

Knowledge Management & Transfer for the Electricity Industry in Canada

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About the Electricity Sector Council

Approximately 100,000 Canadians are involved in the generation, transmission and distribution of one of our country's essential utilities: electricity. Their work powers homes and businesses across the country, fuelling everything from light bulbs, cell phones and refrigerators to water treatment plants and road vehicle assembly lines.

The Electricity Sector Council provides support to this dedicated workforce by collaborating with industry employers and other stakeholders to research and resolve human resource and workplace development issues.

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Supporting KM and KT Theory

This component of the Knowledge Management (KM)/ Knowledge Transfer (KT) Toolkit produced for the Electricity Sector Council (ESC) contains supporting or theoretical grounding of the subject matter in KM/KT.

OVERVIEW

Organizations have long recognized the importance of knowledge management and since the 1980s knowledge management has been part of the accepted lexicon of management practices. In fact, this shift aligns with globalization and the emergence of the knowledge-based economy which replaced a more manufacturing-based economy. The advances in technology (hardware, software and the introduction of the worldwide web) have made it possible for companies to collect vast amounts of data about their business and their customers and clients. This information has been repackaged into information that can be retrieved and accessed in order to inform and aid decision-making, problem solving and services, products and process improvements. The information and data can be used by many different workers throughout the company for the same and different purposes. Knowledge became recognized as a company asset and a competitive advantage that needed to be managed and cultivated. The Web 2.0 technologies have taken knowledge access and dissemination even further through the use of networking software which enables both hard and soft knowledge to be shared and used.

KM can be dated from the late 1880s through the field of anthropology (Boas, Durkheim), moving to Schumpeter (early 1900s) who introduced the input of knowledge to classical economic models, moving into the field of the sociology of knowledge (Mannheim, Merton and others). Knowledge in this stage encompassed social bases (social status, occupation, mode of production, social and institutional structures, bureaucracy); cultural bases and belief systems and categories of thought. In 1957 the term 'organizational learning' was coined and Polyani introduced the concept of tacit knowledge. The 1960s paved the way for knowledge generation and diffusion in terms of introducing 'learning curves' and different modes of learning, as well as the influential work of Kuhn on paradigm shifts. Drucker, along with his management theories, introduced the term 'knowledge worker'. The 1970s focused on cognitive learning, both individual and social, and by the 1980s the information technology revolution was underway, with Wiig and Little coining the term 'knowledge management' in 1986. The economy of the 1990s until the present has been characterized as knowledge based and a plethora of literature from academic experts, management practitioners, IT companies and consultant firms has flooded the market.

"The best information environments will take advantage of the ability of IT to overcome geography but will also acknowledge that the highest bandwidth network of all is found between the water fountain and the coffee machine."

Yogesh Malhotra, 2002

For a full chronological history of knowledge management in the workplace, refer to Module 2 of the on-line KM Certification Program by KM Concepts. 2 (www.eknowledgecenter.com/free_elearning/module_2.htm).

According to Beckman (2004), execution of any KM/KT strategy is not about managing knowledge, but nurturing people with knowledge - the knowledge that exists in employee's experience needs to be effectively harnessed to satisfy the needs of the organization. To do this, an organization needs to provide benefits to each individual as they try to improve how they operate and refine the speed at which they can function. People will use those organizational systems that provide them benefits in doing whatever they are trying to do. If the system is not useful to the individual, then they will not use the system.

DEFINITIONS OF KM AND KT - THERE ARE MANY...

For something that may seem so simple, there are, in fact, many definitions of KM and KT and numerous research studies devoted to defining these disciplines. The literature reveals a range of between 18 to 62 definitions (*KM Definitions – Sims Learning Connections*). The concept of KM has been applied to a very broad spectrum of activities designed to manage, exchange, create or enhance intellectual assets within an organization. There is no consensus on what KM actually is and what it includes, for instance IT applications that are termed KM applications range from the development of codified decision support systems for a call centre or help desk, to the provision of video conferencing to facilitate the exchange of ideas between people.

What is referred to as KM actually consists of a range of practices that address organizational issues and needs. The approaches and strategies used tend to depend on the author's discipline and background. Management theorists are focused on process, innovation, creation and developmental needs; while technologists focus more on transactional, analytical and asset management elements. Management theorists tend to think of technology as an enabling factor while technologists see it as the central focus. These two views have been categorized as "cognitive" and "community" (*Haggie & Kingston*). The community view emphasizes knowledge as socially constructed, and is facilitated by encouraging groups and individuals to communicate and share ideas; the cognitive view regards knowledge in objective terms which can be expressed and codified, often codified in computer systems (*Hansen et al, 1999*).

Snowden and others define KM as

'the identification, optimization and active management of intellectual assets, either in the form of explicit knowledge held in artifacts or as tacit knowledge possessed by individuals or communities' (1999: p. 63);

Swan et al (1999; p.264) explain KM is about harnessing the

"intellectual and social capital of individuals in order to improve organizational learning capabilities, recognizing that knowledge and not simply information is the primary source of an organization's innovative potential".

Snowden claims it is not important to define knowledge, but it is important to distinguish it from information. Davenport, De Long and Beers (1999) claim that *'knowledge is information combined with experience, context, interpretation and reflection'* (p.89) Sveiby goes further and describes knowledge as an activity, *"a process of knowing"*. (1999; p.20)

The definition used by Torben, Aronson and Liang (2005) is useful for understanding how KM is employed in an organization. They define KM in terms of its value to an organization's operations and competitive positioning, viewing KM as:

- ⇒ a process to help an organization to identify, select, organize, disseminate and transfer information;
- ⇒ a structuring of information and data that enables problem solving, dynamic learning, strategic planning and decision making, and
- ⇒ leveraging the value of intellectual capital through reuse.

KM is a systematic and active management of ideas, information and knowledge residing within an organization, its employees, but may also reside in customers, suppliers or regulatory authorities. This is not to be confused with KM systems, which use technologies to manage knowledge. The use of KM systems can help organizational learning since it enables learning from past experiences, from acknowledged best practices and transfers knowledge within the organization. Organizational learning helps to develop new knowledge and keep corporate memory alive within the company. The GSI Group (*Russett*) perceives KM as *"about using what we know to perform a task, solve a problem, make a decision, create something new or plan a course of action"*. The use of a KM initiative is to apply knowledge to work activities, decisions and opportunities.

While there are fewer competing definitions of KT, the scope of what falls under KT can vary. Basically, the subject of knowledge transfer has been taken up under the title of KM since the 1990s but has continued to evolve overtime. Argote & Ingram (2000) define knowledge transfer as "the process through which one unit

(e.g., group, department, or division) is affected by the experience of another" (p 151). They further point out the transfer of organizational knowledge (i.e., routine/job-related, profession-based or best practices) can be observed through changes in the knowledge or performance of recipient units. However, the transfer of organizational knowledge, such as best practices, can be quite difficult to achieve and just as difficult to measure.

Often KT is focused on ensuring current employees are adequately prepared to assume new positions within the organization and/or existing employees know where to get the required information/direction, in order to perform their job. Increasingly, KT has risen in importance given changing demographics and employers increasing concern and need to tap into employee knowledge and expertise before they leave the organization, particularly for employees in key positions where no one else has the knowledge or experience. KT also has a critical role in innovation, the creation and transfer of knowledge throughout the organization.

TYPES OF KNOWLEDGE

There is extensive debate among experts on the types of knowledge and the inter-relationships between the various types (Cortada, 2001). Some experts view sharing knowledge as crucial and want to understand more about fostering such behaviours. Other experts focus on knowledge as a product or asset of the firm that needs to be exploited and marketed internally and externally. They tend to emphasize the more technical aspects of creating facts, data and information into knowledge through technological and process management means.

Data is defined as a collection of facts, measurements and statistics and information as organized data. Data is a collection of raw, un-interpreted measurements and facts, whereas information can be understood as a collection of data within a context that provides meaning. Knowledge is the contextual, relevant and actionable information; it is the experience of using information to make judgments and the ability to link these judgments to decisions or actions. Knowledge therefore encompasses facts, figures, experience, ideas, concepts, theories, principles, practices; how-tos, who knows, where to go, what happens if, etc. Some of what we know, however, is problematic since it also contains misconceptions, untruths, biases and obsolete information. (Dorothy Russell, GSI presentation to IRMAC, Oct 2001)

The literature suggests that to be considered useful to an organization, the definition of knowledge must include at least three concepts. First, it must point out that knowledge is more than data or information. Second, it must describe the tacit and explicit nature of knowledge. Finally, it must describe the personal nature of knowledge (Nonaka & Takeuchi, 1995). Davenport and Prusak (2000, pg. 5) offer the following definition of knowledge: "Knowledge is a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knowers." ¹ This definition, according to Ladd & Ward (2002) also addresses key cultural components of organizations. These factors include the varied experiences and values of the organization's membership and a framework for evaluating and incorporating new experiences and information through embedded routines, processes, practices, and norms (Ladd & Ward, 2002). Since measuring the application of knowledge is vital to organizations, it becomes a tool that can be utilized to evaluate, control and improve existing systems.

"The Tea Laser was designed in the USA and was meant to be replicated by other universities. However even with clear instructions, other labs failed to replicate the laser until the originating lab conducted in-person visits leading to close contact and dialogue on the why and the how. The originators could make the laser work but did not know exactly what it was they were doing to make it work and hence could not document the "how-to". A cooperative process of dialogue enabled the tacit knowledge to be transferred."

HM Collins. "The Tea Set: Tacit Knowledge and Scientific Networks", Bath University, 1982

¹ Davenport, T. And Prusak, L., *Working Knowledge: How organizations manage what they know*". Page 5.

It is generally recognized that knowledge has two key components:

1. *Explicit Knowledge* – is objective, rational, written down, recorded, technical, and codified. It tends to be easily transferable, reusable but requires effort and management support to keep it up-dated and maintained. It includes the following features:
 - Embedded in procedures, reports and documents
 - Structured – Data elements that are organized in a particular way for future retrieval, e.g. documents, databases, spreadsheets
 - Unstructured – Information not referenced for retrieval, e.g. emails, images, audio or video selections
 - Passive learning
 - Transferred with reasonable accuracy
 - Formal and often codified
2. *Tacit Knowledge* – Tacit knowledge refers to knowledge which is only known by an individual. People are often not aware of the knowledge they possess or how it can be valuable to others. Effective transfer of tacit knowledge generally requires extensive personal contact. Tacit knowledge is not easily shared; it often includes habits and culture that people do not recognize themselves. Some tacit knowledge can be made explicit through articulation and then codification. However some tacit knowledge such as “know how” (as opposed to ‘know what’ – facts), “know why” or “know who” (networks) cannot be codified and can only be transmitted via training / personal experience. It involves learning and skill but cannot be written down. For example, apprentices learn their craft from masters through observing, imitating and practice; employees learn new skills through on the job training. It is subjective, cognitive, experiential learning; highly personalized; difficult to formalize; and it is embedded in personal context and includes:
 - Embedded in the human brain (deep experience and know-how)
 - Active Learning
 - Cannot be expressed easily and hard to capture, catalog and document
 - Requires extensive personal contact, networks (e.g. mentorships), on the job experiential learning for transfer
 - Basis for judgment and informed action
 - Richer than documented explicit knowledge

In today’s competitive market place, it is critical for organizations to be able to identify corporate knowledge, manage that knowledge and successfully transfer the knowledge to other employees to ensure it is effectively harnessed and retained within an organization.

According to Buckman (2004) about 90 percent of the knowledge in any organization is in the form of tacit knowledge; as such many would argue that harnessing tacit knowledge should be an organization’s priority in order to release the power of corporately held knowledge. Tacit knowledge is the most dynamic asset available to an organization - it is always changing, always growing in both quantity and quality. A key question is how should it be captured and transferred to satisfy the needs of the organization? It is this dynamic movement of the knowledge that, if properly harnesses, will result in new value creation for the organization.

“Successful knowledge transfer involves neither computers nor documents but rather interactions between people.”

Yogesh Malhotra, 2002

Knowledge needs to be tapped into, documented (if possible), shared, accessible, understood and most importantly absorbed by key people in the organizations and/or to a wider audience. If knowledge has not been absorbed, it has not been transferred according to Davenport & Prusak (2000). Merely making knowledge available is not transfer. Access is necessary but by no means sufficient to ensure that knowledge will be used.

Furthermore, any knowledge transfer strategy/plan must be continually monitored and evaluated to ensure knowledge truly is transferred.

EXPLORING THE FUNDAMENTALS OF KNOWLEDGE MANAGEMENT

OVERVIEW

KM efforts focus on the management of knowledge as a strategic asset and on encouraging the sharing of knowledge. Interestingly, very little is written about the actual management of knowledge, scholarly debate centres on what constitutes knowledge and there is little in-depth exploration of what it means to “manage”. Yet one conditions the other. Morgan (1997 *G. Morgan, Images of Organization, CA, Sage Publications*) claimed that modern management has developed a tunnel vision in which the mechanical way of thinking has become so ingrained that it is difficult to see alternatives. Therefore it is assumed that in order to manage any part of an organization, including knowledge assets, it must first be rationalized and controlled. This prevailing management paradigm does not align with KM, which presupposes openness and sharing of knowledge. Polanyi’s (1969 *Polyani, M., “Knowing and Being”, Chicago, University of Chicago Press*) contention that knowledge is ‘a process of knowing’ and ‘we know more than we can tell’ is an early indication that managing knowledge requires a different approach, since what we cannot tell is not amenable to mechanical forms of manipulation such as codification. Managing in the traditional sense is problematic in relation to KM/Kt.

In 2002 Hildreth and Kimble (*Hildreth, P.M. and Kimble, C., The Duality of Knowledge, Information Research, Vol. 8, No. 1, 2002*) argued that knowledge is a duality composed of ‘hard’ dimensions that can be articulated and ‘soft’ dimensions that cannot. Therefore, the management of knowledge needs to be a dual activity, moving to a more organic management style whereby the ‘soft’ aspects of knowledge need to be nurtured or cultivated.

Polyani and his contemporary Popper (1978) took the knowledge debate further, taking a socio-cultural perspective, arguing knowledge has an external dimension outside the individual mind - which is found within a shared reality. If knowledge is external to individual consciousness and distributed across members of groups, then it is there because it gets transferred and it is in the transfer process that knowledge can be (and is) managed. Socio-culturalists believe that the method for transferring such knowledge is through narrative, through tales and stories. The goal of logic and science is universal truth, while the goal of narrative thinking, the thought mode of everyday life, is to connect events so that they make sense. Narrative is where people get meaning, and therefore it is not locked within an individual, but transcends individuals.

The work of Cole (2000 *Cole, H. P., Narrative Approaches to Health & Safety Training, Paper Presented at the National Occupational Injury Research Symposium, Pittsburgh, Oct, 2000*)) supports Polyani and Popper’s views on knowledge. He reported on a research study that found that approximately 15% of the information in any written text is explicit and the rest is implicit or tacit and understandable only within a broader context. For Cole, knowledge is shared knowing, distributed across group members, and that knowledge can be managed by cultivating it, which he claimed, is accomplished through narrative.

The key point in this discussion is knowledge, unlike information and data, goes beyond the individual. Knowledge is held in the “third dimension” that exists outside of the individual, but also resides within the individual. The ‘third dimension’ means that knowledge is understood within a context of accepted organizational norms. However, knowledge is not static; these shared norms both influence individual thinking and are constantly changed by individual and group learning.

Knowledge management involves the capturing of information and data and converting it into knowledge that becomes a valuable company asset since it can be stored, retrieved, accessed and used for business operations and strategy to gain and/or maintain competitiveness. Knowledge can be used for identifying and exploiting new opportunities and/or for improving current systems, processes, services and products.

DEFINING KNOWLEDGE CREATION

Organizational knowledge creation is the process of making available and amplifying knowledge created by individuals as well as crystallizing and connecting it to an organization's knowledge system. In other words, ensuring what individuals come to know in their work life benefits their colleagues and, eventually, the larger organization.

Knowledge Matrix / Knowledge Spiral Approach (1995):

The approach developed by Nonaka and Takeuchi is one of the most widely accepted approaches to classifying knowledge. Nonaka spearheaded the classification of knowledge based on a combination of knowledge accessibility (the flow of knowledge from one place to another and from one form to another) and knowledge transformation (where the knowledge is stored or located and in what form). From this Nonaka introduced the concept of the “knowledge spiral” in which innovation and learning occurs as a result of the flow and transformation of knowledge. Knowledge becomes crystallized within the organization moving when it moves from the individual to the group to organizational and even inter-organizational levels.

According to Nonaka and Takeuchi (1995), continuous innovation is enhanced by making use of the interdependence of those within the organization.

“Knowledge that is accumulated from the outside is shared widely within the organization, stored as part of the company’s knowledge base, and utilized by those engaged in developing new technologies and products. The process of shifting knowledge from the outside to the inside, or inside to the outside, is called knowledge conversion”

(Nonaka & Takeuchi, 1995).

Nonaka’s (1994) dynamic theory of organizational knowledge creation holds that organizational knowledge is created through a continuous dialogue between tacit and explicit knowledge via four patterns of interactions, socialization, externalization, combination, and internalization.

⇒ **Socialization:** The process of sharing experiences and thereby creating tacit knowledge, such as shared mental modes and technical skills (i.e. common language). The key to acquiring tacit knowledge is experience. Without some shared experience, it is extremely difficult for one person to project her/himself into another individual’s thinking process.

- **Result:** From tacit to tacit - in this mode knowledge is converted through sharing and interaction between individuals. The key to acquiring tacit knowledge is through experience, since it is difficult for people to convey tacit knowledge. (Example: Riding a bike - it is easier to learn by doing than to give verbal instructions).

“Knowledge conversion: Tacit and Explicit knowledge interact and interchange into each other in the creative activities of human beings. Knowledge is created through social interaction of the two types of knowledge!”

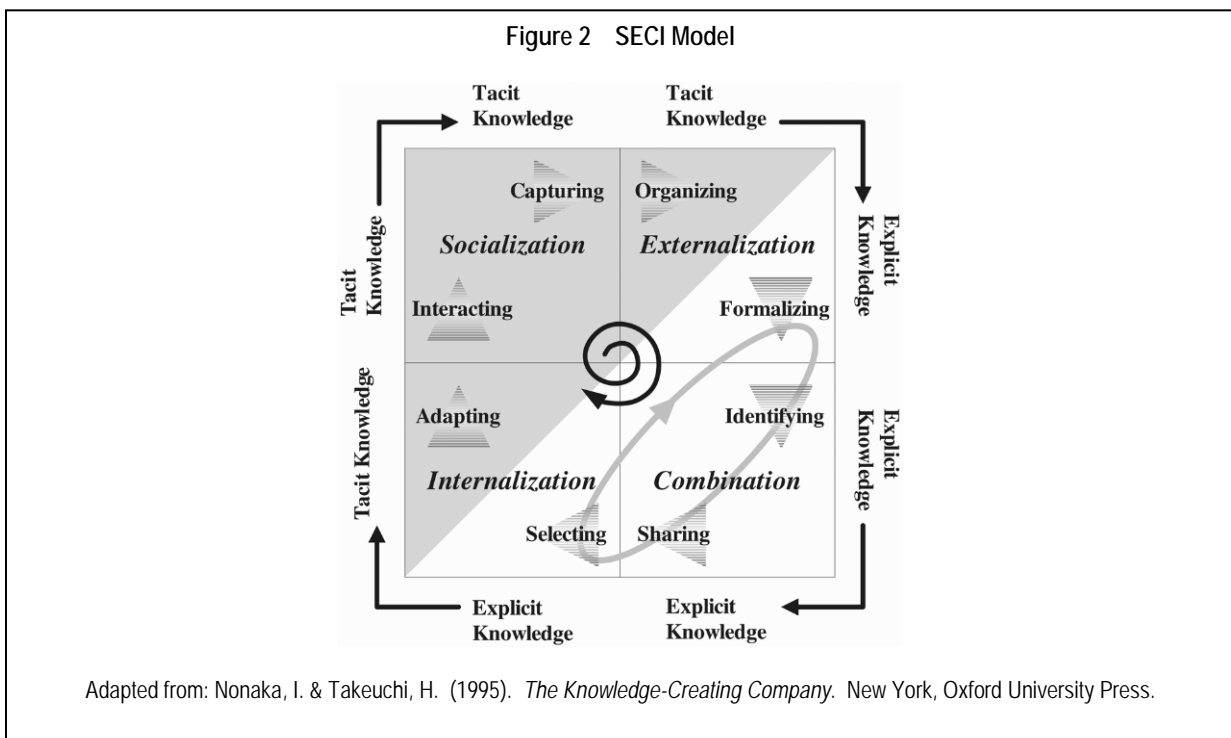
Tacit to Tacit - Socialization
Tacit to Explicit – Externalization
Explicit to Explicit - Combination
Explicit to Tacit - Internalization

⇒ **Externalization:** The process of articulating tacit knowledge into explicit concepts (concrete knowledge). It may however be difficult to find an adequate verbal expression for a mental image through use of analytical methods alone. Externalization is therefore often driven by metaphor and/or analogy. Team members make use of meaningful dialog by sharing metaphors, analogies, concepts, hypothesis, and models.

- **Result:** From tacit to explicit - This expands over time and through a process of mutual interaction between individuals.

- ⇒ **Combination:** The process of systematizing concepts into a knowledge system, i.e., combining different bodies of explicit knowledge. This entails reconfiguration of existing information, where sorting, adding, combining and categorizing of explicit knowledge can lead to new knowledge.
 - **Result:** From explicit to explicit – this conversion involves social interactions to reconfigure existing information through sorting, categorizing, adding and re-contextualizing explicit knowledge.

- ⇒ **Internalization:** This process is closely related to 'learning by doing' - where tacit knowledge is incorporated and applied in a person's or an organization's tasks. In this conversion mode it helps if knowledge is verbalized or diagrammed into documents or oral presentations. During this phase explicit knowledge is turned back into tacit knowledge. Although this appears to be an easy task, it is arguably one of the most difficult phases. Team members begin to internalize new explicit knowledge that broadens and reframes their own tacit knowledge. Internalization, as well as the other three modes, encourages spiralling throughout the organization. The spiral constitutes the four modes circling around each other and justifies concepts created at other stages.
 - **Result:** From explicit to tacit – as with the mode above, this process expands over time.



Within the SECI model shared space serves as a foundation for knowledge creation as knowledge is embedded in shared space. If knowledge becomes separated from shared space then it becomes information. Information can exist in media or networks, knowledge cannot, it is intangible.

The two main areas of KM foci are (a) sharing existing knowledge, and (b) creating new knowledge. The process of knowledge creation occurs when the transfer of what is in someone's head (thoughts, ideas actions, experiences) is transferred to another individual or group in such a way that the recipient's future actions and decisions are influenced by what they have learned. New knowledge is then created. This is what Nonaka means by the "spiralling process of interactions between explicit and tacit knowledge". The spiralling process demonstrates that KM is a dynamic and not a static activity.

I-Space Model (1998):

Boisot's model introduces another dimension to Nonaka and Takeuchi, namely "abstraction". This refers to how knowledge can become generalized to different situations. Boisot proposes a "social learning cycle" to model the dynamic flow of knowledge through six phases:

1. Scanning – insights available from data, documents
2. Problems solving – knowledge is given structure and coherence to these insights as knowledge becomes codified
3. Abstraction – the newly codified insights are generalized to a wide range of situations
4. Diffusion – the new insights are shared with a target audience in a codified and abstract form
5. Absorption – the newly codified insights are applied to a variety of situations producing new knowledge. Knowledge is absorbed and produces new, learned behaviour and so becomes uncoded and tacit.
6. Impacting – abstract knowledge becomes embedded in organizational practices, rules or behaviour patterns. Knowledge becomes concrete.

The social learning cycle means that knowledge is forever changing in a continual cycle of innovation and application. Data is filtered to produce meaningful information, this information is abstracted and codified to produce useful knowledge; this knowledge is applied in diverse situations and thereby produces new experiences in an uncoded form that produces the data for a new cycle of knowledge creation.

Both Boisot and Nonaka and Takeuchi models are dynamic. The rate at which the cycle operates varies from sector to sector. Rapidly evolving sectors have new knowledge being created and applied in rapid succession (e.g. solar energy industry subsector) while in some more established sectors the cycle time for innovation and learning is much slower.

FACTORS IMPACTING KM

Velocity and Viscosity of Knowledge

"Velocity" of transfer is the speed at which knowledge moves through an organization; how quickly and widely it is disseminated; how quickly people who need the knowledge become aware of it and get access to it challenges also exist in terms of the "viscosity of KT" (Davenport & Prusak, 2000).

Viscosity refers to the richness (or thickness) of the knowledge transferred. For example: How much of what we try to communicate is actually absorbed and used? To what extent does the original knowledge get pared down? Does what was absorbed bear little resemblance to what we tried to transmit and retain little of its original value? Viscosity is influenced by a number of factors, especially the method of transfer. Knowledge transferred by means of a long apprenticeship or mentoring relationship is likely to have high viscosity: the receiver will gain a tremendous amount of detailed and subtle knowledge over time. Knowledge retrieved from an on line database or acquired by reading an article will be much thinner.

According to Davenport & Prusak (2000), both velocity and viscosity are important concerns for knowledge managers in determining how effectively a firm uses its knowledge capital. How quickly can it place knowledge where it can generate value and how much of the knowledge assets are actually getting where they need to go? Because genuine learning is such a deeply human endeavor, and because not only absorbing but accepting new knowledge involves so many personal and psychological factors, velocity and viscosity are often at odds. What enhances velocity may thin viscosity. Most KT efforts strike a compromise between these two factors.

Knowledge Packaging

A term closely related to KM is knowledge packaging. This refers to translating and structuring the information into usable knowledge. The concept entails filtering, editing or organizing pieces of knowledge. Packaging is very important because knowledge must be easy to use or employees will not use it and knowledge will not be shared. Myers and Swanborg (1999) identify six steps to ensure successful knowledge packaging:

1. Identify specific topics or general domains and then find knowledge that addresses those subjects;
2. Segment the audience – this requires identifying the target recipients for the knowledge and sorting them in groups by their respective needs;
3. Customize the content – this involves selecting the relevant information for the knowledge base and tailoring it with the appropriate level of detail to each segment;
4. Selecting the appropriate format – e.g. paper, electronic, video, multimedia;
5. Organizing the content – such as the table of contents; index or search engine; and
6. Pilot test the format and content for clarity, usability and overall value (p. 202)

Most organizations rely on computers, intranets and the Internet for knowledge packaging.

Technology

Information technology (IT) has become key to the implementation of KM. It is no coincidence that IT has blossomed at the same time that knowledge is becoming recognized as one of the most valuable organizational assets. Its critical role lies in its ability to support communication, collaboration and those searching for knowledge and information. Computer networks provide the means to break down silos and hierarchical barriers that often inhibit the flow of free-thinking, resulting in the creation of new knowledge. There is a powerful synergistic relationship between KM/KT and technology; that relationship drives increasing returns and increasing sophistication on both fronts. As IT has become our personal desktop tool and our link to each other, access to information and other people's knowledge has grown exponentially. In turn, we demand even better and more effective IT tools.

Key components of KM information technology systems, as discussed by Turban et al, (2005) include the following:

- ⇒ Communication – access knowledge and share with others.
- ⇒ Collaboration – perform group work, synchronous or asynchronous work and ability to collaborate in different place and times.
- ⇒ Storage and retrieval – capturing, storing and retrieval management of both explicit and tacit knowledge through collaborative systems.
- ⇒ Supporting technologies to store, retrieve, share, support problem solving and decision making, including:
 - ✓ Artificial intelligence. These are expert systems which provide "if-then-else" rules. The systems use natural language processing so searches are intuitive for the user.
 - ✓ Neural networks. This refers understanding text.
 - ✓ Fuzzy logic. A form of algebra employing a range of values from "true" to "false" that is used in decision-making with imprecise data, as in artificial intelligence systems.
 - ✓ Intelligent agents. These are systems that learn how users work and provide assistance, for example: knowledge discovery in databases, which is the process used for searching and extracting information both internal (data and document mining) and external (data warehouses)

etc). XML allows for extensible mark-up language; enables standardized representation of data and allows collaboration and communications through portals.

- ✓ Knowledge discovery within current internal and external databases.
- ✓ Custom Relationship Management (CRM) which provides tacit knowledge to users.
- ✓ Supply chain management systems (both tacit and explicit knowledge).
- ✓ Corporate intranets and extranets (allow knowledge to flow freely in both directions).

Implementing the KM management and supporting systems requires:

- ⇒ Identifying and integrating system components –e.g. interfaces between networks and databases.
- ⇒ ‘Know-ware’ - These are technology tools that support KM and include collaborative computing tools (such as groupware); knowledge servers; enterprise knowledge portals; document managing systems (which are content management systems); knowledge harvesting tools, search engines and more.

The Limitations of Technology

There are difficulties caused by IT in KM/KT practices. It leads to misconceptions about the differences between information and knowledge. Organizations often store vast amounts of information and/or data and think they are fostering knowledge flow. Constructing an IT infrastructure does not in itself guarantee that employees will use the systems. Technology applications, according to the American Productivity & Quality Center (APQC), do not, in themselves, create a need or demand to change behavior or share knowledge. IT is more an integrator and a disseminator of knowledge, not the keeper of information or the decision-maker. Technology is indispensable to KM in modern organizations; however, the road to effective KM is littered with abandoned “KM solutions” that were really just applications. These vehicles quickly run out of gas, if they start at all. It is critical to select and implement technology as part of a larger, systematic KM change initiative.

Technology can help – but it cannot substitute for interpersonal communication. Technology is an enabler rather than the starting point for a KM/KT effort; a synergistic relationship (O’Dell et al. 1998). In fact, some organizations rely too heavily on IT and not enough on the social aspects of knowledge. There is always a need for creating a shared understanding through networking and social coordination.

EXPLORING THE FUNDAMENTALS OF KNOWLEDGE TRANSFER

OVERVIEW

More and more companies have instituted knowledge repositories, supporting such diverse type of knowledge as best practices, lessons learned product development knowledge, customer knowledge, human resource management knowledge, methods-based knowledge etc. Groupware and internet-based technologies have become standard infrastructures. A new set of professional job titles – the knowledge manager, the knowledge co-ordinator, the knowledge network facilitator – affirms widespread legitimacy that KM and KT has earned in the corporate world as does the formation of its own professional association. Furthermore, several magazines, journals and newsletters devoted to the field have emerged and almost every leading consulting firm provides some sort of KM service to clients; prominent schools offer business courses and programs on the topic; and many mainstream technology vendors tout the applications of their particular tools to the management of knowledge. Conversely, KT, although it is an important component of KM (Davenport & Prusak, 2000), it has received the least attention in the business community. In the field of psychology, however, the study of KT predates the study of KM by several decades (Argote, Ingram, Levine, & Moreland, 2000).

According to Greenes & Piktialis (2008b), KT can be simple or quite complex depending on

- why you want to transfer knowledge (the need for the knowledge);
- the receivers level of expertise (is this person a novice, practitioner or expert);
- the learning styles and preferences of the intended receivers of the knowledge;
- whether the knowledge will be applied in the same or a different environment; and
- the type of knowledge to be transferred.

The internal transfer of knowledge is about finding out what an organization knows, and using it to improve performance. It is about leveraging the value of knowledge an organization already has. Knowledge in action is a lot easier to digest and a lot easier to implement. We can clearly see what works. We can even talk to the people who made it work. An increasing number of companies have come to believe the transfer of internal best practices is the fastest and most effective way to achieve improvements. The key according to Davenport & Prusak (2000) it comes down to finding effective ways to let people talk and listen to one another for the KT to occur. Knowledge is transferred in organizations whether or not we manage the process at all; however its existence does not guarantee its use (Davenport & Prusak, 2000).

In general, KT is characterized as follows:

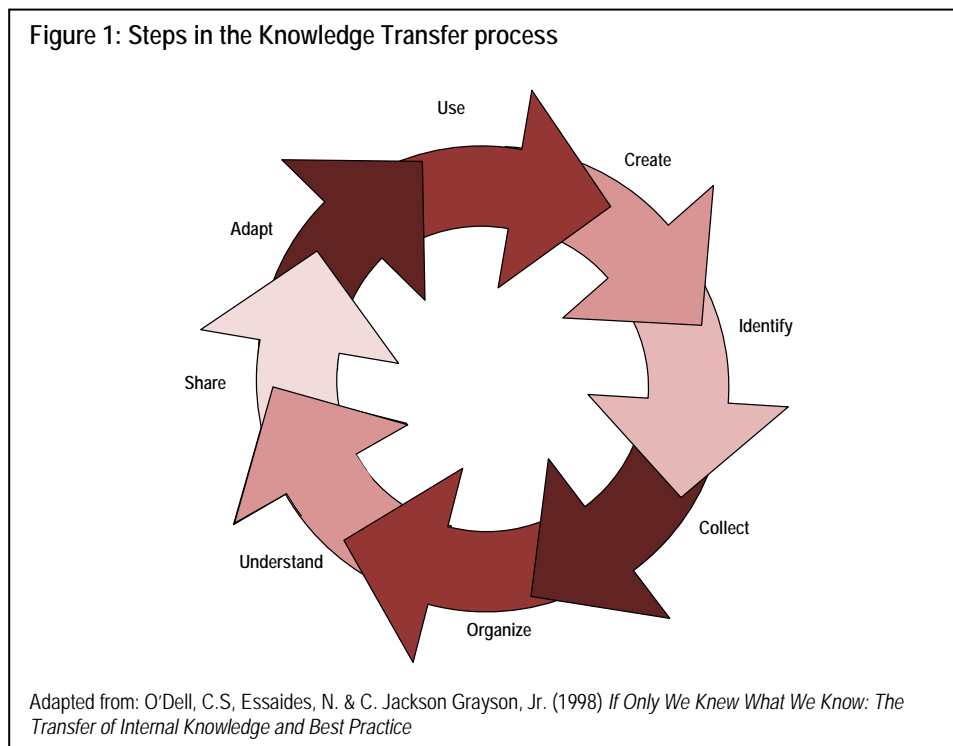
- ⇒ KT may or may not be enterprise wide in scope. It can be as narrowly defined as task, individual or function.
- ⇒ Most KT requires a transfer of information between people;
- ⇒ A good deal of KT can be task based (e.g., the way things are done) but also profession/knowledge based;
- ⇒ There is a “change management” dimension to KT in that KT is generally more than codifying knowledge but capturing the experience that goes with that knowledge;
- ⇒ How knowledge is transferred has a major bearing on the cost of this activity. Craft solutions (e.g., face to face instruction) can result in significant delivery costs.
- ⇒ As with KM, KT materials must be current and updated frequently.

⇒ In many instances, considerations such as regulatory requirements, legal requirements and mandatory professional practices need to be integrated and coordinated, adding a level of complexity to the undertaking.

GENERAL THEORIES OF THE KNOWLEDGE TRANSFER PROCESS

O’Dell et al (1998) have identified the following steps (illustrated in **Figure 1**) as a cycle for transferring knowledge (which necessarily includes KM): 1) create and identify important knowledge, 2) collect the knowledge systematically, 3) organize best practices and internal knowledge in order to understand what is known and where it is, 4) share the knowledge, 5) adapt the knowledge, and 6) apply or use the knowledge to solve business needs and to apply it to “new situations, and/or create ‘new knowledge’”.

Create, identify, collect and organize refers to best practices and internal knowledge so that companies understand what they know and where it is. Identifying, collecting and organizing deal more with the explicit knowledge end of the continuum and the sharing, adapting and using occur more at the tacit knowledge end of the continuum. Once knowledge is shared, then it changes as people understand, use it, experience it and put their own interpretation on it, so it becomes ‘newly’ created knowledge. This is where the payoff really comes, when knowledge is successfully transferred and applied, the knowledge transfer cycle is complete.



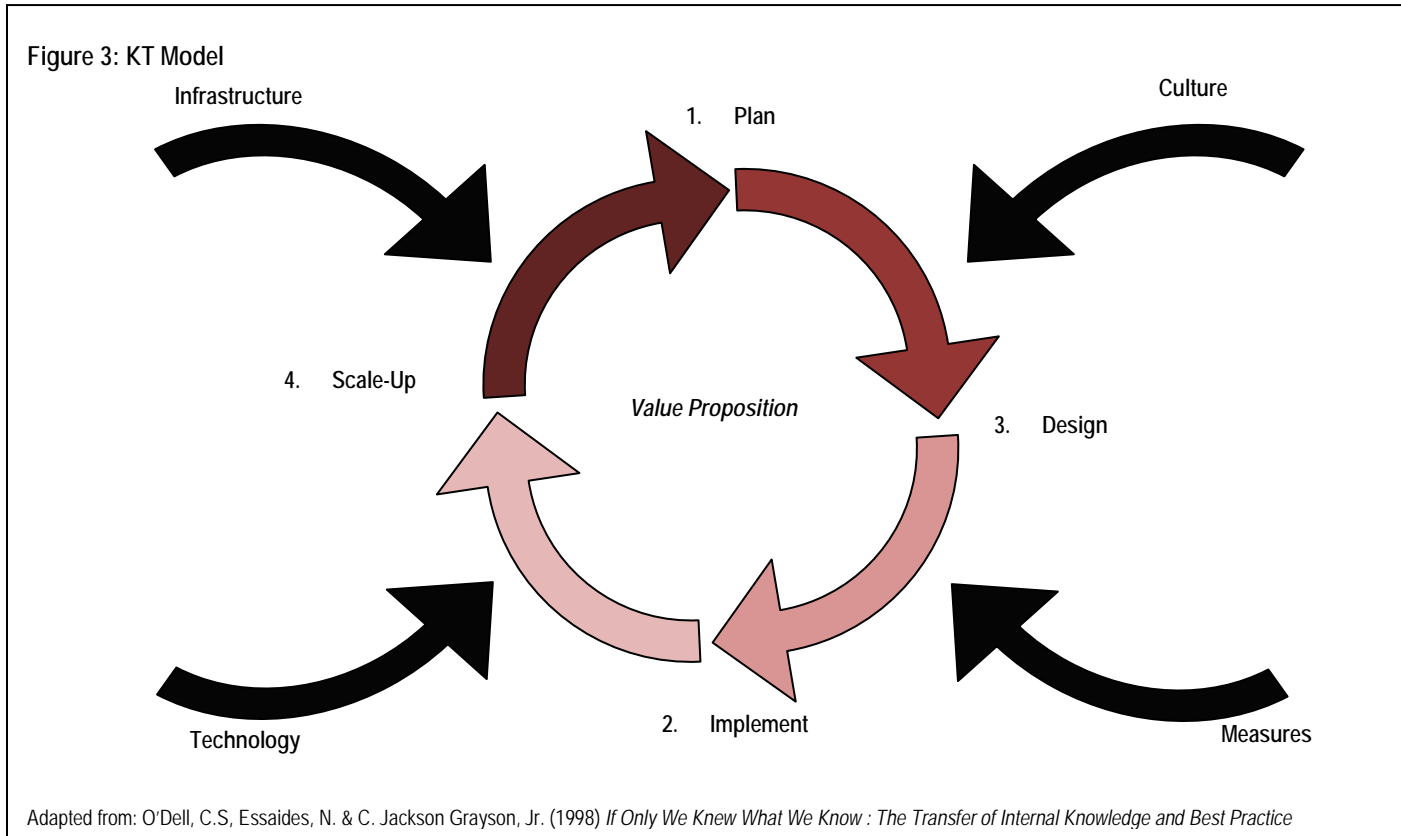
A MODEL FOR KT

According to O’Dell et al. (1998), the key to making KT work is to approach this challenge like the change initiative that it is. First change without purpose, is change without direction or results. The model has three major components:

- The three value propositions (customer intimacy, product to market excellence, operational excellence)
- The four enablers (culture, technology, infrastructure, measurement) (please see “Enablers for KM/KT Implementation”)

- The four step change process (planning, designing, implementing and scaling up) (please see “Tool to Support Planning the KM/KT Change Process” in)

This model applies to knowledge and practices about customers, products, processes, mistakes and successes. It includes not just explicit knowledge, but also applies to tacit knowledge: intuitions, judgment and know-how.



THE THREE VALUE PROPOSITIONS

To extract value out of knowledge, companies must clearly define their *value propositions* – what they hope to achieve through the more effective management and transfer of knowledge. There are a number of real measurable benefits or value propositions from investing in effective KT. Value propositions in this regard tend to fall into three basic categories (O'Dell et al, 1998):

Matching System with Value

A KM/KT strategy must match an organization's value proposition. At Buckman Laboratories, for instance, customer intimacy is a key revenue driver and a strategic imperative. So when the company embarked on its KM/KT quest, it make sure its transfer projects were targeted at providing associates at the point of customer contact with instantaneous access to collective IQ of the organization. "K'Netix", the resulting architecture, is a virtual "library" of the important information relevant to the business of the customer. The KT Department (KTD) – a conglomeration of IS, telecommunications, and technical information centre – is charged with:

- Accelerating the accumulation and dissemination of knowledge within the company
- Providing easy and rapid access to company's global knowledge bases
- Sharing best practices with all Buckman affiliates

- **Customer Intimacy** – this value proposition focuses on harnessing organizational knowledge to better sell to and service customers by capturing knowledge about customers; developing and transferring knowledge and understanding of customers' needs, preferences, and business to increase sales; as well as, bringing the knowledge of the organization to bear on customer problems.
- **Product-to-Market Excellence** - The product-to-market excellence proposition focuses on speeding up the product

development cycle (innovation). This proposition is focused on two transfer strategies: (1) ensuring new ideas and new design from inside and outside the organization are incorporated into product and service offerings; and (2) accelerating the product development process by reusing lessons learned from earlier attempts.

- **Operational Excellence** - The pursuit of operational excellence proposition focuses on using best practices to improve the internal performance of an enterprise. More specifically, this value proposition focuses on the transfer of operational processes and know-how from top-performing business units and processes to less-well-performing businesses, ultimately improving the organization's overall performance, reducing expenses, and increasing revenues.

Each value proposition may necessitate a different overall approach. The key learning behind these value propositions is simply that a KM/KT effort must be designed to help solve an important business problem.

Appendix B - KM/KT Literature Review List

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