perspectives develops each student's capability to challenge concepts and context, and ultimately to become more capable professionals. Students develop confidence to think for themselves about decisions and actions in their workplaces. This reflection and skills development directly contributes to developing professional capability and personal strengths, aligning with McIntosh's (2010) recommendations for reflective practitioners.

Applying the andragogy principles helps build and leverage social capital and generates opportunities for each student to individually interact with the learning facilitator and their peers, through both face-to-face and virtual connections. This teaching strategy creates an identity and confidence that

resonates beyond their time in the KDP course. The shared assignments in the wiki reinforce these interactions between students – there, they collaborate to generate a comprehensive encyclopaedia on a range of relevant topics and to share their own 'professional profile'. They regularly interact with each other through this platform which they identify as 'their own space' and many of the students remain in contact with the learning facilitator and each other beyond the course.

This research reinforces the claim that moving away from teacher and content-focused presentation to student-centred dialogue about content in the student's own contexts and experiences, produces richer learning and higher quality student submissions. Quality of student work submitted is further enhanced because the early assessments are open for all participants to see, which highlights the quality range and the gap between their work and others. More importantly, the collaborative learning environment enables all students to learn from all other student's work, as it is available to them throughout the rest of the course.

Conclusion

Experiences with this course demonstrate that interactive and social learning increases the learning outcomes and the richness of the learning experience. The ultimate desired outcome of effective teaching is that students develop deep and rich insights into a wide range of factors that influence how they interact and perform in their workplaces. This case demonstrates that student experiences in the *Knowledge Driven Performance* course have been positive and motivated some of them to implement changes in their workplaces within the learning period. It is hoped that these experiences will enable them to deal more effectively with uncertainty and look towards developing better future solutions. They emerge with a mindset that enables them to move from 'what is' to explore 'what is possible'. This mind-shift and an enhanced motivation to be lifelong learners, places them well to succeed in their professional pursuits through the innovative application of capabilities and knowledge to stimulate personal, team and organisational performance.

In the end, the real voice of authority for the quality the learning facilitator provides is that of the students themselves. This is best summarised by one student's statement highlighting the value of experience and style of the facilitator: ***"Your knowledge, time, investment and inspiration have made it one of the best quality and inspiring courses I have ever learnt. Thank you very much."***

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Abstrakt (in Polish)

Innowacje dotyczące sposobu prowadzenia kursu Zarządzania Wiedzą dla studentów studiów podyplomowych pozwoliły na osiągnięcie lepszych wyników nauczania i zwiększyły zaangażowanie studentów w kurs. Informacje zwrotne uzyskane od studentów pokazują, że preferują oni wspólne, aktywne uczenie się, pozwalające im na bogatszy wgląd w tworzenie wiedzy i stosowanie jej do osiągnięcia innowacji i wartości. Kurs stosuje podejście andragogiczne, w którym studenci współdziałają w cotygodniowym dialogu dotyczącym ich doświadczeń związanych z treścią kursu zamiast po prostu uczyć się tej treści. Podejście to łączy myślenie systemowe, praktykę uczenia i aktywne uczenie w celu zbadania współzależności między tematami oraz ich wpływem na rzeczywiste sytuacje. Kurs zachęcił studentów do zastosowania tych idei w ich miejscach pracy.

Słowa kluczowe: *wiedza, uczenie, edukacja, myślenie systemowe, myślenie projektowe, aktywne uczenie, współzależność, wiedza własna.*

Biography

Dr Arthur Shelley is a capability and knowledge strategy consultant, educator and author of several journal articles, book chapters and two books: *Being a Successful Knowledge Leader* and *The Organizational Zoo, a Survival Guide to Workplace Behaviour*. He has a Masters in Microbiology/Biochemistry and a PhD in Project Management. He works with corporate, non-profit and government teams to enhance outcomes from projects and knowledge based initiatives. He has been a judge for the Knowledge Awards for the ActKM forum and the Singapore Information and Knowledge Management Society. In his former role of Global Knowledge Director at Cadbury Schweppes, he successfully initiated and facilitated virtual global communities to leverage knowledge, exchange ideas and increase productivity. Arthur is the founder of Intelligent Answers, the leader of the RMIT University MBA Student Mentoring program and the coordinator of the Knowledge Driven Performance course in the MBA and the Knowledge Management and PM Leadership courses in the Master of Project Management. He co-facilitates the Melbourne KM Leadership Forum and the Organizational Zoo Ambassadors Network (a peer mentoring group interested in using metaphor to creatively leverage behavioural diversity). Intelligent Answers and RMIT University, Melbourne, Australia. Graduate School of Business and Law, RMIT University, GPO Box 2476, Melbourne VIC 3001 Australia. Tel. (61) 413 047 408. Tel. (61) 413 047 408, Email: Arthur@IntelligentAnswers.com.au. Skype: Arthur.Shelley. LinkedIn: http://www.linkedin.com/profile/view?id=4229168.

Becoming a Learning Organization Through Dynamic Business Process Management

Marek Szelągowski

Abstract

As customers demand easier access to individualized products and services, companies now face an ongoing problem of how to deliver flexible and innovative solutions while maintaining efficiency and competitiveness. In this environment, the only sustainable form of competitive advantage rests in the ability to learn faster than the competition (de Geus, 1988). The article returns to the somewhat forgotten concept of the learning organization and explores how its principles can be applied with the use of dynamic business process management (dynamic BPM). Enabling in this concept individual or team-based limited experimentation and providing conditions for learning though experience in the course of performing business processes allows for the constant creation of practical knowledge. This article provides examples of how dynamic BPM facilitates the constant creation and verification of practical knowledge, with the aim of improving and adapting processes to maintain the competitive advantage of the organization.

Keywords: *knowledge management, learning organization, organizational learning, knowledge acquisition, business process management, BPM, dynamic BPM, Process Mining, process-related knowledge, knowledge-intensive processes, experimenting.*

Introduction

The economy is undergoing accelerating, multidimensional changes, which are the result of the growing demand of customers for easier access to individualized products and services. Customers want products on demand, at moderate prices, and of perfect quality. They seek products with a wide range of features, products which can be adapted to their preferences, habits, and, increasingly more often, to their expectations, which are shaped by commercials and social media (Koźmiński, 2004, p. 90). In effect, companies are forced to change their management styles — from general market orientation, focused on the average statistical customer, to management focused on the individual customer. In consequence, companies are forced

to update their knowledge on their customers' needs on an ongoing basis. However, it is no longer possible to gain a complete understanding of the clients' ongoing needs on the basis of their past choices. Changes in customer needs, which are the result of globalization, technological changes, the influence of social media, or the rapid implementation of scientific discoveries (e.g. in medicine, cosmetology, or electronics), are so common that it is essential for companies to operate in and understand the present on the basis of their knowledge of the perceivable future (Kisielnicki and Szyjewski, 2004, p. 1).

This means that organizations must strive daily to keep their rules of operation relevant. Furthermore, their information on the current and potential needs of their customers must be updated on an ongoing basis (Fiol and Lyles, 1985). Organizations should constantly verify and update their current knowledge, as well as gain access to more recent knowledge, by means of collecting and analyzing experiences resulting from their ongoing relations with their clients, partners, as well as their competition (Rybiński, 2014). In other words, companies should constantly learn how to operate with their clients in mind, even though their clients might not know today what they will need tomorrow. The problem is how to find sources of recent knowledge, and how to extract and verify information on the trends which underlie the changing needs of the clients. From whom should the organization learn? Where is the source, or where are the sources, of always-current and implementable knowledge, which will provide the organization with competitive advantage?

A learning organization - literature review

The concept of a learning organization first came to prominence in the 1990s. Among the various definitions of a learning organization, this article will make use of two. One of the most popular definitions of a learning organization was formulated by Peter Senge. According to Senge (1990), learning organizations are "[...]organizations in which people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning to see the whole together" (p.19). The second definition was formulated by C. Sikorski and reads as follows: "[...] a maximally flexible organization, in which routine, habits, and stereotypes do not replace the dynamic reality" (Mikuła, 2001, p.29-35). One could also state that a learning organization is an optimally flexible organization, in which routines, habits, and stereotypes change under the influence of the knowledge of the dynamic reality and the perceivable future. According to P. Lassey (1998), the

key to understanding a learning organization is development. Assuming that the learning process is a modification of behaviors, a learning organization must be capable of modifying its own patterns of behaviour (Lassey, 1998, p.7). In effect, it must be able to adapt, transform, and to develop itself (Mikuła, 2001, p.30). Then it will have perfectly implemented processes of organizational learning, which work on an ongoing basis. This is a good point of departure for looking at an organization from a somewhat different perspective: that of organizational learning.

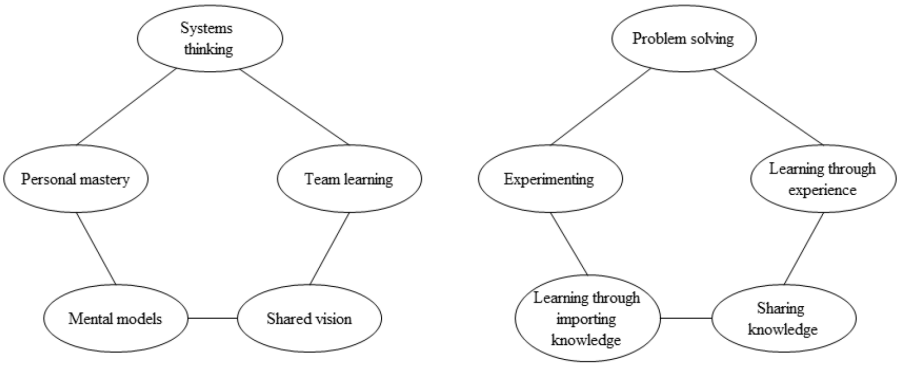

Figure 1. Two approaches: a learning organization (Senge) contrasted with organizational learning (Garvin)

Source: Jashapara (2011), p.183.

In P. Senge's model, building a learning organization is predicated upon the five following disciplines: personal excellence, team learning, systemic thinking, thought models, and a shared vision. According to Garvin, a learning organization should be proficient in generating, acquiring and sharing knowledge, as well as implementing the newly-acquired knowledge into ongoing activities (Jashapara, 2011). From the perspective of Garvin's model of the theory of learning, there are two fundamental methods of learning on the level of individual, team, and organization:

1) shaping: learning through experience and using the trial and error method, or, in other words, active experimentation in solving ongoing problems and daily challenges.
2) modelling: adopting the experiences of others, or education and the observation of other teams or organizations, and adopting their methods of operation.

E. Tsang stated that organizations learning from practice will automatically gravitate towards making improvements in their performance, as long as the process is accompanied by appropriate knowledge (Tsang, 1997, p.78). At present, this method of learning is increasingly singled out as the most effective. Nevertheless, it remains necessary to solve the problem of gaining, analyzing, and circulating experience gained from active experimenting and knowledge acquisition, including the knowledge obtained by observing other organizations (Pfeffer and Sutton, 2000). Processes pertaining to knowledge management in the organization within such a system should share several features in common with the general knowledge lifecycle model:

1) The creation of new knowledge

Employees should be able to make individual choices on how to approach their work. Organizational procedures (e.g. ISO quality management systems) and process models should enable employees to search for the most efficient solutions, or de facto allow for active experimentation, which is present in Garvin's model (1993).

2) The analysis of created knowledge

The management should be able to monitor changes introduced to work performance on an ongoing basis, as well as to measure the results of work in an objective and quantifiable fashion, both on the level of comprehensive customer support (individual orders, contracts, or products) and the level of particular activities. Only then will it be possible to identify those experiences which should be shared throughout the organization (best practices), as well as to identify those behaviours which should be avoided (wrong practices).

3) The dissemination of knowledge

The process of organizational learning should not be limited to collecting knowledge and information, but should also allow for their rapid dissemination throughout the organization with the aim of using knowledge in business practice in order to gain competitive advantage.

A system with the above features allows us to model all activities within the company. The company's knowledge on customer expectations and the efficiency of particular adaptation mechanisms should be stored in appropriate common-use databases and verified on a continuous basis. Such well-applied knowledge quite frequently guarantees a competitive advantage in terms of reaction time and the implementation of processes which adapt to changes outside of the organization. In an ideal situation, an organization should possess knowledge which allows, with great probability, to anticipate, or at the very least, closely follow the changes that are happening or are about to happen outside of the organization (Mikuła, 2001, p.66).

The concept of dynamic business processes management (dynamic BPM)

All organizations which want to function in the 21st century should be centered on processes (Hammer, 1996). Thanks to the possibilities offered by modern IT systems, process management does not need to be limited to the routine, repeated execution of the same actions with a defined production method and a clearly defined, wholesale end product. Process-driven companies are no longer limited to executing the same actions, which were tested in practice time and again and which can be changed only at the consent of upper management (Kisielnicki and Szyjewski, 2004, p.6). Due to the ever-changing customer demands, as well as the changing competitive environment that companies find themselves in, processes should be maintained, i.e. quantified, adapted to changes, and elaborated upon in detail after their implementation (Szelągowski, 2013). This is why, according to Michael Hammer, among others, the concept of dynamic Business Process Management (dynamic BPM) is the practical solution to the management of a learning organization. This concept is based on the implementation of process management in accordance with the following three basic principles:

I. Evolutionary changeability during the realization process

Employees executing a certain process should have the freedom to introduce changes in accordance with the current demands of the customer. This is why standard processes implemented within an organization are called "standard processes as of today". Because in reality there are no two identical conditions for completing different processes (e.g. two identical construction investments, two identical consultant projects, two identical tailor-made suits), process executors introduce changes to the standard process in accordance with client demands, technological requirements, or the executors' own experience. Processes must be defined and implemented in such a way that their course and the activities performed in each step of the process can be supplemented, or even changed by their direct executors. Previously, only process owners were entitled to introduce changes to ongoing processes, but nowadays the direct executors of such processes should also be allowed to make such changes. They should be able to perform limited experiments by performing actions, or even entire fundamental processes, which are not included in the standard process "as of today", as well as to discontinue performing actions or processes which no longer add value (Garvin, 1993). The scope of such possible experimentation should, of course, be limited to such an extent, as not to lead to chaos.

II. Processes are considered completed only after having been documented

Only under this condition can we compare the *definition of the process* ("the standard process as of today") with the *execution of the process*. And only then will an analysis of the comparison provide us with full, up-to-date, contextual information about all of the active experiments or innovations introduced by process executors, as well as about their effects. And only then will it be possible to systemically transform hidden knowledge into shared disclosed knowledge of an organization (Vines and Hall, 2011, pp.23-25). In order to avoid additional, inessential documentation of the performed activities, the performance of a process itself should be considered tantamount to the documentation of a process with the use of e.g. a work flow system, a business process management system (BPMS), a case management system, or a personal intranet portal. Thanks to Automatic Business Process Discovery (ABPD) tools and Process Mining, we can also identify the course of a process within the standard systems used throughout the organization, e.g. communication, ERP, or CRM or other systems. We can also identify the stages of a process or analyze the introduced deviations from the standard process, and then expand or enhance the standard model (Aalst and Dustdar, 2012, p.82–83). In effect, we can speak not of ex post management, but of dynamic day-to-day management on the basis of data which systematically reach the management (Process Mining Manifesto, 2012).

III. Comprehensiveness and continuity

The introduction of process management should include processes which, at a minimum, describe the most fundamental operations of the company. If possible, the descriptions should also include the suppliers, the partners (who e.g. work in one organization network), as well as the clients. This would enable the company to seek methods of raising its efficiency through experimentation encompassing all actions which provide value for the client (Champy, 2003). The aim is not to minimize the costs or the labor time in a company which is e.g. the main contractor. The aim is to minimize the overall costs and the overall supply requirements, while also lowering the total time of execution (Hammer, 1996). This would considerably widen the range of opportunities of increasing efficiency, and often also reduce the time of completing a project due to optimizations which take into account activities which fall outside the range of a single company (e.g. supply, warranty service) within a single value-adding process, which would define the total cost for the customer (Drucker, 1999).

Dynamic business process management maintains all of the standard capabilities of process management, but it also allows the process executor to shape his/her work in a creative fashion

In standard, static implementations of business process management in organizations, the process executor still plays the role of a systematically controlled "cog in the machine". In dynamic BPM, however, thanks to the opportunities offered by modern computer systems, the owner of a given process is able to observe actual multiple executions of a process and their end results and is able to supplement or remodel the standard process in accordance with best practices, understood as such practices which have led the process to success in its subsequent iterations. This can be achieved through preventing mistakes (e.g. supplementing the process with control and verification actions before making a decision), through adding faster, more efficient actions, which allow for the completion of the process with better results (e.g. by a different division of work, omitting unnecessary decision levels, a more detailed definition of customer expectations, faster coordination of work with subcontractors, introduction of newer technologies, etc.), or perhaps through other activities, which could not have been foreseen at the time of designing the process. Such activities are often factors which were known earlier, but whose importance was neglected. Including all possibilities in the description of the process may have been considered too expensive or physically impossible. At the same time, analyzing particular executions of a single process leads to identifying practices that should not be copied or imitated. These might be called "wrong practices". They are the result of identifying unquestionably failed experiments and fields in which the company's knowledge has become outdated.

Dynamic BPM is not the first attempt at overcoming the limitations of classic, static process management, and adapting it to the requirements of a hypercompetitive organizational environment. The most well-known concept, though perhaps one of mere historical significance at present, is the concept of Business Process Reengineering (BPR). Its authors, M. Hammer and J. Champy (1993), accented changes to the organizational environment and the lack of adjustment of organizations to their new conditions. The scholars advocated for fundamental re-evaluation and radical redesign of the sum of processes of an organization. Not just mere improvements, enhancements, or modifications, but complete re-evaluation and redefinition. In effect, reengineering was not preoccupied with negligible growth or minor improvements, but rather, it was focused on qualitative leaps, analogous to the qualitative changes in the organizations' environment. (Zimniewicz, 1999).

Despite the fact that the concept of reengineering was met with considerable interest and was quickly popularized, growing experience and the growing number of implementations revealed that reengineering does not live up to its promises (Davenport, 1995). The main reasons behind BPR implementation failures are:

- large scope of implementation,
- its one-time character,
- rejection of all prior experiences,
- top-down (prescriptive) introduction of changes.

In turn, such threats are nonexistent in projects managed along the principles of dynamic BPM. The concept of dynamic BPM is based on:

- creating knowledge in the course of limited, local experimentation (no issues resulting from the massive scope of an implementation);
- ongoing verification of current knowledge and the creation of new knowledge (no issues resulting from the one-time projections of the future and the rejection of prior knowledge);
- involvement of the largest possible number of employees (no issues resulting from misunderstanding or even rejecting changes imposed on the employees from above).

The concept of dynamic BPM allows for the practical use of performed business processes as an internal source of organizational knowledge. It should be stressed once more that this source of knowledge operates on an ongoing basis and allows for:

- the accumulation of up-to-date knowledge, which can be implemented on an ongoing basis. (Vines and Hall, 2011, pp.23-25).
- the ongoing verification and enhancement of acquired knowledge (Dalmaris, Tsui, Hall, and Smith, 2007, pp.12-16).

It should be stressed once more that in contrast with BPR, such knowledge is created and used in the course of an organization's normal activities, in the form of dynamic workflows, actions, and cases embedded in business process, rather than projects managed by external consulting firms (Remus and Schub, 2003).

Dynamic BPM and the management of a learning organization

Companies managed in accordance with the concept of dynamic BPM practically instantly become companies which fit the definition of learning organizations. All, or at least a wide range of employees in an organization produce collective, accessible knowledge in the process of recognizing and selecting new solutions (Table1).

Table 1. Mapping principles of dynamic BPM to the learning organization needs

Learning Organization	dynamic BPM			
	I. Evolutionary changeability during the realization process.	**II. Processes are considered completed only after having been documented.**	**III. Comprehensiveness and continuity.**	**Standard measures process-managed organizations.**
1. The creation of new knowledge	Generating new knowledge through the creation of new business processes or the adaptation of existing business processes to the requirements of customers, suppliers, and employees.	Collecting complete, contextual knowledge about: - the expectations of customers, suppliers, and employees, - active experimentation and its results.	Creating and gathering contextual knowledge on the entire fundamental process executed by different organizational units, suppliers, or the customers themselves.	Process identification – knowledge on how the organization operates (or rather: should operate).
2. The analysis of created knowledge	Contextual analyses performed during the process execution, including the ongoing monitoring of benchmarks and actual processes.	A complete, contextual analysis performed after having performed the processes, including comparative analysis of benchmarks and the actual execution of processes.	Analysis of the impact of limited experimentation on the results of the entire fundamental process, which enables organizations to avoid fragmented sub-optimizations.	Planned actions of the organization's management.
3. The dissemination of knowledge	The possibility of immediate, creative use of newly-created knowledge.	Communities of practice centered around knowledge obtained during the course of processes execution (best practices and wrong practices).	Current knowledge on the processes of the organization. The availability of contextual knowledge on various scenarios of executing processes and their results in actual business performance.	The organization's knowledge base. Standard communication of knowledge in the organization.

Below is an overview of the process of knowledge management and the broad creation of accessible and available knowledge in a learning organization managed with the use of dynamic business processes. Each newly-hired employee receives fundamental data and information on the company and its specific character. Usually, such information, apart from introductory training sessions, is provided in the course of a senior employee/novice mentor relation. Once the work is started, the junior employee begins to generate individual knowledge, as well as contribute to the creation of the organization's collective knowledge. Should the employee leave the company, he/she also irrevocably takes away his/her individual knowledge, which quite often contains a significant amount of the so-called "hidden" company knowledge that neither the owner nor the company managers are able to absorb and keep in the organization (Perechuda, 2004, p.1). The process owner is responsible for planning/forming the processes, as well as for training the process participants. In other words, the process owner is the one who shares knowledge with the novices. Thanks to the possibilities offered by dynamic business processes management, after the preliminary period of familiarizing new employees with the courses of business processes which comprise the organization's collective knowledge, the employees then generate such collective knowledge on an ongoing basis through the identification and selection of new solutions, as well as the verification of processes in actual day-to-day activities. Such ongoing verification *(the first characteristic of dynamic business process management)* is fundamental. Without it, in the age of rapid technological changes, as well as changes to the company's environment, it could easily turn out that the company is using old and outdated knowledge, generating something we have previously called "wrong practices".

In consequence, the ability to create and verify knowledge (best practices and wrong practices alike) on an ongoing basis is a fundamental skill, which allows companies to preserve their permanent capability of both changing and reacting to change. We are not speaking of an action, of restructuring, reengineering, or similar provisional measures, which are usually unrelated to the generation of added value for the customers, and aimed at restoring the ability to fulfil customer needs. Instead, what we have in mind are continued actions pertaining to the fundamental operations of the company, which enable the company to adapt to changing conditions. Such conditions include the changing expectations of the customers, the proprietors, and the staff (indeed, fulfilling the expectations of one's employees may be as crucial as fulfilling the demands of the customers from the point of view of motivating good performance). Within dynamic BPM, the ability to change and to generate change is permanent and inscribed in the company's ongoing actual operations. It fulfils all of the requirements put forward by Drucker or

Hammer with respect to the "institutional ability to change" (Heijden, 1996, p.18). By means of verifying organizational knowledge on an ongoing basis and attempting to introduce innovations which would increase efficiency and provide the company with competitive advantage, dynamic BPM creates and institutionalizes the company's potential to self-reform. The key to success is not being able to predict the future, but rather, the continuous adaptation of the rules of operation, in order to face an unforeseeable and surprising future (Płoszajski, 2004, p.1).

By introducing principles which allow for the dynamic modification of processes, companies inseparably combine their fundamental operations with their day-to-day capability of introducing innovations, generating knowledge, and changing. Because process executors are able to change processes dynamically, the entire system of business management opens itself up to the creative initiatives of employees without introducing the danger of chaos associated with the uncontrolled change of rules of operation. Additionally, with the ability of monitoring the effects of changes, we can enrich the collective knowledge of an organization with the practices and solutions which provide the best results. Now we can indeed see M. Hammer's vision of what it means to be a process-oriented organization, where process enhancement is neither secondary nor peripheral, but central to the task of management. This is what M. Hammer called the deep system of management, which monitors, administrates, adjusts, and reforms the surface system, to generate value for the customer (Hammer, 1996). However, it is not a separate, external system which, apart from generating additional costs, might easily begin to be perceived within the company as another bureaucratic duty, impeding normal work. Instead, it has the role of enabling genuine day-to-day enhancements and adaptations introduced in the process of analyzing the course of processes. The body of knowledge on the best practices which are currently in operation, as well as on the direction and methods of their modification, is the company's property. At the same time, the "hidden" knowledge is being minimized. IT systems which are responsible for dynamic business process management, along with their databases, make practically all of the collective knowledge of the organization accessible to all employees. It goes without saying that in such a situation, even when key employees leave the organization, practically all of their "individual knowledge" remains in the company and remains its property by default, regardless of whether the company is traditionally managed or operates as a virtual network. There is just one condition: the Management Board, or the "integrator" of a network company, should consequently enforce the use of dynamic process management tools and the rules of activity documentation, as well as make use of the possibilities offered by e.g. Process Mining tools.

Experimental results and discussion

In order to demonstrate the process of organizational learning through the daily operation of dynamic BPM, let us consider two examples of its practical implementation.

The first example is the change of one of the fundamental business processes in the largest Polish construction business. The standard main process of the enterprise, which was initially identified and is presented in Figure 2, is comprised of 4 main processes:

1) Winning contracts,
2) Preparation of realization,
3) Execution of the contract,
4) Guarantee service.

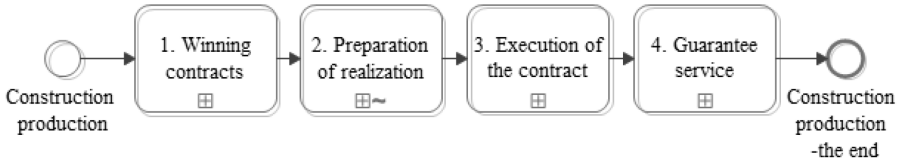

Figure 2. The main process of the construction company

The second part of the main process, "Preparation of realization", is further divided into 4 sub-processes. The sub-process "2.3. Takeover of the construction site" is comprised of the following actions pictured on the right-hand side of Figure 3.

In the case of each large or medium-sized construction business, the "2.3 Takeover of the construction site" sub-process is executed multiple times with each new contract or investment action. For that reason, it is crucial for this sub-process to be tailored to the needs of the business and the demands of particular investors. It can be just as expensive to either omit crucial actions (such as on-site inspection or general contractual risk assessment) or to overburden the process with actions which generate additional costs or loss of time.

Having implemented the process and analyzed its subsequent executions, the process owner and the business management singled out two executions for further analysis. Both executions resulted in a fast and problem-free takeover of the construction site and launch of the investment. Both of these executions, which are presented in Figure 4, are different from the standard (current) process.

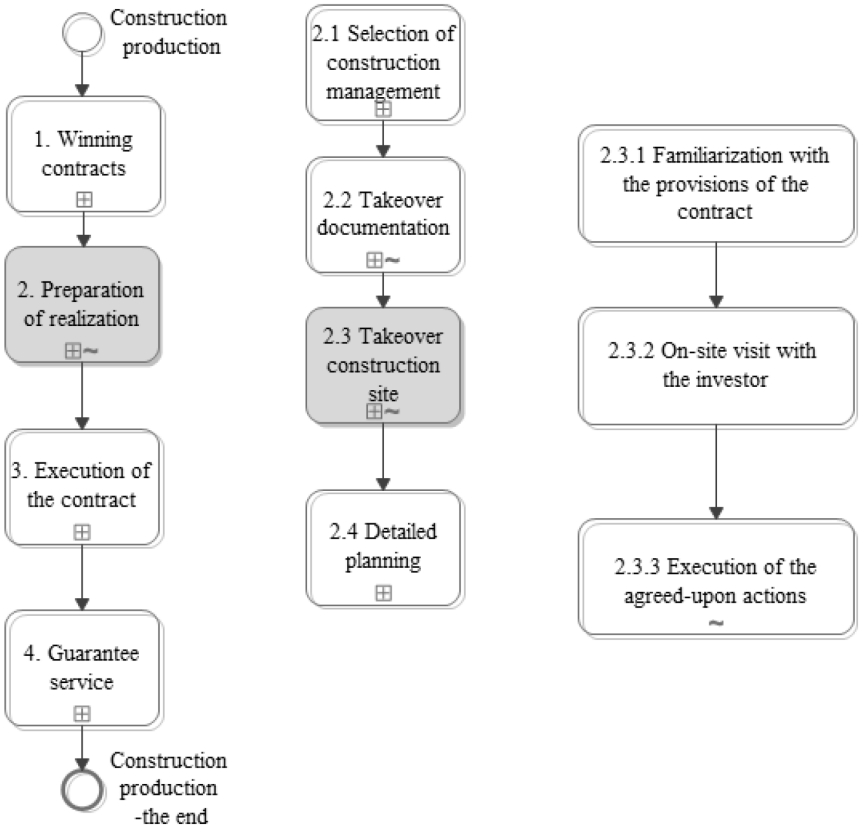

Figure 3. The standard (current) process "2.3. Takeover of the construction site".

Execution "A" was different from the standard (current) process in that it also included the action "Preliminary on-site inspection with the subcontractors", or those who would execute their share of work. This allowed the contract manager responsible for the process to be better prepared for the on-site inspection with the investor, and thus to establish the needs and risks of construction in a more accurate manner. This, in turn, resulted in a faster and a problem-free commencement of the contract.

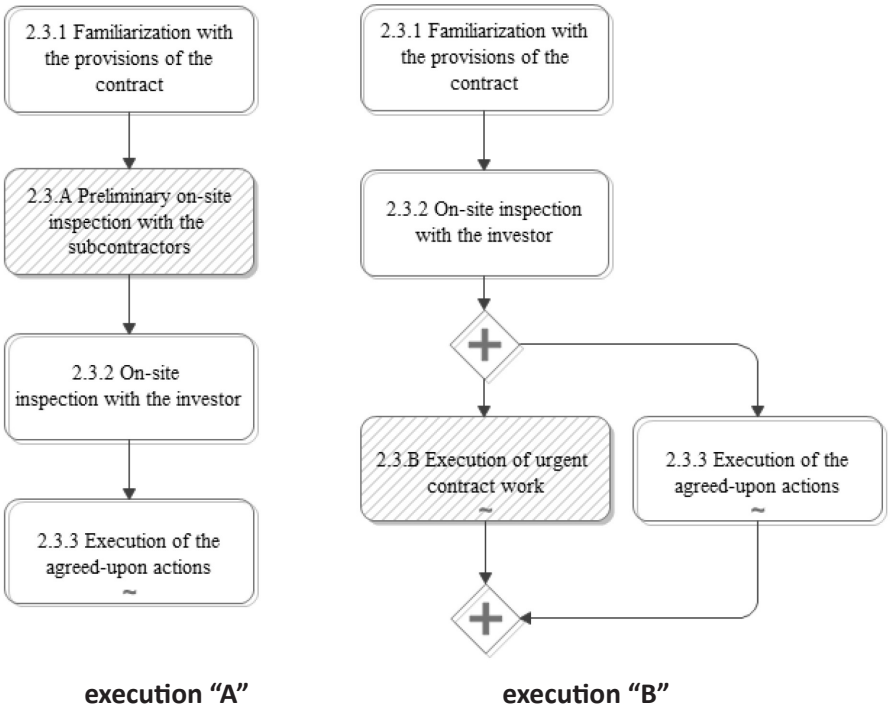

Figure 4. Actual executions of the basic sub-process "2.3. Takeover of the construction site"

In the course of execution "B", the on-site inspection identified some deviations from the provisions of the contract, which required additional preparation work on the part of the investor. However, in order to avoid delays, the contract manager (the process executor) decided to begin the execution of the contract and the execution of urgent contract work (preparation work) at the same time. In effect, even in this case, departing from the standard process resulted in a faster and timely commencement of the contract, as well as efficient cost reduction.

Having performed an ex-post analysis of the execution of this process, its owner has introduced changes to the "2.3. Takeover of the construction site" sub-process, as pictured on Figure 5.

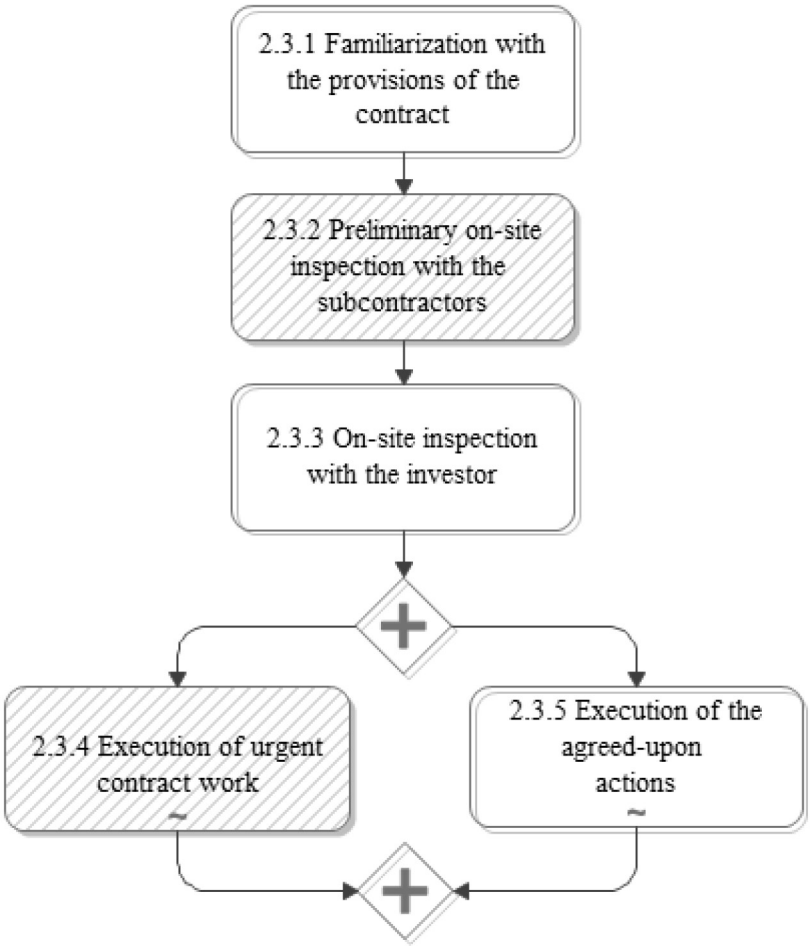

Figure 5. The new standard process "2.3. Takeover of the construction site"

The change made in the process repository through the associated Process Portal accessible on a corporate intranet, has been communicated instantly throughout the organization. Despite the lack of a business process management system (BPMS), it has been implemented throughout the entire organization regardless of the geographical location of the ongoing contracts. (At that time, the business was in the process of executing about 120 contracts all around Poland.)

In conclusion, thanks to the rapid practical verification of knowledge, the organization was able to supplement its processes with new elements and make use of them on a broad scale as fast as possible.

In the second case, the business managed to avoid substantial risks associated with its ongoing operations thanks to the rapid identification, verification, and circulation of process adaptations in reaction to changes in its environment. The identified standard ("the standard process as of today") Central Purchasing Process of the company is pictured in Figure 6.

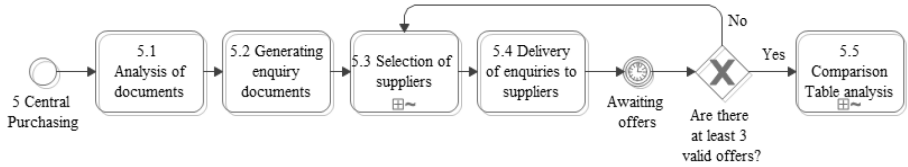

Figure 6. The standard (current) process, "5. Central Purchasing"

This process requires receiving at least 3 valid offers for each purchase and assumes standard waiting times of 14 days for making offers. In 2006, during the market crash for building materials in Poland, the execution of such a process was practically impossible. The prices of building materials fluctuated each 2-3 days by several, and at the onset even a dozen or so percent. E.g. the basic MAX ceramic hollow brick, which initially cost 1.5 PLN, was then offered for 2.5, 5, or even 6 PLN. For a construction business looking for tens or even hundreds of thousands of individual bricks, the price risk was immense. At the same time, the same risk was faced by suppliers, who refused to make offers with a period of validity of 30 or 60 days, because the prices themselves fluctuated each 2 or 3 days.

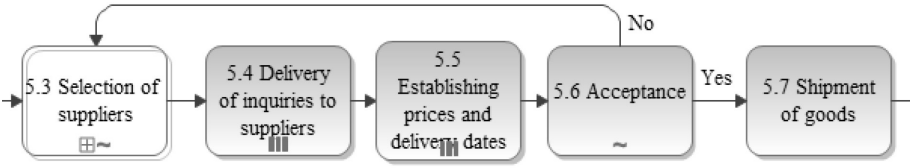

Figure 7. The new standard process "5. Central Purchasing"

In the course of several days, the Central Purchasing team developed changes to the Purchasing process and tested them in practice, which enabled the business to function in the circumstances it was facing (Figure 7). The inquiries were sent to suppliers via email. The suppliers agreed to make their offers the same day via phone or email, providing for the size of the order, the delivery date (almost always "ASAP"), and even the place of delivery. On the same day, the offers were collected and negotiated via phone and following

internal consultations, either the best offer was accepted or the process of sending inquiries and negotiating offers began anew. Accepting an offer was practically tantamount to the goods being shipped immediately.

After the new version of the process was developed and tested in practice in the course of ongoing operations by regular employees of the department, it was accepted as a contingency plan. This change was communicated throughout the entire organization and entered in the official rules and regulations of the company.

It should be stressed that the development and implementation of this change should be primarily credited to the regular workers of the business, in cooperation with the suppliers. By way of minor experimentations, the regular workers independently applied the knowledge of the organization, as well as their own experience, to an unforeseen market situation. By allowing for the rapid circulation of this knowledge, the management ensured its widespread use in accordance with the interests of the company and the expectations of its clients (the construction works were not delayed). This ability to draw on the experience and engagement of a wide range of employees in modifying the rules of operation to account for newly-acquired knowledge is the basic principle behind how an organization learns new things to remain in touch with the actual necessities of its operations, as well as ongoing changes of circumstances, which might have strategic importance (Garvin, 1993).

In conclusion, in a situation where external pressure was exerted on the enterprise, thanks to rapid and limited experimentation the organization managed to adapt to an unforeseen situation by supplementing its knowledge to date with new elements and making widespread use of such knowledge as fast as possible.

Conclusion

The fundamental abilities of a learning organization include knowledge management and the ability to use knowledge quickly, on a broad scale, and in a controlled manner, with the participation of the largest possible number of employees (Senge, 1990, p.19). Organizations managed in accordance with the principles of dynamic BPM practically almost immediately fulfill all the requirements of a learning organization. Such an organization can create new knowledge on an ongoing basis in the course of active experimentation, which adapts the organization's activities to the changing requirements (the first principle of dynamic BPM). It can also verify its knowledge in a transparent fashion and make the results of such a verification available both to the management, as well as to a large number of employees, in the form of a full context for all performed processes (the second rule of dynamic

BPM). In effect, such results can be used to adapt to the changing market conditions and the competition on an ongoing basis in the course of at least an entire fundamental process.

The concept of dynamic BPM, developed since 2004, is not the first attempt at overcoming the limitations of classic, static process management, and adapting it to the requirements of an increasingly more hypercompetitive business environment of the organization (D'Aveni, 1994). However, as we exemplified, the experience of its implementation to date raises the hope that by genuinely using the dynamism of a wide range of employees, this concept will allow us to combine the effectiveness and efficiency of process management with the flexibility and openness to change provided by a learning organization.

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Abstrakt (in Polish)

Ponieważ klienci oczekują łatwiejszego dostępu do zindywidualizowanych produktów i usług, przedsiębiorstwa muszą zmierzyć się z problemem jak dostarczyć elastyczne i innowacyjne rozwiązania przy jednoczesnym zachowaniu wydajności i konkurencyjności. w gospodarce wiedzy jedyną szansą na uzyskanie trwałej przewa-

gi konkurencyjnej jest zdobycie przez przedsiębiorstwo zdolności do uczenia się szybciej niż konkurencja (de Geus, 1988). Artykuł powraca do trochę zapomnianej koncepcji organizacji uczącej się i bada, jak jej zasady mogą być stosowane w organizacji zarządzanej zgodnie z koncepcją dynamicznego zarządzania procesami biznesowymi (dynamic BPM). Umożliwienie w tej koncepcji realizacji indywidualnych i zespołowych ograniczonych eksperymentów oraz zapewnienie systemowych warunków do nauki przez doświadczenia zdobywane w czasie realizacji procesów biznesowych, pozwala na ciągłe tworzenie praktycznej wiedzy. Artykuł zawiera przykłady, jak dynamiczne zarządzanie procesami ułatwia stałe tworzenie i weryfikację praktycznej wiedzy, w celu poprawy i dostosowania procesów do wymagań klientów oraz utrzymania przewagi konkurencyjnej organizacji.

Słowa kluczowe: *zarządzanie wiedzą, organizacja ucząca się, organizacyjne uczenie się, nabywanie wiedzy, zarządzanie procesami biznesowymi, dynamiczne zarządzanie procesami biznesowymi, eksploracja procesów, wiedza o procesach, procesy wymagające znacznej wiedzy, eksperymentowanie.*

Biography

Dr inż. Marek Szelągowski is an experienced business process management specialist. Author of an increasingly popular concept of „dynamic business process management" (dynamic BPM) and „Process criterion for significance." He has had more than 20 years of experience in implementing IT solutions in support of management. He has participated in the development and implementation of IT solutions in the areas of accounting, human resource management, production, project management, IT infrastructure management, etc. He worked as CIO for Budimex Group and was responsible for the creation and development of the IT office, and most of all IT strategy for adapting to changing business needs. Currently involved in dealing with dynamic BPM implementation process management based on common sense to improve and simplify processes, choosing and implementing solutions tailored to the client's situation. Corresponding address: 02-372 Warszawa, ul Opaczewska 44/18. Mobile: 601 62 02 81. Email: marek.szelagowski@dbpm.pl.