Knowledge management(s)

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Abstract

This article reviews developments in the field of applied knowledge management dating from 1990 and argues that a fragmented mosaic of programs and problematics currently exists, at various levels of incompatibility. Using a software product, we map the information space around applied knowledge management as an illustration of this basic fact. We then describe a research program that extends this logic and develop a model on four dimensions that appears to order the various programs, practices and processes in this divergent field. Implications for managers of knowledge management initiatives are discussed, and avenues for future research suggested.

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> Quick – in 25 words or less, define knowledge management. Can't do it? You're not alone.

This was the clarion call sounded by a business editor in 1995 who (like most business editors) continued by saying that despite its unruly nature, knowledge management was certain to become a dominant issue[1]. And so it has. A quick tour of the ABI/INFORM database reveals that the number of new KM articles has, on average, more than doubled each year over the past decade[2]. If the exponential growth dating from 1995 continues, we will soon have little else on the business bookshelf (Figure 1).

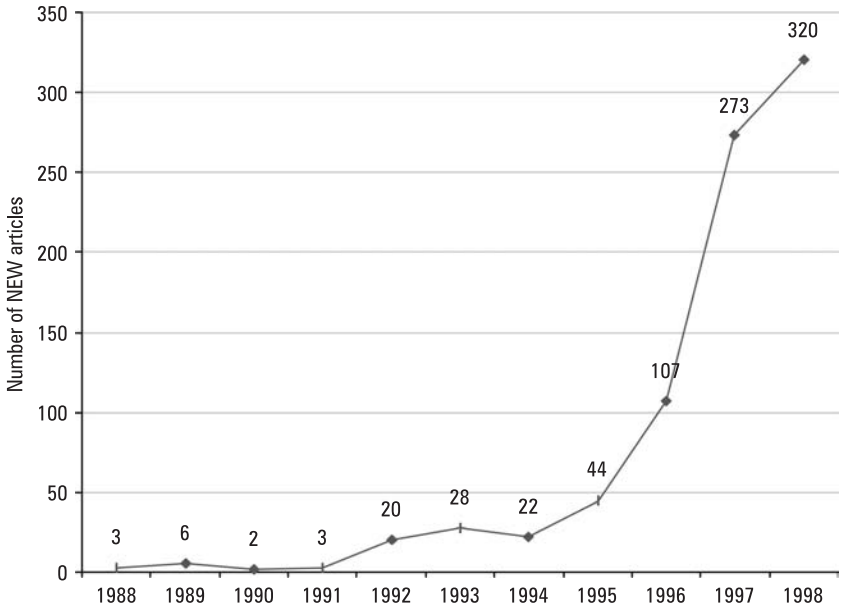
In some ways this is already the case. The fast-breed "knowledge management" now crowding our required reading lists is the popular outgrowth of a cognitive science that underwrites much of this century's intellectual agenda. To make the case that brains are useful metaphors for organizations, for example, Morgan (1986) roots his discussion in cybernetics and self-correcting systems (Wiener, 1961) information processing (Galbraith, 1977; Simon, 1945) and organizational learning (Argyris and Schön, 1978). Each of these is firmly installed in contemporary mindsets and anything but a quick-burn business fad.

But there is little comfort in noble descent. Knowledge management is clearly on the slippery slope of being intuitively important but intellectually elusive:

- Important because, "With rare exceptions, the productivity of a modern corporation or nation lies more in its intellectual and systems capabilities than in its hard assets ..." (Quinn *et al.*, 1996).
- Elusive because, "To define knowledge in a non-abstract and non-sweeping way seems to be very difficult. Knowledge easily becomes everything and nothing" (Alvesson, 1993).

The field is rife with this "everything and nothing" dilemma. Knowledge management is variously at the center of global economic transformation (Bell, 1973, 1978) organizational success (De Gues, 1988) the eventual demise of private enterprise capitalism (Heilbrunner, 1976), new forms of work and the forthcoming paradigm shift from InfoWar to Knowledge Warfare (K-Warfare) (Baumard, 1996). Competitive advantage is located in "learning organizations" (Mayo and Lank, 1994; Quinn *et al.*, 1996; Hedlund, 1994;

Figure 1 Keyword "knowledge management" in the ABI/INFORM database, 1988-1998



Mills and Friesen, 1992), "brain-based organizations" (Harari, 1994), "intellectual capital" (Stewart, 1994) and the "economics of ideas" (Wiig, 1997). Knowledge has assumed this centrality in conjunction with sweeping changes in organizational forms[3] and the dawning post-industrial and information revolutions (Bell, 1973; Postman, 1993). We find it difficult and we believe most people find it difficult to weave these trajectories into a coherent message.

Emerging phenomena are fuzzy phenomena, particularly when their importance is fundamental, and knowledge management is among the fuzziest to arise in recent times. There is neither agreement nor clarity on what, exactly, constitutes the concerted effort to capture, organize, share and transform the knowledge that is considered important to a corporation. Instead, there exists a patchwork of subdomains that deal with one aspect of the problem while ignoring others. Most, for example, would agree that terms like intellectual capital, intellectual assets, knowledge resources, information management, learning organizations and organizational learning are vague at best. This is to denigrate neither serious works nor those that delimit their purview (see Hedlund, 1994) but rather to suggest that the domain of knowledge management is pre-pre-paradigmatic in the sense that a fragmented mosaic of views exists within the general framework of an emerging cognitive science. Things are far from certain. One part of the problem is so basic as to stem from the definition of knowledge itself. Another is that this field offers neither the principles nor the models that anchor thinking and practice in any domain. The resulting fluster is remarkably similar to organizational culture's struggle with conceptual clarity during the 1980s which has been likened to the allegory involving an elephant and the truth-seeking blind. But if one takes a meta-analytic view, the design requirements for these principles and models begin to emerge, and the practical implications become clearer.

Mapping an information space

It is a truism that humans seek order in nature's confusion (some believe we simply create the illusion) and various means have been developed to do so. One, which is the focus of this article, are those maps that trace a proximate environment and fix our place in it[4]. The online wwWebster dictionary[5] informs us that maps are first and foremost representations that clarify matters. It is in this spirit that we set TriVium's Umap[6] to work on the field of knowledge management. Umap is a software product that develops conceptual maps of an information space by grouping data elements according to the logic of a proprietary technology that manipulates the frequency and proximity of words. The output is a map in the form of a tree (trunk,

Journal of Knowledge Management
Volume 3 · Number 2 · 1999 · 110–120

stems, branches) which groups or separates data elements based on their similarities and differences. If one applies Umap to the Internet using the keywords "knowledge" and "management", the representation in Figure 2 appears.

We have overlain our interpretation of the thematic elements in this map and circled their corresponding regions. Some interesting issues result for those involved with the chaotic field of knowledge management:

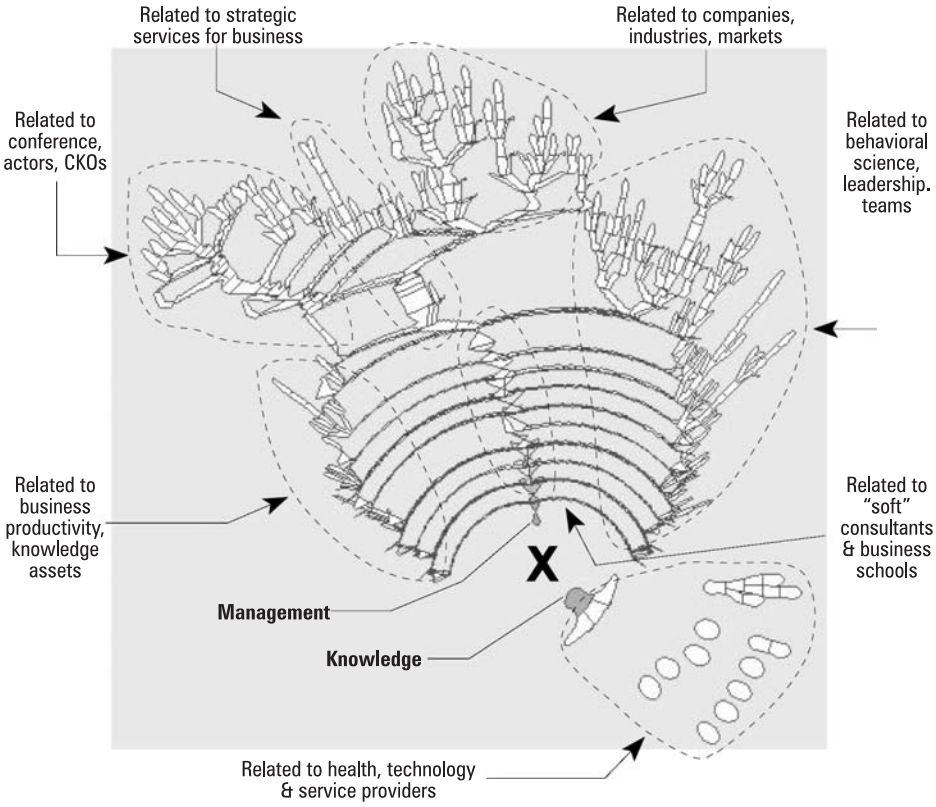
- The user is situated at point **X** by Umap: segments of the map closest to the concerns of the individual (knowledge and management) are said to be most relevant.
- The program generates six major clusters of information.
- There are many more sites related to "management" than to "knowledge".
- Sites dealing with productivity and knowledge assets are related to, but significantly separated from, sites relating to behavioral science and human resource management.
- Institutions of higher learning and consultants tend to group together, and are closely linked to strategic services for business.

If one manipulates Umap to generate finer distinctions by exploring the nodes that stem from the keyword "knowledge", a refined cartography produces the information in Figure 3:

- cancer, art and IBM reportedly have a relationship with knowledge;
- geography and knowledge are somehow related (Illinois, Hong Kong);
- a set of service providers are closely associated with the keyword knowledge Fulcrum, Delphi, ServiceWare and so on.

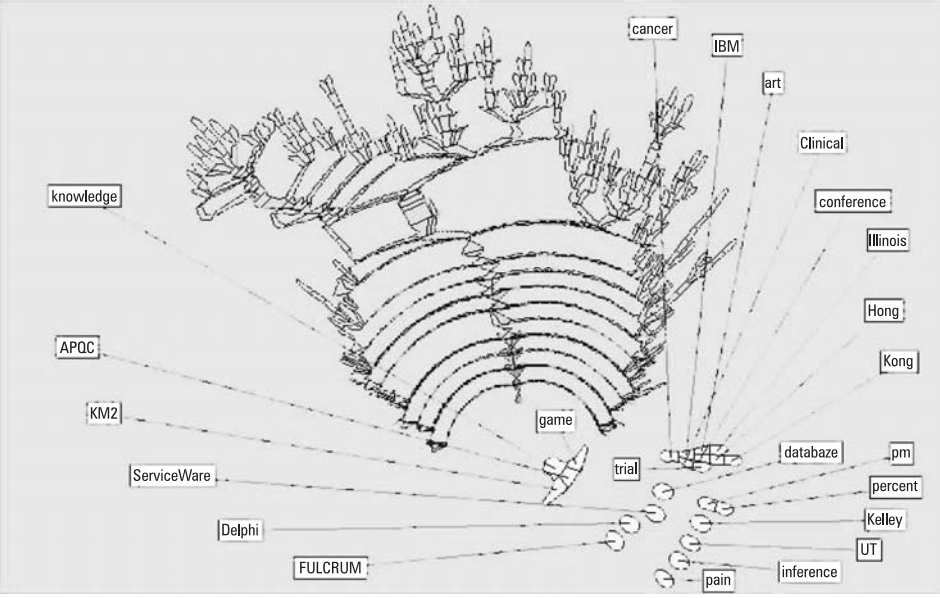
Observations like these are divergent in nature: they generate questions, suggest options and expand the feasible horizon. This mapping of the knowledge management information space also begins to illustrate some of the convergences and divergences in this field. It is anything but homogeneous.

Figure 2 A Umap representation of keywords "knowledge" and "management" in a limited number of Web sites



Note: Each segment of a branch represents an Internet site.

Figure 3 Detail of the Umap representation



Mapping knowledge management

These Umap maps are but two examples from the broad-band research that we employed to create another chart of this field. Beginning in September 1997, we undertook a research program that explored the various aspects of applied knowledge management in three types of literature: academic, consulting and practitioner. Meta analytic by design, the research aimed to "make sense" of the many, often disparate positions and problematics in knowledge management. Approximately 500 paper and electronic texts formed the core of our analysis, accompanied by interviews with executives and consultants. This initial phase of work reached into many of the fields that are either foundational to, or closely allied with, knowledge management:

- management;
- economics;
- organization theory;
- strategy;
- human resource management;
- cognitive psychology;
- epistemology;
- the sociology of science;
- creativity;
- information science;
- information systems.

Examples of conclusions tentatively drawn during this phase of work are included below.

The corporate domain

- Companies that implement knowledge management do so in a variety of ways, ranging along certain dimensions:
  - Knowledge as a variable of the firm, versus knowledge as the firm itself.
  - Fundamental and strategic commitment, versus fad followership.
  - As a change vehicle, versus strengthening existing arrangements.
  - Through and primarily based on technologies (typically electronic), versus people.
  - Knowledge as a source of innovation, value creation.
  - A new approach to human resource management: individual responsibility for knowledge sharing and learning.
- There is growing impetus to move from "knowledge management" to "intellectual capital". This is usually an attempt to clarify real and intended contributions to the bottom line. Much of the field is also moving towards the delineation of best practices in various contexts.
- Knowledge bases and Intranets are among the most popular ways of implementing knowledge management. Typically an attempt to share knowledge in the company, there are typically few questions on what knowledge is being

Journal of Knowledge Management
Volume 3 · Number 2 · 1999 · 110–120

shared, if it is being shared, and control structures around the process.
- Document management is used synonymous with knowledge management by certain companies. This is typically a response to organizing and systematizing access to exisiting knowledge in a company.

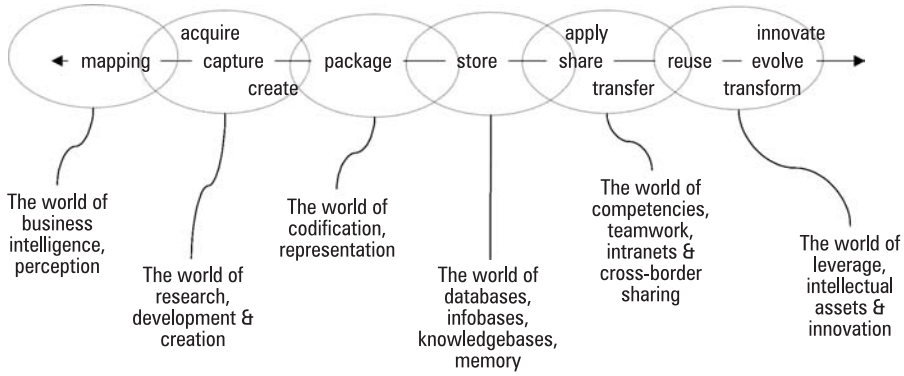
The consulting domain
- Most consulting firms are moving aggressively into the field of knowledge management. Many of the larger firms have implemented substantial systems for managing their own stock of knowledge, and are often cited as leading examples.
- Different consulting firms approach knowledge management differently and several distinct categories are in evidence:
  - Human structures and systems: pertaining to teams, interpersonal dynamics, creativity, innovation.
  - Organizational systems and structures: generally aimed at networked organizing forms.
  - Technological systems and structures: most often relating to electronic networks, forms of groupware/group work, and distance working
  - Strategic services: aimed at redefining the corporate mission, realigning activities, redesigning core processes.
  - External services: consulting firms that provide business intelligence/information services for purposes of marketing and strategy.
- There is a growing tendency among consulting firms to customizie and/or specialize their KM services, often by developing best practice methods specific to a particular industry.

The academic domain
- Much of knowledge management displays the characteristics of a quick-burn business fad, but the underlying dynamics are durable. The psycho/social/economic foundations and their future trajectories seem clear.
- The majority of popular and even serious works on knowledge management ignore a theory of knowledge ... that is, they fail to define the thing they deal with. There is, however discussion of the nature and treatment of knowledge. It is nonetheless possible to identify an implicit theory of knowledge in such works and, in general, there are significant differences between academics and managers in this regard.
- The bulk of academic/practitioner literature on knowledge is case-based and anecdotal, e.g. pre-paradigmatic. There are few viable attempts to develop a knowledge-based theory of the firm. Conceptual development is haphazard in that it springs from a variety of sources: economics, sociology, organization, management, psychology, etc.
- The term intellectual capital denotes an emerging trend to introduce the measurement and evaluation of intellectual assets. The newest concepts, "information ecology" and "knowledge ecology" take into account the environment or context of knowledge.
- The literature tends to present an assortment of research on various aspects of knowledge management: knowledge sharing, knowledge creation, knowledge transfer etc.

A second phase of work, begun in January 1998, sought to find or develop a meta model of applied knowledge management. As indicated above, the programs, practices and models of action that are typically promoted in this literature are numerous. Our review indicates that several distinct approaches to applied knowledge management now exist at various degrees of incompatibility. Since none presented the overview we sought, the task became one of identifying the dimensions that underlie the thinking in this field (the epistemological primitives) and assembling these into a classification system or taxonomy. Our work in this regard indicates that four dimensions underlie much of the current thinking:
(1) time;
(2) type;
(3) level;
(4) context.

Time
Various strands of the cognitive sciences have untangled the complexities of their subject by outlining a process of cognition ... that is, the critical steps and elements that lead to the accomplishment of some act. If we extract a synthetic process appropriate to the concerns of knowledge management, it is possible to specify an event chain that from a linear and structural perspective appears as in Figure 4.

Figure 4 A knowledge management event chain



While this representation greatly simplifies the interconnected and multiply-causal nature of cognition, it appears to fit many of the issues addressed in this field. We have defined six key events in the process:

(1) *Mapping* – Individuals and organizations function within information environments of their own making. Most of us agree with the truism that we scan for information but fewer acknowledge that, first these environments are actively constructed and second, they are multiple not singular. This has important implications. If a formalized business intelligence system monitors Environment X, for example, the weak signals in Environments Y and Z are likely to be absent from the radar screen. Recent history suggests that this can be disastrous. There is a balance to be struck between divergence (which can be costly) and convergence, which focuses attention on a delimited field.

(2) *Acquire/capture/create* – From these information environments we appropriate information or combine the elements that are judged valuable. This has feedback and feedforward loops with the Mapping phase since much of what people search for at Time1 is what they expected to find at Time2. No surprise to fans of DeBono and other original thinkers, a large part of the creativity literature is centered on developing new inputs during this phase by opening horizons in the former. A significant body of research that investigates the filtering and distortion of information, which is pertinent to this phase, is also finding its way into knowledge management.

(3) *Package* – At a mundane level this involves the media that bundle information: paper, electronic, voice, multimedia and so on. There is obviously much to be said for the effective packaging of information at this level. More important, however, is the matter of codification and representation. Before information can be transmitted it must be codified by the author (who seeks to infuse it with meaning) and once this is accomplished, a representation is launched into a public space. Characters on a page, numbers, maps and balance sheets are all representations. The critical issue, of course, is the meaning that one extracts from them and this is anything but a given. This phase is founded in the semantics and semiotics of communication.

(4) *Store* – Individuals and organizations stockpile information in memory systems of various kinds. These range from the mysterious chemistry of synaptic response in the brain, to recipe cards, hard disks, filing cabinets, libraries and data warehousers. The identification and retrieval protocols associated with stored information are equally important: little benefit is derived from information that exists but cannot be accessed. Some of the origins of applied knowledge management are located in this phase (data warehouses, search engines) and the focuses of work appear to remain technology-dominated.

(5) *Apply/share/transfer* – Implicitly, the field of knowledge management recognizes that information is inherently social. There is, in fact, no way of recognizing a stimulus as information or knowledge outside a social (not a psychological)

Journal of Knowledge Management
Volume 3 · Number 2 · 1999 · 110–120

process of some kind. This means that knowledge must be communicated and the many forms and functions of this basic fact abound in the literature: knowledge cafés, groupware, virtual teams, communities of practice, and so on. The field is also beginning to validate the notion that the value of knowledge is known only through action.

(6) *Innovate/evolve/transform* – Finally, knowledge must evolve in step with changes in the environment, else it risks losing its value. This implicates product development programs that build on experiences in the marketplace, R&D processes that adapt basic science to a product's needs, creativity processes that broaden intellectual horizons and so on. In the language of systems theory, the issue is change: the extent to which an individual or organization is satisfied to remain in stasis.

Type

The field of knowledge management struggles with the fact that knowledge is not a simple, stable quantity. There are, in fact, philosophies and sociologies of knowledge devoted to understanding the root phenomenon. One perspective in the philosophy of knowing, for example, makes the following distinctions:

- Knowledge: a person knows that X is true.
- Information: a person recognizes X as information.
- Competence: a person is able to accomplish X.
- Acquaintance: a person is familiar with X.

These are clearly not the same thing, yet there is little express acknowledgement in the field that the concept of knowledge is multiplex rather than singular. Currently, the most prominent distinction with regard to types of knowledge is that of Tacit and Explicit. This has a long and respected history in the philosophy of knowledge (Polyani, 1962) as well as more recent works in the field of expert systems and organization theory. The importance of Tacit and Explicit knowledge is also increasingly recognized by managers and the subject of discussion within knowledge management. For these reasons, as well as its parsimony, we included this basic distinction in the taxonomy.

Level

Libraries of literature have distinguished three levels of social aggregation: individuals, groups and organizations. Business management has adopted this thinking since its inception. Individuals are the fundamental reality of organization and this is particularly true in knowledge-intensive systems that draw their primary resource from the individual. Individuals accomplish work with and through others: groups confer an identity, physical and psychological resources, organizational power, a sensemaking ground and so on. Organizations are complex systems in which individuals and groups are the foundational elements.

Even a quick review of the knowledge management literature reveals that all three levels are the object of programs and problematics. Some KM applications seek to relate each of the levels while others work exclusively within only one. Separating matters at the level of individuals, groups and organizations provides greater clarity and disentangles the various approaches to applied knowledge management.

Context

People and groups work within a company context ... or so they believe. It is true that humans think and act within a context, but also that first, their thinking and action create that context and second, the identity boundaries we fix around legal entities are social fictions contextually speaking, given the wide-ranging work interactions we all have. This is a complex and subtle matter. The importance of an organization's culture, for example, is increasingly cited in the KM literature relative to the expectations that lie therein and the systems and structures it animates.

A deeper importance lies in the seldom acknowledged reality that nothing has any meaning outside of a context. That is to say, black has no meaning apart from white; neither has any meaning apart from a color scheme; color schemes are inherently culture-bound and so on. The relevance for KM is that a datum may or may not be meaningful as a consequence of its context. The implication, which has anecdotal support in the KM literature, is that initiatives should begin by specifying their meaning-making context(s) and build from there.

Journal of Knowledge Management
Volume 3 · Number 2 · 1999 · 110–120

Navigating a map of knowledge management

Assembling these dimensions creates a taxonomy or map that appears to position most of the practices that companies, consultants and academics are applying in knowledge management (Figure 5). Each cell in this 3X5 matrix (which we will call the Map) is partitioned to include both Tacit and Explicit knowledge, and the overall framework is embedded in a context whose definition is contingent on the purposes of the analysis. One value of this classification system is that its dimensions appear to embrace the various discourses that exist in applied knowledge management today. As a corollary, the similarities and differences among these discourses are identifiable.

We present an example using vignettes of three companies that are publicly available: Dow, Hughes Space Communications and Buckmann Laboratories.

Hughes Space Communications

Hughes conducts highly specialized work with employees of high technical qualification. According to Arian Ward, Leader of Learning and Change (Ward and Leo, 1996), the company suffered from islands of knowledge: "We want to link our islands of knowledge, and we call our linking efforts the 'Knowledge Highway'. Our Knowledge Highway is a human network that is supported by technology when practical." This includes a systematic way of capturing and sharing knowledge through a knowledge base, news group archives, a yellow pages, the mapping of internal knowledge and efforts to link people.

Dow Chemicals

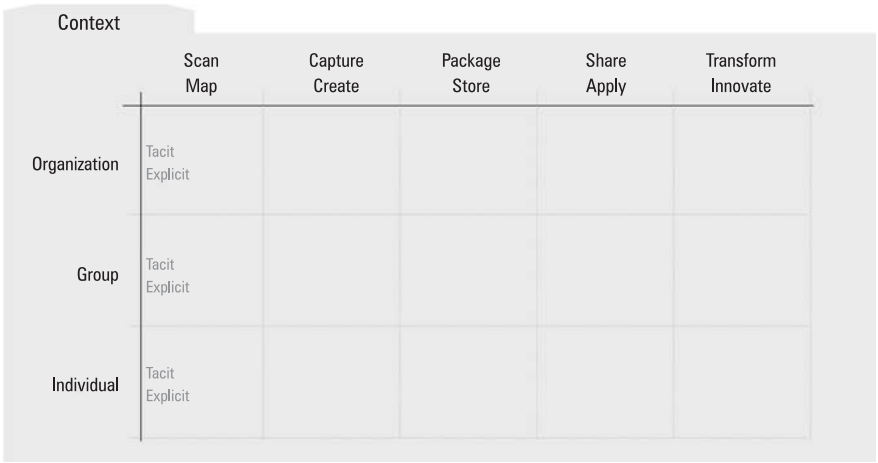
"There are obvious reasons why a company, such as Dow, that expects to earn a high income through licensing its technology would want to systematize information on patents, make that information accessible not only to research and manufacturing, but also to the marketing staff" (Mullin, 1996). Dow is frequently cited for its "Patent Tree" which maps the dominance, breadth of coverage and opportunities in a business area *vis-à-vis* the patents held in the company. This also investigates which competitors and inventors are active in the area and is evolving into a "Knowledge Tree" that includes other intellectual assets

Buckman Laboratories

Buckman found that its average employee spent 80 percent of his/her time with customers. Its KM effort seeks to focus the full weight of Buckman's collective expertise on customer requirements. The company has shifted from centralized management to a customer-focused culture based on knowledge sharing. It is stated that the power of the organization resides in the minds of its people. Buckman has implemented a worldwide intranet (K'Netix) that facilitates the sharing of knowledge and experience, encourages employee inputs, records problems and solutions to develop a continuously-updated knowledgebase.

There are overlaps in the activities of these companies and it is certainly true that we have

Figure 5 A taxonomy of applied knowledgement management on four dimensions



Journal of Knowledge Management
Volume 3 · Number 2 · 1999 · 110–120

stylized their knowledge management efforts, but it is also true that notable differences exist in the way each is implementing its programs (Figure 6). The Map makes these differences apparent: if it fairly represents the scope of programs and problematics within applied KM, companies like Dow, Hughes and Buckman are clearly making choices. Be they implicit or the result of open discussion, decisions are made that lead companies to navigate in some parts of the KM domain while neglecting others. This has merit from the perspective of adapting programs to a company's specific needs, but it is less desirable if such decisions are made on the mistaken assumption that some part of the Map (such as the ubiquitous intranet) is the domain itself. Likewise, one is able to map the offer from service or product vendors in the field (Figure 7).

By plotting various KM activities in the Map it also becomes possible to define certain regions of practice that cluster various practices and processes in the field. We have tentatively identified seven such regions, corresponding to Figure 8.

These regions appear to be the fuzzy sets that characterize the real world of applied knowledge management since few companies or vendors restrict themselves to the boundaries of a single cell. Each cluster illustrated in Figure 8 is obviously impoverished in relation to the variety of terms and technologies implied, but the areas of activity within the Map appear to be valid. The conventional wisdom reported by KM practitioners and managers is that companies most often follow a developmental sequence when implementing a project. They typically gravitate to some region of the Map based on a perceived deficit or strength, and address the problem or opportunity through a KM initiative of some kind.

Figure 6 A map of KM programs and practices

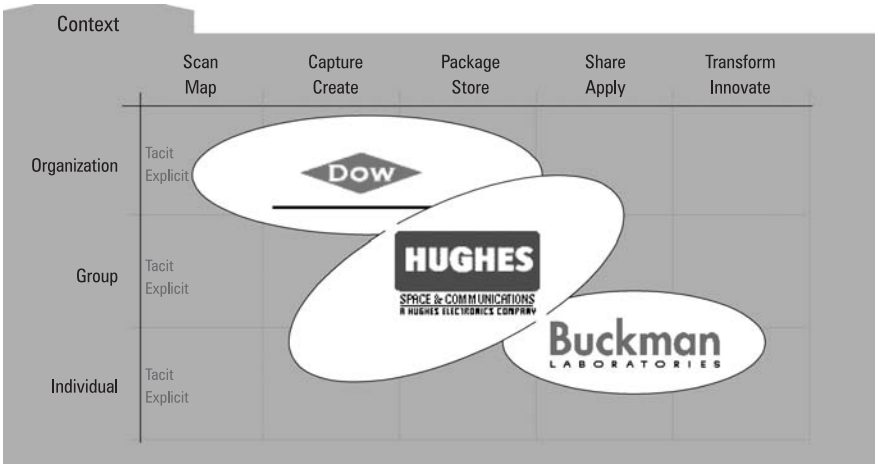


Figure 7 A map of KM products and services

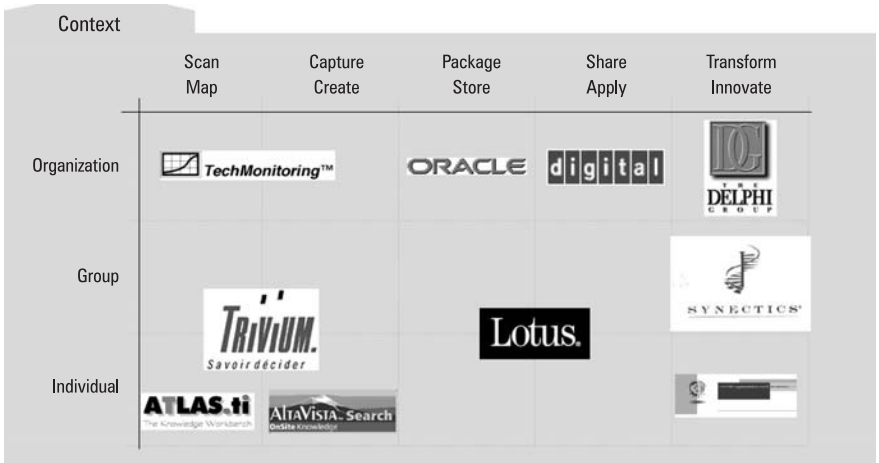
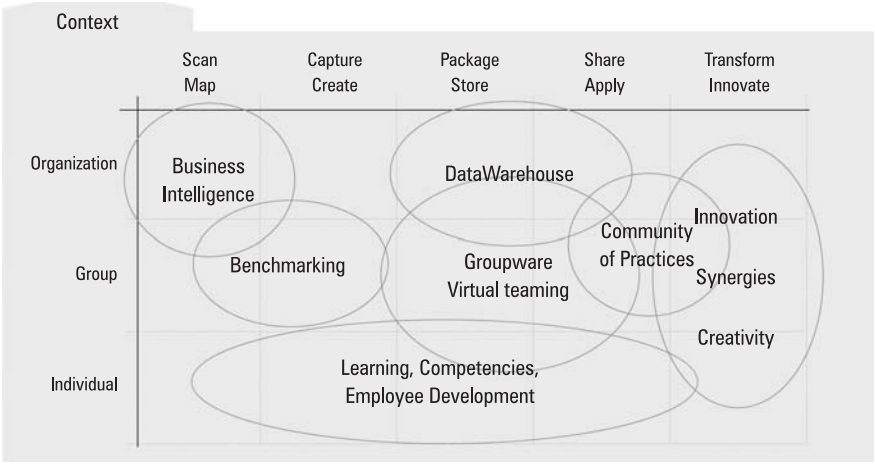


Figure 8 Regions of practice within knowledge management



Conclusion and implications

The central point of this article is that knowledge management is the Map is knowledge management. Managers working in this field should realize that KM is more than groupware or an intranet (Group level/ Package-Store & Share-Apply in the KM Map), more than business intelligence (Organization level/Scan-Map) and more than a yellow pages database of employee CVs (Individual level/Package- Store). A person may choose to implement a yellow pages database via an intranet and this is certainly acceptable that person but she/he should know where she/he is navigating in the Map. Our research indicates that most companies implement such KM projects on a small, experimental scale and then expand into other areas of the Map. The Map itself is a chart of the feasible options.

It seems clear that knowledge management as a distinct field of work is now and has always been rooted in the individual and his or her behavior. With the formalization of this field, attention has shifted upward in the Map towards the systems and structures that encourage the generation, transfer, application and re-invention of knowledge in a company. Much of this movement has been occasioned by the information technologies that facilitate one-to-one, one-to-many, and many-to-one communication. It also implies that successful KM programs are conceptualized as process-based rather than static structures. This said, the Map appears to be a helpful visualization of the types of activities required in different areas and at different levels.

Further research is being conducted at the THESEUS Institute to test and refine the dimensions of this taxonomy. One program of work is addressing its scholarly foundations while another is testing the usefulness and applicability of the Map with working managers. Among the questions being examined are the following:

(1) *Origins:* is there a region of practice where companies typically define their KM problematics and begin their KM programs?
(2) *Movement:* is there a developmental sequence within the Map that companies typically follow?
(3) *Specificities:* are there differences in the way companies implement KM activities within the Map according to industry, size, type, national origin or other factors?
(4) *Formal/informal structures:* do companies that successfully implement KM programs in one area of the map have informal structures and systems in others that act as necessary antecedents?

These and other research avenues are currently being investigated through a 72- item questionnaire that measures activities and behaviors within each cell, as well as through ethnographic research and informal contacts. Our ultimate goal is the development of a meta model that not only places the field on a more sure-footed intellectual basis, but also helps to equip it with more effective tools for practitioners.

Notes

1 Ann Stewart editor at *CIO* magazine. She continued that knowledge management is, "... the subject of a recent torrent of books, magazine articles, conferences, business-school classes, World Wide Web sites and even an emerging executive position (Chief Knowledge Officer)".

2 The ABI/INFORM database contains 800 journals of popular and academic merit in fields related to business. This search recorded the number of new articles that included the keywords "knowledge management" each year between 1988 (3 articles) and 1999 (320 articles). Over the ten year period, this represents a 10, 566 percent increase.

3 The move has been from rational (engineered, segmented, bureaucratic) to natural (organic, pyscho-social, humanistic) to open and multiply-connected organizational forms (Perrow, 1973; Scott, 1987; Noharia and Eccles, 1992; Despres, 1996).

4 For an interesting discussion on this topic see MacEachren, A. and Menno-Jan, K. "Exploratory cartographic visualization: advancing the agenda". A working paper located at http://www.geog.p-su.edu/ica/icavis/m&kintro.html

5 The address for Merrian-Webster's wwWebster Dictionary is http://www.m-w.com/dictionary.htm

6 TriVium, 10 Bd de Sebastoppol, 75004 Paris, http://www.trivium.com

7 This map (created in September 1997 at the result of 5 search engines – AltaVista, HotBot, WebCrawler, Excite and Lycos – constrained to 50 Web sites each) is certainly far from exhaustive. It is also one of many since Trivium's product permits various configurations.

References

Argyris, C. and Schön, D.A. (1978), *Organizational Learning: A Theory of Action Perspectives,* Addison-Wesley, Reading, MA.

Alvesson, M. (1993), "Organizations as rhetoric: knowledge-intensive firms and the struggle with ambiguity", *Journal of Management Studies,* Vol. 30 No. 6.

Baumard, P. (1996), "From infowar to knowledge warfare: preparing for the paradigm shift", Taken from the Internet site http://www.indigo-net.com/annexes/289/baumard.htm

Bell, D. (1973), *The Coming of Post-industrial Society,* Basic Books, New York, NY.

Bell, D. (1978), *The Cultural Contradictions of Capitalism,* Heinemann, London.

De Gues, A. (1988), "Planning as learning", *Harvard Business Review,* Vol. 66 No. 2.

Despres, C. (1996), "Work, management and the dynamics of knowledge", *Sasin Journal of Management,* Vol. 2 No. 1, pp. 24-36.

Galbraith, J. (1977), *Organization Design,* Addison-Wesley, Reading, MA.

Harrari, O. (1994), "The brain-based organization", *Management Review,* Vol. 83 No. 6, pp. 57-60.

Hedlund, G. (1994), "A model of knowledge management and the N-form corporation", *Strategic Management Journal,* Vol. 25, pp. 73-90.

Heilbruner, R. (1976), *Business Civilization in Decline,* Norton, New York, NY.

MacEachren, A. and Menno-Jan, K. Working paper, "Exploratory (artographic visualization: advancing the agenda", http://www.geog.psu.edu./ica/icavus/m&kintro.html

Mayo, A. and Lank, E. (1994), *The Power of Learning: A Guide to Gaining Competitive Advantage,* St Mut, London.

Mills, D. and Friesen, B. (1992), "The learning organization", *European Management Journal,* Vol. 10 No. 2, pp. 146-56.

Morgan, G. (1986), *Images of Organizations,* Sage Publications, London.

Mullin, R. (1996), "Knowledge management: a cultural evolution", *Journal of Business Strategy,* Vol. 17 No. 5, pp. 56-9.

Nohria, N. and Eccles, R. (1992), *Networks and Organizations,* Harvard Business School Press, Boston, MA.

Nonaka, I. (1991), "The knowledge-creating company", *Harvard Business Review*, November-December, pp. 96-104.

Perrow, C. (1973), "The short and glorious history of organization theory", *Organization Dynamics,* Summer.

Peters, T. (1993), "Thriving in chaos", *Working Woman,* Vol. 18 No. 9, September, pp. 42-5.

Polyani, M. (1962), *Personal Knowledge,* University of Chicago Press, Chicago, IL.

Postman, N. (1993), *Technopoly: The Surrender of Culture to Technology,* Vintage/Random House, New York, NY.

Quinn, J., Anderson, P. and Finkelstein, S. (1996), "Leveraging intellect," *Academy of Management Executive,* Vol. 10 No. 3.

Scott, R. (1987), *Organizations: Rational, Natural and Open Systems,* Prentice Hall, Englewood Cliffs, NJ.

Stewart, T.A. (1997), *Intellectual Capital: The New Wealth of Nations,* Currency Doubleday, New York, NY.

Simon, H.A. (1945), *Adminstrative Behaviour,* The Free Press, New York, NY.

Ward, A. and Leo, V. (1996), "Lessons learned on the knowledge highways and byways", *Strategy & Leadership,* Vol. 24 No. 2, March/April, pp. 16-20.

Weiner, N. (1961), *Cybernetics,* MIT Press, Cambridge, MA.

Wiig, K. (1997), "Knowledge management: an introduction and perspective", *The Journal of Knowledge Management,* Vol. 1 No. 1, September.

Further reading

Drucker, P. (1992), "The new society of organizations", *Harvard Business Review,* Vol. 70 No. 5, September/October, pp. 95-104.

Frost, P., Moore, L., Louis, M., Lundberg, C. and Martin, J. (1985), *Organizational Culture,* Sage, Beverly Hills, CA, p. 82.

Harrigan, K. and Dalmia, G. (1991), "Knowledge workers: the last bastion of competitive advantage", *Planning Review,* Vol. 19 No. 6, November/December, pp. 9-48.

Sveiby, K. and Lloyd, T. (1987), *Managing Knowhow: Add Value by Valuing Creativity,* Bloomsbury Publishing Ltd, London.