

Teaching Knowledge Management in the Context of Information Systems Education: A Foundation for Educators and Curriculum

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Abstract

Knowledge Management is a current and important topic in Information Systems education. As the transformation of data into information, and information into knowledge enables the business organization to compete globally, teaching Knowledge Management concepts and technologies in the context of information systems is a challenging task. Knowledge is the catalyst of innovation in the new knowledge economy. 21st century knowledge workers will use knowledge to advance the competitive position of the business organization. This paper applies a relevant literature review in answering six foundational questions regarding Knowledge Management. This is useful to all Information Systems educators who are interested in the relationship of information systems to Knowledge Management.

Keywords: Knowledge Management, KM, knowledge workers, knowledge-based management systems

1. INTRODUCTION AND CONTEXT

This paper will answer six relevant questions related to Knowledge Management (KM). Presented as a qualitative study it applies a literature review as a foundation to the study and to support responses to the relevant questions. There has been a migration in the basis of the United States economy, and thus American society, from its early roots as an agricultural society to an industrial society, then to a technology society, an information society, and now to a knowledge society. Nasbitt and Aburdene (1991) suggest that the cycles are getting more rapid with each successive transition. This is evidenced by the long period of initial United States history that was characterized by an agricultural based economy and society, which was interrupted and replaced by an industrial society when Andrew Carnegie

capitalized on the invention of steel. This brought about the construction of the railroads, and other principal infrastructures and modes of transportation, ultimately yielding the military industrial complex, and the United States war machine that succeeded through World War II and on into the 1960s. On July 20, 1969, when the United States put a man on the moon, the space race marked the beginning of the technology age, with its relevant impact on the economy and society. In the early 1980s, the advent of the Personal Computer marked the transition to the information age and society; and in the 1990s, the ubiquitous access to the Internet, and proliferation of information systems with "knowledge applications" marked the entrance of the knowledge-based economy, the knowledge worker and the knowledge age.

The knowledge age is characterized by several elements that are dissimilar to the industrial age. First and foremost is the idea that the knowledge age is one that emphasizes that knowledge and creativity are the most valuable assets a society can possess (Knowledge Society, 2003). The industrial age, by contrast, would emphasize invention and craftsmanship as the most valuable assets. Social development strategies for building a knowledge society hold that knowledge is the most widely recognized key resource for development (Total, 2003). Alternatively, the industrial age maintained that money is the key component for development. Another key characteristic of the knowledge age is the social position of the knowledge worker. Drucker (1994) recognized the emergence of the knowledge society in the early 1990s, when he defined knowledge workers as not the "ruling class", but the "leading class" in terms of their characteristics, social positions, values and expectations. They gain their social status in the emerging knowledge age through formal education (Drucker, 1994). In the alternative, status in the industrial age was based on manufacturing and production prowess, where skilled labor and tradesmen were in high demand. Drucker (1994) points out that the number of blue-collar workers grew phenomenally in the first half of this century to the point where they represented the actual majority of the working population by the mid-1950s. The central workforce in the knowledge age, in contrast to the industrial age, is characterized by highly specialized, educated people.

Another interesting contrast between the knowledge and industrial ages is the focus of the knowledge age on teams within the business organization. Rather than the strict employee-boss relationship seen in the genre of industrial manufacturing and production organizations, because the work is knowledge-based, the organization is less about superiors and subordinates, but rather about cohesive and effective teams of specialists. Finally, the knowledge age is dependent on technology, whereas the industrial age was not. Information technology and communications infrastructure are the key components of an economy that constantly drives the value proposition from data to information to knowledge. In part, the basis of the knowledge age is intellectual

capital, with the other part being the technology infrastructures and tools that allow for knowledge capture and use. The industrial age failed to recognize the intellectual capital within the organization, and has no formal, technical means for capture, organization, and dissemination or sharing of knowledge. New visions of how the knowledge age is shaping a knowledge economy are seen in theories such as the "Weightless Economy", recently presented by Professor Danny T. Quah, Professor of Economics, London School of Economics and Political Science in a workshop titled "The Evolution of the Knowledge Economy" at the 2000 Asia-European Young Leaders Symposium IV. In his presentation, Quah points out the key drivers of the knowledge age are changing the nature of economics, as e-commerce through technology transparently drives across national borders in search of consumers.

2. WHAT ARE THE MODERN ORIGINS OF KNOWLEDGE MANAGEMENT?

Karl-Eric Sveiby began researching the idea of managing knowledge within organizations in the early 1980s, and published on the topic in 1986 with a book titled "The Know-how Company", which received the Swedish award for best management book in that year. Peter Drucker discussed the emergence of the knowledge worker and the knowledge-based society in the late 1980s and early 1990s, and the origin of the KM movement in the United States began about that time. American "gurus" of KM, such as Larry Prusak and Tom Davenport began to publish and present at conferences on the topic of KM. The globalization of information, worldwide computing and communication architectures, and the goal to achieve "knowledge-centric" organizations have been catalysts in the development of modern KM thinking.

The modern origins of KM can be parsed into two views, one being the "intellectual" origins and the other being the "practical" origins (Prusak, 2001). In the intellectual origins of KM, there are principally three foundations, which according to Prusak (2001), are (in order of impact) economics, sociology, and philosophy and psychology. The economic impact occurred as a result of trying to make manufacturing and production

processes more efficient, and to develop strategies to capture and pass on tacit knowledge and understanding. Sociology contributed to the modern origins of KM through the intellectual view by working to understand how an organization's internal communities and networks could be harnessed into productive knowledge structures within the organization. And thirdly, the intellectual foundation that came from philosophy and psychology was in the area of differentiating tacit and explicit knowledge, and how the "quality" of knowledge impacts KM. In Prusak's (2001) view of the practical origins of KM, he makes a distinction between three practices relevant to KM. The first is information management. Information is typically classified as documents, data, and structured messages. Information management is reliant on information technology to host and process data into information, and ultimately interface with the knowledge platform of the organization. It provides the underlying technology capabilities for the KM architecture. The second is the quality movement, and the subsequent techniques of quality management from which KM borrows its concepts of measuring success. Measuring success in a KM initiative is a similar challenge to what the Quality Management initiatives faced previously. And the third is the foundation provided by human capital. The recognition that investing in people through training and education can lead to an improved rate of return (through increased innovation and higher productivity) is one of the underlying assumptions of the KM movement. The concept of intellectual capital as a balance sheet asset for the organization has direct origins in the foundations of the human capital theory.

Initially, two tracks developed in an attempt to define KM. One track was an information technology (IT) track, and the other was a personnel management track. The IT track was characterized by a concentration on hard skills and a view of technology as a solution. The focus was on computer information systems where knowledge became an object on the network that could be queried and manipulated. Alternatively, the human track was characterized by a concentration on soft skills, with a focus on altering behaviors and skills through training and education to improve performance and pro-

ductivity. The view was that knowledge is a process of continual learning and development of "know-how" in the organization. Since its modern origins in the late 1980s and early 1990s, KM has experienced a shift through three distinct phases. The first phase looked inward in the organization and sought IT solutions to KM through the creation of best practices and improved productivity. The second phase brought in a customer focus to better learn about how to match supply with demand by knowing more about the customer. And the third, and current phase of KM evolution, is about interactivity among all components of the business organization, with IT infrastructure playing a key role in the process.

A chronological view of the modern origins of KM start in 1980 with computer components configured as expert systems. In 1986 Karl Wiig introduced the term "KM" at a major conference, and in 1989, large consulting firms began initiatives targeted at managing knowledge, with Price-Waterhouse being the first of the consulting firms to integrate the practice into their business. Ikujiro Nonaka and Hirotaka Takeuchi wrote one of the first premier articles on the subject in 1991, and Karl Wiig published the first book (KM Foundations) on the subject in 1993. The first KM conference was held in 1994, the same year that major consulting firms started offering KM as a business service. Through the later 1990s, KM received much notoriety in the business community, and by 2001 began to appear as mainstream conversation and practice.

3.0 IS KNOWLEDGE MANAGEMENT A FAD?

KM is a current business fad, but it is also much more. Clearly, the migration to a knowledge-based economy was foretold by such industry gurus as Peter Drucker, Karl-Erik Sveiby, and Karl Wiig. So the evolution of the value proposition offered by information systems to transform data to information, and then use analytics to transform information to knowledge, and thus create corporate wealth, is not a new concept in terms of the past decade of events. But as information systems, and advanced communications, have proliferated during the past ten years, a resurgence of interest in the study and discipline of KM has also in-

creased. It has been a trendy market strategy for business applications companies to rehash old or existing applications and reintroduce them to the marketplace as new KM applications.

In a recent thesis titled "KM: another management fad?" by Ponzi and Koenig (2002), the authors applied bibliometric techniques developed by Eric Abrahamson in the 1990s to determine if KM is just another business fad or is here to stay. Their conclusion in the study was that KM has survived the initial phases of life cycle development and is in prime candidacy to reach maturity as a full business discipline. So based on empirical research, the question of whether or not KM is a fad has been answered by Ponzi and Koenig (2002). In a 1999 article, Tod Newcombe offered three reasons why KM is a fad that will continue to exist, and probably grow to maturity. The three reasons according to Newcombe (1999) are:

- 1) The nation's economy is shifting away from the production of tangible products, such as steel, cars and soap, toward such intangibles as services and software. Companies that find knowledge and use it to their advantage compete better in the marketplace.
- 2) The workers who help create that wealth are no longer the loyal employees of yesterday. They switch jobs more frequently than their parents ever did. As a result, companies are turning to KM to capture worker knowledge.
- 3) There has been a growing realization that investments in information technology have not paid off in performance. What is absent is worker creativity and innovation fueled by knowledge.

When answering the question of whether or not KM is just a fad, or will survive in the long run, Meyer (1999), says KM must be linked to "action strategies". If left alone as a new, high-tech IT strategy, Meyer (1999)

believes that it will fail, but if mapped to process improvement it will deliver the results intended by the user. According to Abell et al. (2001), the practice of KM is growing. Evidence of the growth pattern is offered in the form of new company titles, such as Chief Knowledge Officer, Knowledge Capture Manager, and Information and Knowledge Engineer. Additionally, the authors cite examples of how companies are now routinely making the leap from innovation and idea to business process and product more quickly because of KM. Initially, KM was accused of being a far off, unachievable goal, but with current advances in information technology and communications, there is evidence that KM is here to stay and is making its way into the mainstream of business planning.

4.0 HOW HAS THE KNOWLEDGE MANAGEMENT MOVEMENT EVOLVED?

If the KM movement were parsed into the various paths it has taken, we would see that proliferation occurs where it takes the path of least resistance. Least resistance can be defined as those areas where evolutionary development has been cultivated, where an excellent infrastructure for KM exists, where cultural, organizational, and managerial climates favorable to KM exists, and where a Knowledge culture is valued. The explanation of why differences in the KM movement exist geographically can be articulated through the measurement of these least resistant definitions within the context of the specific geographical areas. By first looking at the KM movement in North America, specifically the United States, we can create a baseline for comparison of the movement in the major geographic areas of Europe, Japan, China, and finally a global perspective.

4.1 Knowledge Management in North America

Much of the KM movement in North America, and specifically in the United States, is driven by how closely the corporate culture of the organization lends itself to the concepts and goals of KM. In North American business culture there is great value placed on exactness and precision, not only in the business planning process, but in the execution of strategies and initiatives to meet the business goals. Conceptual knowledge is

valued in that businesses create models, and use conceptual knowledge frameworks, to implement business strategies and conduct business planning. The methodology of implementation is through systematic techniques, processes, and system design methods using well developed information and operations science. North American business has evolved through management science with many of the leading management scientists, such as Peter Drucker and Frederick Taylor, laying the foundation for management as a principle technique of business processes and strategies. Now with KM as a principle management strategy, we see the United States as a leader in managing knowledge. With a significant focus on management, the evolution of management concepts and strategies are more broadly accepted within the North American business community, and thus the move away from the hierarchical culture of management to the knowledge culture of management is an easier transition. So it is significant that the organizational culture of business in North America is more conducive to acceptance of KM practice. KM, in North America, has always been linked to the concept of intellectual capital. According to Feiwel (1975), the term "intellectual capital" was first used by John Kenneth Galbraith in a letter to economist Michael Kalecki. More recently, Stewart (1991) made intellectual capital an attribute of the organization. Sveiby (1998) calls intellectual capital and KM two branches of the same tree. When discussing how Western organizations need to unlearn their view that KM is about explicit knowledge, Takeuchi (1998) points out that the focus for KM in the West has traditionally not been on tacit knowledge, but on measuring and managing existing knowledge, and a small number of KM initiatives. He goes on to say that Western business needs to refocus on tacit knowledge, knowledge creation, and a having total organizational involvement in the KM process.

4.2 Knowledge Management in Europe

The modern era of KM had early beginnings in Europe. Sveiby began much of the early thought of the movement in Europe with his writings on the "know-how" company. Europe lacks much of the infrastructure of the capitalistic enterprise by way of management focus on precision planning and

systems and operational science. But by way of merely understanding the inherent value of knowledge philosophically, they may be more advanced than the North American movement, and are certainly ahead in their ability to measure knowledge. The origins of the KM term and movement in Europe, according to Sveiby (2001), were seen in the titles of some works published in Europe around 1992-1994 by researchers in Holland. Early writings using the term KM in the United States emerged around 1994, so the movement has roots in Europe that pre-date those of North America. Sveiby (2001) believes KM has been going through phases of maturity, with the maturity cycle further along in Europe than in other parts of the world. The clear focus on being able to measure knowledge is a departure from the focus on managing knowledge in the United States. Further evidence of this is seen in United States commercial applications of Enterprise Resource Planning suites of products that include Customer Relationship Management (CRM) software. Takeuchi (1998) points out that European business has a lead position in developing measurement systems for intellectual property. European companies report their intellectual assets through the concept of "structural capital", which encompasses plant and facilities as well as customer relationships and intellectual property.

4.3 Knowledge Management in Japan

The KM movement was first evidenced in Japan in 1980 with the writings of Hiroyuki Itami in his publication titled "Mobilizing Invisible Assets". By the mid 1980s, Ikujiro Nonaka published "The Knowledge-Creating Company" that elaborated on how Japanese firms used KM to accomplish innovation through the capture of both tacit and explicit knowledge. One of the main differences in how the KM movement has evolved in Japan is through the valuation of explicit and tacit knowledge. Explicit knowledge, in the Western thought, is easier to quantify and manipulate because of the ability to create taxonomies for the data, store it in relational data structures, and use computer technology to advance the value proposition of data to information to knowledge. Tacit knowledge, on the other hand, is predicated on a personal view of the individual. Takeuchi (1998) declares this as the Japanese intel-

lectual tradition that has a strong emphasis on the "whole personality", or the encapsulation of what a person knows with what they believe, perceive, and otherwise transcend out of the cognitive realm. The philosophical difference of how the importance of tacit knowledge should supercede the importance of explicit knowledge is one of the main differentiators between Japan's view of KM and the rest of the world's view on it. According to Takeuchi (1998) there are few visible signs of progression in KM in Japan. Since the Japanese cultural believes that knowledge resides in people who have on-the-job knowledge, the idea of capturing knowledge in computer database systems is contrary to Japan's method of innovation. Nonaka and Takeuchi have published on the topic of knowledge creation, but their contrary view of KM is reflected in Japanese business. Nonaka promotes the idea of companies having "slack" time in order to remain creative and innovative. The distinction in the Japanese view of and progression to KM can be seen in the cultural antithesis to Descartes, who brought the concepts of cognitive knowledge and scientific method to the West. Thus a focus on tacit knowledge in Japanese society may be one of the prime inhibitors to the advancement of KM in that country.

4.4 Knowledge Management in China

As a country engaging in the journey to a knowledge economy, China has tremendous potential to be recognized as a major force in the movement. Drucker (1997) declares that the world now depends on a strong China. There is currently strong interest in participation in the knowledge economy in China, and there is anecdotal evidence in published reports (Mulan, 2000) that China is now laying the foundation for a knowledge economy. Although there is little direct insight into the state of China's KM movement, there is evidence that China is engaging in the movement. According to Amidon (1998), China is developing quickly through an industrial economy and is systematically studying the implications of the challenge to become a knowledge economy.

5.0 IS KM AN OBJECT, A PROCESS, OR BOTH?

KM is both an object and a process. The evolution of the KM discipline took two dis-

tinct paths. One path was the view of KM as a product, or outgrowth, of Information Technology (IT). In this view, the value proposition of the "data centric" organization, as described in the Zachman Framework (Inmon and Zachman, 1997), is to relinquish the small repositories, or stovepipes, of information within the organization and move the organization to one central, main repository of data. This allows the transformation of data into information, and information into knowledge, where knowledge is defined as an object (generally in the database) that represents the attributes of knowledge. This object can thus be queried or manipulated, and is further associated with "learning objects" and "mapping" techniques as tacit knowledge is quantified, documented, and aggregated. In viewing KM as an object, there is considerable reliance on the IT infrastructure. The line between information and knowledge is blurred, and in fact, information can be misconstrued as knowledge. IT applications offer the opportunity to "collect" and "connect", as the terms are coined, to knowledge that has been embedded in documents, object models, and applications. This collection technique assumes that tacit knowledge can be embedded, or associated, with objects that reside on the IT network. The ability to connect to others and share significant knowledge through the IT infrastructure is the other opportunity that exists in the object view of KM.

The view of KM as a process is taken from the "people" side of the equation, meaning that KM can be viewed as a way of organizing, educating, and managing people to put in place processes which lead the goals of KM. KM as a process is not as "tidy" as that of KM as an object, because the object is defined and quantifiable, and process (particularly people processes) resides in shades of gray where management competencies and strategies rule. It also tends to be a dynamic environment rather than a more static technology environment. Central to the processes that can be defined as KM is the link between KM and business strategy. The idea of creating learning organizations and managing their knowledge creation processes is a completely different view of KM than that of the computer people who are looking for a technical solution for the problem of timely delivery and application of

organizational knowledge and business intelligence. Initially, KM looked at intellectual capital from the position of managing and measuring knowledge related competencies, and not much attention was given to knowledge generation and learning. Significant work on intellectual capital and organizational knowledge by Miller (1996), Sveiby (1997), and Evinsson & Malone (1997) in the late 1990s evolved in parallel with business strategists who focused on analyzing corporate strengths and weaknesses and optimization of corporate resources. The merge point became the view of the successful corporation as one run by knowledge-based management. Tuomi (2002) supports the view of KM as a process by saying "knowledge acquisition is always a learning process". The technology view of KM drives knowledge into the view of knowledge as an object resident on the infrastructure of an IT network. The human capital view of KM drives knowledge into the view of knowledge as a process that is designed and managed from intellectual capital found on the information channels and communities of knowledge within the organization.

6.0 WHAT ARE THE MAJOR DIFFERENCES BETWEEN INFORMATION MANAGEMENT AND KM?

KM is a much broader topic than Information Management (IM). IM can be concluded to be a subset of KM in that IM is an enabler of the larger superset of KM. When considering the transformation provided by the Information Technology value proposition of changing data into information, and then by applying analytics, changing information into knowledge, IM is focused on the technology and process to facilitate the application of analytics for the purpose of distilling knowledge. KM is a broader concept because it not only includes the results (objects) of that distillation process, but includes the infrastructure and process for capturing tacit knowledge and creating new knowledge. IM generally focuses on the capturing and processing of data and information via paper or electronic modes. KM, on the other hand, generally focuses at the resource level and the advancement of an environment that serves as a catalyst for new thinking and innovation. IM presents itself as both a strategy, driven by customer requirements, and a (generally) technical infrastructure, for

processing and disseminating information. IM is interdisciplinary and can transcend administrative boundaries (USGS, 2003).

KM characteristics include broader concepts such as collaborative partnerships inside and outside of the organization, content management focus rather than people management focus, and the development of a learning organization (Abell et al., 2003). The KM environment utilizes a broad range of communication techniques, and strives to embed a philosophy of knowledge sharing among the divisions of the organization. Another view of KM is the view of it as the cultivation, valuation and management of knowledge capital. Strassmann (1999) provides a formula for calculating knowledge as an asset that can be posted to the balance sheet. He suggests that Knowledge Capital = management value-added / price of capital. As such, this becomes a prime differentiator between IM and KM, in that information (in the capital asset sense) has not been suggested as a balance sheet item.

7.0 WHAT IS MEANT BY INTELLECTUAL CAPITAL OR KNOWLEDGE CAPITAL?

Intellectual capital is an intangible asset that can account for much of the difference between the book value and the market value of a corporation. It can be defined in the know-how of an organization. Awareness of the importance of intellectual capital began to grow in the mid-1990s. Intellectual capital often includes the knowledge that employees possess. An intellectual asset is a specific part of the know-how of an organization (Turban & Aronson, 2001). Ulrich (1998) defined intellectual capital as an individual's competence and commitment to contribute to the corporate goals. In other words, an equation such that intellectual capital = competence x commitment. Another view, posed by Alavi and Leidner (1999), is that intellectual capital is a personal belief that improves a person's capacity to be actionable. Actionable items include psychomotor skills and competencies, as well as cognitive processes and activities. These observations point to the meaning of intellectual capital as specific knowledge that resides in a person, and not in a collection of data or information. Knowledge capital is a slightly different concept. Knowledge capital exists in two ways: first, within the minds of

people in the organization who know something useful that will make the organization more productive; and second, as content that is the formal expression of knowledge (McGovern, 2001). According to Davenport and Prusak (1998), knowledge is derived from information, and information is derived from data, so knowledge capital is information in action. Some view it as information in context. Knowledge capital must be exchangeable between persons, and it must be able to grow. Nonaka and Takeuchi (1995) believe that many details of intangible knowledge assets are overlooked, including insights, intuitions, "gut feelings", values, affective beliefs, and analogies. Although knowledge capital is also an intangible asset, it is further distinguished from intellectual capital in that it is the focus of a management discipline, that being KM. Whereas intellectual capital is viewed as a commodity to be assessed and quantified for the balance sheet, knowledge capital is approached from the standpoint of management process. Barriers to knowledge capital include lack of process, disjointed infrastructure, and poor management. Barriers to intellectual capital include the quality of intellectual assets, and the inability of the organization to adequately utilize the assets in a synergistic fashion.

8.0 SUMMARY AND CONCLUSIONS

The evolution and maturity of the KM movement is distinctly different in the various regions of the globe. Several factors influence the state of the movement in each region with origination and cultural or societal factors being chief among them. Sveiby (1998) points out that KM had early beginnings in Europe and Scandinavia, with a focus on the metrics for measuring and reporting intellectual capital and assets in business. With a strong focus on scientific method and the technological ability to store and manipulate data, Western countries have pursued explicit knowledge and have worked to manage knowledge through scientific and technical means in order to advance the use of knowledge in the knowledge economy. Western companies, according to Takeuchi (1998), are fueled toward the KM movement by a shift to knowledge as a basic resource, a shift to knowledge-based industries, and a shift to growth as the top managerial priority. Japan has held back because

of cultural philosophical differences in the view on the importance of explicit and tacit knowledge, and the view of the "whole organization" and the "whole personality". Even though there is merit to the thinking that tacit knowledge is the "real" knowledge, the technical ability to capture, classify, and manipulate tacit knowledge is a great inhibitor and is thus reflected in their view of incorporating KM into the business enterprise. China represents the great variable. As a country that has demonstrated its ability to bootstrap into a global economic presence, it is probably the most interesting region to watch as it is clearly laying the foundation for its knowledge economy.

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