

WHAT IS KNOWLEDGE MANAGEMENT?

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Introduction [1]

It has been said that an enterprise is what it knows. That being true, this knowledge has to be at the core of any attempt to improve the enterprise's performance. Hence, managing knowledge is the quintessential function of any organization.

In effect, knowledge management has been sweeping through the corridors of enterprise over the last few years. It is part of a trend that shows little sign of abatement, since it is central to move any organization to a stronger competitive stance. It rides the disciplines of the moment – electronic commerce, data warehousing and mining, document management, enterprise information portals (EIP), the Internet, collaborative technologies, customer relationship management, supply chain management – and is tightly coupled with them in order to facilitate their exploitation by the organization.

Enter the Chief Knowledge Officer

Another key indicator of this knowledge management movement has been the appearance of the chief knowledge officers, or CKOs. They have started to emerge throughout industry as stewards of an enterprise's knowledge, and with a wide range of roles and responsibilities. Today, AMOCO, AMS, SAIC, KPMG, Monsanto, Andersen Consulting, PriceWaterhouseCoopers, and many other companies have CKO's. Furthermore, the federal government named its first CKO last summer, at the General Services Administration. Now, several other agencies, including the Navy, the Coast Guard and the Department of State have all named chief knowledge officers. [2] [3]

Facing strong commercial and competitive pressures, many private enterprises have already launched substantial KM initiatives. And public agencies, facing the challenges of smaller budgets and privatization trends, are having to decide how to do more with less, and hence perform in a more focused and intelligent mode.

What Is Knowledge?

Going into an in-depth discussion of knowledge itself is not within the scope of this chapter. However, it is difficult to explain knowledge management without using knowledge at least as the starting point.

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It is said that technology is what one has to know in order to do; and science is what one has to do in order to know. While this is an oversimplification, because we cannot assert that scientific inquiry is the only form of inquiry for the pursuit of knowledge, it is helpful in transmitting some basic concepts in knowledge management. In particular that there is one or more processes which we follow in pursuit of understanding. This moves us, in effect, toward the Oxford Dictionary definition of knowledge: *Knowledge is understanding gained through experience, observation or study.*

Knowledge exists primarily in an individual's head. We can sometimes capture that knowledge in an explicit manner (explicit knowledge) or it may stay trapped inside a human brain (tacit knowledge). Either because it has never been actually made explicit or because of the difficulties inherent in describing the specific knowledge, such as attempting to explain how one rides a bicycle. Again, this is an attempt to simplify reality. Beckman, in a more complex account, speaks of four types of knowledge focusing on our availability to access it – explicit, implicit, tacit and unknown. [4] And Firestone offers some interesting arguments and counter-arguments relative to the role of “knowledge-based cultural artifacts” and of the social interactions that occur in the process of refining knowledge. [5] Much, in one's view of knowledge, depends on whether you take a strong or a weak anthropomorphic point of view relative to it.

What is Knowledge Management?

What exactly is knowledge management? As with any emerging discipline there are many definitions that we can resort to. (See Table One) Practically every scholar, author and organization will offer his or her own definition. But at its core, knowledge management is *the process through which an enterprise uses its collective intelligence to accomplish its strategic objectives.* If we focus on this definition we can obtain some insights.

Table One -- Selected Definitions of Knowledge Management

AUTHOR/SOURCE	DEFINITION
Yogesh Malhotra (@brint.com)	Knowledge management caters to the critical issues of organizational adaptation, survival, and competence in face of increasingly discontinuous environmental change. Essentially, it embodies organizational processes that seek synergistic combination of data and information-processing capacity of information technologies, and the creative and innovative capacity of human beings
Joseph M. Firestone (Executive)	Knowledge management is human activity that is part of the Knowledge Management Process (KMP) of an agent or collective. KMP, in turn, is an ongoing, persistent,

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Information Systems, Inc.)	purposeful interaction among human-based agents through which the participating agents aim at managing (handling, directing, governing, controlling, coordinating, planning, organizing) other agents, components, and activities participating in the basic knowledge processes (knowledge production and knowledge integration) into a planned, directed, unified whole, producing, maintaining, enhancing, acquiring, and transmitting the enterprise's knowledge base.
Thomas M. Koulopoulos	Knowledge management is the leveraging of collective wisdom to increase responsiveness and innovation.
Public Service Commission of Canada	Knowledge management refers to the processes of creating, capturing, transferring and using knowledge to enhance organizational performance.”
Joseph Williamson (EDS)	Knowledge Management (KM) is an integrated, systematic approach for identifying, managing, and sharing all of an enterprise's information assets, including databases, documents, policies and procedures, as well as previously unarticulated expertise and experience resident in individual workers.
Douglas Weidner (Litton/PRC)	Knowledge management is handling, directing, governing, or controlling of natural knowledge processes (produce, acquire, integrate K) within an organization in order to better achieve the goals and objectives of the organization
Ramon Barquin (Barquin and Associates, Inc.)	Knowledge management is the process through which an enterprise uses its collective intelligence to accomplish its strategic objectives.

First, knowledge management is a *process*, and thus it has phases and components, and is embedded in time. As such there is more than one approach and different structures and architectures to this process.

Second, "*uses*" implies that this intelligence must lead to action. That means that there are expected outcomes and performance to be measured.

Third, we must interpret *collective intelligence*. *Collective* means that there is a community of participants involved and hence the need for identifying ownership and source of the knowledge, as well as for providing mechanisms and incentives to sharing their knowledge. *Intelligence* necessitates its own definition. We may take it to mean both "capacity to learn" as well as the informational constructs that do not yet qualify as knowledge. Think of intelligence here in a military sense, where one gathers as much "intelligence" as possible in order to better understand a specific situation. This leads inevitably back into separating

the tacit from the explicit, and extracting, storing and processing bits and bytes in order to obtain data, information, intelligence and then knowledge from it.

Lastly, *to accomplish its strategic objectives* means that KM is strongly tied to strategy. It has to fit into, and enable, an enterprise's broad plan to achieve its long-term goals.

When Professors Ikujiro Nonaka and Hirotaka Takeuchi pioneered some of the basic concepts of knowledge management in Japan early in the decade, their principal concern was understanding how Japanese companies were managing their intellectual capital – what they knew or had the yet unrealized potential to know – for competitive advantage, especially in order to bring better products to market more quickly. [6] One reads the Nonaka & Takeuchi work and finds that there is precious little mention of information technology. Computers do not play a prominent role in his analysis. There is nothing about object-oriented data warehouses, the Internet or document management systems, and no discussion of data mining techniques or of enterprise information portals. Of course, They were writing just prior to the emergence of these disciplines, but the main reason is that they were concerned with understanding some very basic things. Who owns an enterprise's knowledge? Where does it reside? How is it transferred from an individual or group of individuals to others? What are the incentives for sharing? What is the impact of resistance to change? These were the types of questions that were at the heart of Nonaka and Takeuchi's research.

Who Owns Knowledge Management?

For starters, this is a discipline that is claimed by many others. Certainly it is difficult to argue with the *philosophers*, for whom knowledge is a principal pursuit. Or with the *educators* who have been responsible for the creation of knowledge since the earliest of times. Or with the *librarians or information scientists* who have been classifying and organizing knowledge for millennia. Or with the *cognitive psychologists* who have been trying to understand how we acquire, store and manipulate knowledge through the human brain. Or with the *management scientists*, who have been looking at how the enterprise deals with this most valuable organizational asset. Or with the *computer scientists*, who are directly concerned with the design and implementation of real systems that produce and deliver knowledge from the bits and bytes stored in their data warehouses.

So while there is a growing acceptance that the management of knowledge, including its delivery, is one of the most compelling requirements of the enterprise; there is little common ground as to what community of professionals has the responsibility for its pursuit. And yet, it seems quite obvious that this is essentially a multi-disciplinary endeavor since we are all in this together.

The Knowledge Organization

There must be at least a brief look back to history in any attempt to provide an overview of knowledge management. The history of mankind is coupled very tightly to knowledge. Our very name as a species – Homo sapiens, or “knowing man” – points to the central relationship between man and knowledge. This ascent of man, if you will, is nothing but our ability as a species to engage successfully in the very practice of knowledge management.

We wander and explore looking for food, shelter, warmth, following our basic instincts and guided by our senses. Over time what made us ultimately develop distinctly was our capacity to collect observations and then make information, intelligence and knowledge out of them; and finally, most importantly, to communicate those insights and observations to others. Using our expanding knowledge base, we started to compete ever more effectively in the evolutionary scheme.

By the time we emerge into recorded history, we have ample proof that mankind was simply a species which excelled at knowledge management. We had developed many tools and techniques to assist in the process of capturing, representing, disseminating, sharing and managing knowledge. Among these are speech, writing, counting, drawing, measuring, and then establishing stores for our explicit knowledge eventually known as libraries.

Throughout history society moved through the agrarian, industrial and service stages. We entered the information age and now we are quickly moving into the knowledge age. But throughout, the historical role of knowledge, and of the knowledge organization, is central in understanding the development of the knowledge management discipline. [7]

Knowledge Management and Information Technology

Today, knowledge management has been overwhelmed by information technology (IT). Many of the IT disciplines previously mentioned, and the tools that they have enabled, have undoubtedly transformed the face of knowledge management for the better. Yet, most of the truly difficult barriers to successful knowledge management environments lie not in the problem domains that IT can address, but in those that Nonaka and Takeuchi initially identified: Who owns an enterprise's knowledge? Where does it reside? How is it transferred from an individual or group of individuals to others? What are the incentives for sharing? What is the impact of resistance to change? [6, Op. Cit.]

Today we can say that while IT may be the cornerstone of an enterprise's knowledge management architecture, one cannot be successful at knowledge

management with IT alone. There are too many other components outside the IT domain that must play an active role to ensure success.

The Components and Processes of Knowledge Management

We mentioned previously that knowledge management “was riding the disciplines of the moment” and mentioned electronic commerce, data warehousing and mining, document management, enterprise information portals (EIP), the Internet, collaborative technologies, customer relationship management and, supply chain management to typify the set. But we also mentioned earlier that knowledge management is not necessarily about technology. Yet it takes a fair amount of technology, especially information technology, a number of soft disciplines, and a significant measure of leadership to make knowledge management take within an organization.

Knowledge that is in people’s heads must be captured and made explicit, communities of practice have to be identified, and within them, “best practices” must emerge. Resistance to change must be overcome in most cases and the enterprise must be willing to continuously learn from its experiences. And all this must be underpinned and supported by a robust business intelligence platform and a very solid IT infrastructure. Business intelligence primarily means data warehousing and data mining. An enterprise’s knowledge is delivered these days, mainly through an enterprise information portal (EIP). The web is the prime vehicle for all communications and sharing.

But there are many other methods or techniques which we must address as part of the knowledge management discipline. Some would appear to be anathema to IT practitioners since they are very “soft” by most IT standards. Yet they are certainly very important and need to be considered. For example, we should be able to understand the role of critical success factors, communities of practice and change management techniques. We must be able to identify and utilize as necessary, leadership techniques, best practices and storytelling. The role of the chief knowledge officer and his/her relationship with the chief information officer must be defined.

If we look at it from another angle, here’s what the process looks like. Information has to be acquired, new knowledge has to be invented and then it has to be incorporated into the universal knowledge stores in order to be shared. This implies that it must be organized, stored, transferred, shared, taught. Because, as we have repeatedly said, knowledge resides primarily in someone’s head. All knowledge must be looked at first from the human perspective. It is the individual who starts out to learn (acquire information) through browsing, exploration, observation and research, often structured through channels like formal education. In today’s environment, learning is assisted through a number of tools and techniques. Some are ancient, such as verbal communication and physical

observation. Others are bit more recent, like reading and writing. And still others are very new such as browsing through the Internet to research some special area of interest.

As man acquires knowledge, repositories of this knowledge start to emerge outside the brain. Clearly, collections of anything have the effect of being an available resource for observation or analysis. As documents emerge, for example, books, they are stored in places and ways that make retrieval easy and convenient. Hence, physical libraries are born where books and other documents are kept. Physical libraries are now also yielding to virtual libraries as the repositories of all content, in electronic format. They are essential cogs in the knowledge acquisition process.

But individuals, using different levels of cognition, such as recall, comprehension, application, analysis, synthesis, and evaluation are able to build incrementally from the existing base and invent and create new knowledge. This in turn must be named, organized, stored, transferred, “taught,” shared.

In effect, Kamran Parsaye and Mark Chignell [8] speak of five basic properties of knowledge that can be used to define and represent objects, properties, and interactions: naming, describing, organizing, relating and constraining.

Taxonomies and Metadata

Taxonomy is the science that classifies all organisms. Taxonomies usually embed naming conventions. You need a taxonomy to classify and organize knowledge too. As a matter of fact, it is a very important part of knowledge management. How can you transfer, store, retrieve, and share knowledge if you do not have clear way of identifying and referring to it. When dealing with bases of explicit knowledge stored in electronic format, any taxonomy utilized is tightly coupled with the body of metadata utilized to define, identify, point, describe and characterize the contents of the knowledge base.

Technology has now also wrought data warehouses, and they have become the principal stores of content to be mined for knowledge. In effect, today’s data warehouses are slowly, but surely, morphing into knowledge warehouses as we continue to add value to the bits and bytes along the Barabba-Haeckel Framework, which starts with data and advances all the way to wisdom. [9] It is aa continuum of stages: data, information, intelligence, knowledge, and eventually wisdom.

Knowledge Lifecycle Model and Knowledge Management Processes

But the key to understanding the mechanics of knowledge management lies in moving into the nuts and bolts of it. Edward Swanstrom, Joseph M. Firestone,

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Mark McElroy, Douglas Weidner and Steven Cavaleri jointly initiated the Knowledge Life Cycle (KLC) model at the Knowledge Management Consortium International (KMCI), in a paper called "The Age of the Metaprise." [10] The KLC model, now refined further, provides the platform from which we must look at the knowledge management process itself.

In fact, Firestone defines knowledge management only in terms of the knowledge management process (KMP) which is "an ongoing, persistent, purposeful interaction among human-based agents through which the participating agents aim at managing (handling, directing, governing, controlling, coordinating, planning, organizing) other agents, components, and activities participating in the basic knowledge processes (knowledge production and knowledge integration) into a planned, directed, unified whole, producing, maintaining, enhancing, acquiring, and transmitting the enterprise's knowledge base." (See Table One) Where the basic knowledge processes in the KLC are knowledge production and integration, Firestone breaks the KMP down into "three task clusters: interpersonal behavior, knowledge processing behavior, and decision making behavior." [ibid.]

These processes are embedded in the enterprise in multiple organizational processes and at a number of different levels. Activities make up tasks, which in turn migrate to task patterns and to task pattern clusters on the way to integrating the business process level.

But knowledge must first be acquired before it can be managed. We are reminded of this by Douglas Weidner, who delves into the knowledge management process in substantial detail. He inserts knowledge acquisition as part of the KMP and also makes the link to the critical issue of people, people with a commonality of interests, or communities of practice. [11]

Communities of Practice

The term "communities of practice" can conjure up any of a number of interesting images. In the main, it refers to a group of individuals engaged in certain common endeavors. At its core it has to do with identifying best practices and sharing knowledge. It is essential for the right hand to know what the left hand is doing in any organization.

The traditional "water cooler" model, around which people gather to discuss things of common interest, works well in small organizations; but once you start to grow to the size of the modern enterprise, this approach is just untenable. Communities of practice have to be discovered, structured and nurtured. Some very interesting work in this area is described by Cathy Hirsh, et al, based on the knowledge initiative at AMS. [12] From a very successful program over several years, they have learned five very important lessons:

- 1) Individual achievement must be recognized
- 2) Group identity must be built
- 3) Motivation and reward are tools that must be utilized
- 4) Successes have to be celebrated
- 5) Value has to be delivered

Without people, without communities of practice, knowledge management would be somewhat meaningless.

Toolkit for Knowledge Management

Knowledge Management and Data Warehousing

While there are many tools in the knowledge management toolkit, we want to talk about just a few in this chapter. Heading up the list are data warehousing and data mining.

The advances leading to mainstream data warehousing constitute the seminal point of departure from which we have to mark the start of contemporary analytical processing. It was data warehousing that served as the first thrust for the rigorous and methodical production of knowledge from our data. Herb Edelstein defines data warehousing as “the consolidation of data from multiple sources into a query database.” [13] This process of integration for purpose of analysis is the hallmark of data warehousing.

In the process of building data warehousing environments, we often also work with data marts. These are simpler data structures or databases supporting a single workgroup, department, process, or application in an organization.

Data mining, according to Joan Conover, is “the nontrivial discovery of meaningful new correlation, patterns, and trends and the extraction of implicit, previously unknown, and potentially useful information from large amounts of data. It uses pattern recognition technologies in conjunction with machine learning, statistical, and visualization techniques to discover and present knowledge in a form that is easily comprehensible to humans.” [14]

It is in the manipulation of an enterprise’s data through these decision-support and database management tools that we start the ascent from bits and bytes, to data, information, intelligence and knowledge. All sound knowledge management environments are richly supported through data warehouses and data marts that are mined to produce important insights for the different communities of practice.

Furthermore, it has been through the emergence of information technology and computer systems that we have been able to make substantial inroads. These

insights tie very directly to our concept of data warehousing. Not so much in terms of the tool, the data warehouse, but rather the process it supports. Data warehousing is the continuation of the age-old process of obtaining meaning from a collection of data points or observations.

Daniel Boorstin, the former Librarian of Congress, gives some fascinating insights into these data points and operations through an essay titled, "The Age of Negative Discovery," in his book *Cleopatra's Nose*. [15] Boorstin points out that "for most of Western history interpretation has far outrun data." He also says, "The modern tendency is quite the contrary, as we see data outrun meaning." He attributes this "outrun" to the advent of the "mechanized observers" or machines that generate such vast numbers of observations, or data points, and make it essential that we learn to navigate these oceans of facts.

The essential insight in all this has to do with the importance of negative discovery. In other words, discovering that which is not and hence allowing us to discard all data, through analysis, that does not contribute to a better understanding of reality. The implication for knowledge management is that in order to "use our collective intelligence" we must increasingly utilize tools and techniques that enable us to interpret large amounts of data as we strive to achieve understanding.

Enterprise Knowledge Portals

The principal delivery mechanism for an enterprise's knowledge is the portal. Portals have become omniscient in corporate parlance and planning. And they are the main switchboards for eventually extracting value from the Internet. They seem to be part of e-everything. We could argue whether we should speak here of the Enterprise Information Portal (EIP) or the Enterprise Knowledge Portal (EKP). For purposes of this discussion let's refer to both simply as enterprise portals, and offer definitions of both.

First, Vitalos defines the EIP severally, as "1) An information system integration framework, 2) An access and management mechanism to information and services, and 3) An environment providing integrated, role-focused views." [16] They sit as a semantic layer over infrastructure, repositories and applications and have an architecture composed of a network, server and browser.

Second, Firestone, while asserting that an EKP is also an EIP, defines the EKP as "an enhanced Enterprise Information Portal (EIP). that: 1) is goal directed toward knowledge production, knowledge integration, and knowledge management, and also 2) focuses upon, provides, produces and manages information about the validity of the information it supplies, 3) provides information about your business and meta-information about the degree to which you can rely on that information, 4) distinguishes knowledge from mere

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information, 5) provides a facility for producing knowledge from information and 6) orients one toward producing and integrating knowledge rather than information.” [10]

Knowledge management is fundamentally about accomplishing useful things for an organization. The portal, whether an EIP or a true EKP, moves us substantially in that direction as it becomes the principal vehicle for the dissemination and sharing of common knowledge.

Document Management:

A document is a record of some event or observation. It captures data, information, intelligence, and even knowledge. As technology has revolutionized the media we use to produce and store documents, their management has become a more important part of any knowledge management environment. The classification of documents for fast and easy retrieval and support of the knowledge management processes described earlier is an essential aspect of good knowledge management.

Further, document management is becoming almost paperless. Safdie reminds us that the U.S. Department of Defense is set on some clearly established goals, even though some are not yet met. “By Jan 1, 2000, all aspects of contract processes were to have been paper free; DoD will expand use of electronic catalogs and electronic shopping malls to put buying decisions into the hands of the people who need the product; On July 1, 1998, DoD discontinued volume printing of all DoD wide regulations and instructions and made them available via the Internet and CD ROM.” [17] The move of more and more organizations toward electronic media for their documents should result in more effective and efficient knowledge management environments.

Storytelling

And then there is the telling of stories.

“Once upon a time, in a land far far away...” So start so many of our fairy tales. What does any of this have to do with knowledge management? Well, we have long since known that a good story focuses our attention, and children’s stories have for millennia served the purpose of transmitting lessons, values and other cultural tenets from generation to generation. In effect, they have been excellent tools for knowledge sharing.

In knowledge management, storytelling has become a well-accepted and used technique. Stephen Denning, Program Director, Knowledge Management for the World Bank, might well make his case by saying, “Let me tell you what happened

in Madagascar in November of 1998.” He gives us an example of a story that is currently doing the rounds at the World Bank:

“In November 1998, the World Bank was conducting a public expenditure review in Madagascar with the government, the IMF, and other development partners. The program included a simplification of the tax system, including the introduction of a Value Added Tax (VAT). A controversy emerged as to whether the VAT should be applied to medicines. Some participants in the review argued strongly for exempting medicines so as to avoid a negative poverty impact. Others argued that once exemptions were allowed, implementation became so complicated that many of the intended benefits were lost. The mission was inclined to allow no exemptions but contacted the thematic group on tax administration and asked for help within 72 hours. Within that time frame, the mission received advice from Indonesia, Moscow, the Middle East, North Africa, the research complex of the World Bank, a retired staff member in Canada and an external partner at the University of Toronto. The mission concluded that the sounder course of action was to exempt medicines from VAT, and advised the Government and its partners accordingly. As a result, medicines were exempted from the VAT that was implemented in Madagascar.” [18]

With the advances in technology, of course, storytelling has been substantially transformed. We no longer rely on the oral tradition in most cultures, nor do we need to rely on the written word. Today with the advent of digital video cameras and their integration into the net, we can implement corporate storytelling as a critical part of an enterprise’s knowledge management environment. [19]

We defined knowledge management as *the process through which an enterprise uses its collective intelligence to accomplish its strategic objectives*. In this context, storytelling becomes a powerful tool for knowledge sharing, which is the essential component for harnessing collective intelligence to achieve objectives.

Conclusion

It has been said that the single greatest challenge facing managers for the next several decades is to raise the productivity of the knowledge workers. Who is the knowledge worker? What does a knowledge worker do? In the context of the workplace, the knowledge worker is the professional who must command and constantly update a body of relevant knowledge to do their job.

A few years ago, the Annual Report of a leading bank provoked some thought. In this document, they were attempting to articulate their business model in terms of a value proposition.

“*Value* is that combination of *product, service and price* that customers find attractive and our company finds profitable.” [20]

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But it is clear that *value*, in the context of that statement, depends almost completely on the ability to produce, deliver and manage knowledge about customer behavior, customer satisfaction, and product and account profitability.

Furthermore, for decisions to be made in a business-like and timely manner, it is essential that we be able to deliver to the knowledge worker, that specific *knowledge* that he or she needs at the time when it is needed. In a sense we need to resolve the retail equation in this new context in order to deliver the right knowledge product, at the right place, at the right price and, of course, at the right time.

If this seems to be a challenge, it's because it is. It's difficult and we still don't know how to do it very well. Today, we are seeing the emergence of some of the early knowledge management systems. Yet to understand whether we are on the right track, we have to go back to basics.

Ultimately we need knowledge in order to make decisions. In this context, it is well to remember the words of Admiral A. W. Radnor: "A decision is the action an executive must take when he has information so incomplete that the answer does not suggest itself." [21] This is our challenge in knowledge management: to minimize the decision domain for knowledge workers and provide them with the tools they need to their job.

References

[1] This paper is derived from Ramon Barquin, "What Is Knowledge Management?" in Ramon Barquin, Alex Bennet and Shereen Remez (eds.) Knowledge Management: The Catalyst for E-Government (Vienna, VA: Management Concepts, Inc., forthcoming, 2001). It is being published here with permission from Management Concepts, Inc.

[2] Shereen Remez, "Who Will Lead the Knowledge Revolution? An examination of the differing roles of the CIO and CKO" in Ramon Barquin, Alex Bennet and Shereen Remez (eds.) Knowledge Management: The Catalyst for E-Government (Vienna, VA: Management Concepts, Inc., forthcoming, 2001)

[3] Robert Neilson, "Knowledge Management and the Role of the CKO" in Ramon Barquin, Alex Bennet and Shereen Remez (eds.) Knowledge Management: The Catalyst for E-Government (Vienna, VA: Management Concepts, Inc., forthcoming, 2001).

[4] Tom Beckman, "Creating Business Value from KM: The Fusion of Knowledge and Technology" in Ramon Barquin, Alex Bennet and Shereen Remez (eds.)

Knowledge Management: The Catalyst for E-Government (Vienna, VA: Management Concepts, Inc., forthcoming, 2001).

[5] In a personal communication to the author, Joseph M. Firestone makes the following important observations:

"The implication is that tacit knowledge is *ultimately* all the knowledge that exists, since explicit knowledge is not inside an individual's head. If you deny this by saying that explicit knowledge is tacit knowledge that has been made explicit, I say in response that we cannot know this because (a) there is an "epistemic gap" between tacit and explicit knowledge in that we have no way of putting them side-by-side with each other to compare them, and (b) the evidence we have from scientific investigation is that while explicit knowledge is linguistic in form, knowledge in the brain is in the form of neural structures associated with predispositions to express what we believe. So, again we can't compare the semantic networks in our brain with the semantic networks in explicit knowledge-related expressions. We can only infer the latter from behavior resulting from the interaction of our environments with our *wetware*.

Next, I think the idea that *ultimately, knowledge exists only in an individual's head*, is clearly opposed to the idea of knowledge-based cultural artifacts, including scientific knowledge. It devalues the idea of objective culture as providing the environment in which all individuals interact.

When we refer to "scientific knowledge," we are not generally referring to what is in the heads of scientists. We refer instead to artifacts such as Einstein's theory of relativity, or quantum theory, which are instances of explicit knowledge. To say that these instances are "ultimately" the expressions of tacit knowledge is not something that can be easily proven or even made sense of.

Yes, the theory of relativity was originally the expression of the neural structures and functioning of a single mind. The theory has been enhanced and enriched since by the work of the scientific community. Relativity as it exists today is not Einstein's knowledge captured in documents. Instead, it is a cultural product that is the result of all of the social interaction that has occurred around the theory since its first expression.

This interaction is motivated by the minds of all of the individuals who have contributed to it, by the documents containing explicit knowledge about relativity that have been produced, and by the social processes that are producing new tacit and explicit knowledge about relativity all of the time. So the theory of relativity, as it exists today, is not "ultimately" in someone's head, or even in multiple heads. Instead, it is ultimately distributed. It is shared throughout the community of scientists working on it and trying to comprehend and develop it. It

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is tacit and explicit at the same time. It is in many heads, in many documents, and is continuously undergoing change as people interact over what it says.”

[6] Ikujiro Nonaka and Hirotaka Takeuchi, The Knowledge-Creating Company (New York, NY: Oxford University Press, 1995).

[7] David Bennet and Alex Bennet, “The Rise of the Knowledge Organization” in Ramon Barquin, Alex Bennet and Shereen Remez (eds.) Knowledge Management: The Catalyst for E-Government (Vienna, VA: Management Concepts, Inc., forthcoming, 2001).

[8] Kamran Parsaye and Mark Chignell, Intelligent Database Tools & Applications: Hyperinformation Access, Data Quality, Visualization, Automatic Discovery, Wiley: New York, NY, 1993.

[9] I’ve given the Barabba-Haeckel framework this name because it first came to my attention in a presentation by Vince Barabba, the former head of the Bureau of Standards and Vice President of General Motors, at a Knowledge Management Summit I co-chaired at the Brookings Institution in October 1997. Vince Barabba explained that he had developed it in discussions with Stephen Haeckel, former IBM Vice President. Hence the origin of the nomenclature.

[10] Joseph M. Firestone “Enterprise Knowledge Portals, Knowledge Processes and Knowledge Management” in Ramon Barquin, Alex Bennet and Shereen Remez (eds.) Building Knowledge Management Environments for Electronic Government (Vienna, VA: Management Concepts, Inc., forthcoming, 2001).

[11] Douglas Weidner, “Collect and Connect: Linking Communities of Practice to Knowledge Bases,” in Ramon Barquin, Alex Bennet and Shereen Remez (eds.) Building Knowledge Management Environments for Electronic Government (Vienna, VA: Management Concepts, Inc., forthcoming, 2001).

[12] Cathy Hirsh, Mark Youman, and Susan Hanley, “Creating Knowledge-Based Communities of Practice,” in Ramon Barquin, Alex Bennet and Shereen Remez (eds.) Building Knowledge Management Environments for Electronic Government (Vienna, VA: Management Concepts, Inc., forthcoming, 2001).

[13] Herbert Edelstein, "An Introduction to Data Warehousing," in Ramon Barquin and Herb Edelstein (eds.) Planning and Designing the Data Warehouse (Upper Saddle River, NJ: Prentice-Hall, 1996).

[14] Joan Conover, “Data Warehousing, Data Mining and Digital Libraries,” in Ramon Barquin, Alex Bennet and Shereen Remez (eds.) Building Knowledge Management Environments for Electronic Government(Vienna, VA: Management Concepts, Inc., forthcoming, 2001).

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Biography

Ramon Barquin, Ph.D. is an expert in data warehousing and knowledge management, and is recognized as one of the pioneers in the field. He is the founder and immediate past president of The Data Warehousing Institute and specializes in developing enterprise information systems strategies. He had a long career with IBM and was president of the Washington Consulting Group. He holds a Ph.D. degree from MIT and is the author and editor of several books and over 100 technical and management publications. He has assisted a number of corporate entities and government agencies looking for guidance in these endeavors. Some of his clients include: CIGNA, Deloitte & Touche, EMC, First Union, IBM, KPMG, Lockheed Martin, MITRE, NASDAQ, NCR, and PriceWaterhouseCoopers. Public sector clients encompass the Departments of Agriculture, Commerce, Defense, Energy, Health and Human Services, Justice,

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