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KNOWLEDGE MANAGEMENT TECHNOLOGIES

The "continuumization" of knowledge management technology

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Abstract

Purpose – This paper aims to explain why a different technology for knowledge management (KM) is needed. It also investigates the new trends in knowledge management technology (KMT), and shows how the new technology can be aligned with KM principles to satisfy business goals.

Design/methodology/approach – This paper interprets array of literature in the area of KMT as related to its importance and development. It provides a roadmap to how technology may ascend to the level of the KM cognitive process. This can only be achieved, if KMT presents itself as an authentic conduit for knowledge, and not only a channel for the lower end of the continuum.

Findings – So far, KMT is not mature enough to deliver *bona fide* KM processes. The distance from data to knowledge cannot be handled by the existing technology unless technology cast off its bivalent logic. Despite the recent leaps in technology in general, the situation is still perplexing and elusive. This is because KMT deals with the knowledge continuum sets either as discrete unrelated events or as one class with no different technological requirements.

Practical implications – KMT has become increasingly complicated and confusing. This paper will explain why KMT has not fulfilled its promise yet, and how this fact can be used to avoid technology selection pitfalls.

Originality/value – The paper provides a roadmap for KM practitioners for evaluating KMT functionalities as related to the type of knowledge needed in their organizations for achieving competitive advantage.

Keywords Knowledge management, Knowledge management systems, Communication technologies, Tacit knowledge

Paper type Viewpoint

Background

It is concluded by many investigators that information originates from data, and knowledge is the result of information (Cheng, 2001; Yolles, 2000; Frey, 2001; Wah, 1999; Hedelin and Allwood, 2002; Newman and Chaharbaghi, 2000; Tuomi, 1999/2000; Beckett *et al.*, 2000; Blumentritt and Johnston, 1999; Beckett *et al.*, 2000). However, the demarcation among these three classes is blurred. The succession from one phase to the other is gradual build up of context and they posses a recursive relationship between them (Figure 1). Therefore, the non-spatial distance between data and knowledge can collectively be described as data-information-knowledge continuum. Knowledge transforms as it transfers within this continuum. In effect, that is why knowledge adds value, and that is where in its progression and diffusion, knowledge is inversely related to the law of diminishing returns.

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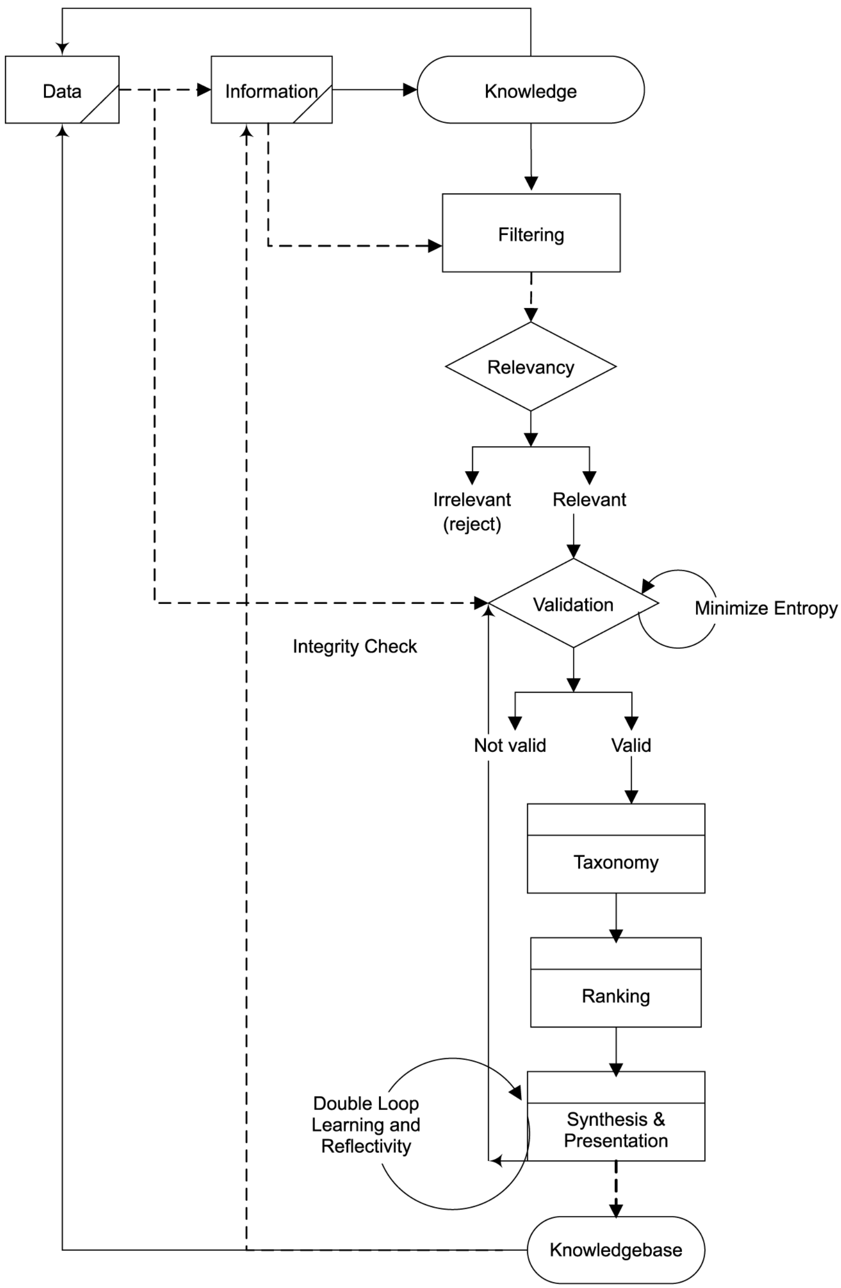

Figure 1.
Knowledge iterative supply network

Note: Solid lines resemble the role of human, while broken lines denote the role of technology

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Historically, there used to be a problem of lack of information for decision makers to take informative decisions (Gurteen, 1998; Raisinghani, 2000; McIvor *et al.*, 2000). Of course, the lack of information correlates with the likelihood of entropy and inescapable risk. Nevertheless, in the late 1990s, technology began to show its impact on shrinking the time and the space dimensions. In its turn, this resulted in pooling domestic and exotic information that in the long run led to information overload. Then organizations felt the burden and started to complain about the symptoms of what Gorsky *et al.* (1999) called Informcenosis; which is a direct result of information and communication technologies (ICTs) explosion. This same conclusion reached by Wilson (1996), Kumaraswamy *et al.* (2000), Melgoza *et al.* (2002) and Herbig and Kramer (1994). The predicament of information overload coupled with absence of knowledge filtration, validation (Figure 1), besides the lack of clear information plans and strategies may even lead to crises. This is clearly stated by Gorsky *et al.* (1999) that "mankind is moving towards global crises and catastrophes because of the lack of strategies and policies to deal with information."

Technology that created the problem cannot be used to solve the exact same problem at its entirety. Pursuing the same line of logic, we may conclude that, since data and information are contextually different from knowledge, then the same technology used to manipulate data and information, cannot be employed with the same degree of effectiveness. Hence, a technology with different properties and more robust functionalities is needed to leverage the company's knowledge.

Importance of KMT

In the current global market, the strategic importance of ICT in global reach has never been refuted. This is because geographically distributed organization needs technology to provide distributed systems such as databases at both synchronous and asynchronous levels. In general, technology assures information availability, immediacy and transparency and all together make just-in-time solutions possible. But, the first generation of knowledge management (KM) practitioners were not excited about technology role in KM. Some investigators from the second generation recommended the use of technology in KM, only if needed (McDermott and O'dell, 2001; Hibbard and Carillo, 1998). But, the more intricate question is when it is not needed?

If we consider KM in its third generation as indicated by Reneker and Buntzen (2000), Cavaleri and Fearon (2000) and Snowden (2002), then the sentiment about the role of IT in KM is dramatically changed. Presently, ICT is considered a critical factor in the success of any KM initiative; Stankosky and Baldanza (2000) regarded technology as one of the four pillars that uphold the KM program and Stankosky stated:

> I often mention that in the decades of the 70's and 80's, technology was an enabler to achieving an enterprise's objectives. Today, it is no longer the case. Technology is "systemic" – it is such a fundamental part of the system that the enterprise of today cannot function or survive without it.

This gradual change in the apprehension of the role of technology is attributed to the advancement in different computing capabilities to mimic human cognitive dimensions and to support social interrelations. But then, it is a result of the

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technology response to the global market needs for the transformation of organizations from the functional to process systems.

Owing to the abundance and complexity of the current technology, the selection of knowledge management technology (KMT) for a particular organization is always a dilemma. In general, the selection for KMT modus operandi is a departure from the standard IT selection procedures, because we are selecting tools for knowledge more than selecting for information. These procedures depend on the organization practice and on KM processes applied on them. For instance, there are many techniques for externalization of knowledge such as brainstorming, consensus decision making, repertory grid, nominal group technique, Delphi method, concept mapping, and blackboarding. These techniques may be the determinant for the type of technology to be selected. In general, if most organizational knowledge needed is explicit, then robust content management with powerful taxonomical and/or ontological perspective is the solution. Moreover, understanding how the software affects the core competencies and the value proposition of the company is vital.

The challenge

Technology might help people to work together, but how it promotes people to think together is the crux of the issue. Some systems need heavy involvement of humans others come with rich automation features, Figure 1 shows the knowledge iterative supply network and where technology and human play their roles. However, technology is immature to perform a holistic cognitive solutions yet, Mohamed *et al.* (2006) state that:

> It is accurate to say that current technology does not, and may not offer the absolute cognitive dimension that exercises by human brain. This is because the cognitive process involves socio-cultural perspectives built and sustained by social units, such as organizations, in a harmonized social network maintained by human beings.

This immaturity in the technology can be attributed to the binary logic of 0s and 1s, which are the fundaments that construct technology in the first place. The binary vision is capable of expressing the extremes, but not in-between, where the realities of tacit knowledge exist. This is the rationale behind the fact that technology is not ready to be the conduit for the entire knowledge continuum. Hence, there is a need for a comprehensive transformation of technology infrastructure to accommodate the continuum. This can be achieved when the learning machines based on the concepts of fuzzy logic, chaos theory and artificial intelligence (AI) are ready to transfer non-contextual data into pragmatic solutions, by understanding patterns, determining relevancy, minimizing entropies (Figure 1), and providing inferences.

"Networking externalities" concept states that as network increases in size that leads to exponential increase in benefits. In learning organizations, "Network externalities" take place at human level, but it is still dawdling at the technology space. For it to happen at the machine level, *ipso facto*, machines must think, learn, build experience, synthesize knowledge (Figure 1), and most importantly, interact and share knowledge without human intervention. Considerable efforts have been in effect, but alas, sub-optimization did occur. For example, there is a quantum leap in the area of networking through grid-computing, but the hardware and software components are still having difficulty in channeling and expressing knowledge "tacicity."

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New developments

Recently, there is a conspicuous synergetic convergence between ICT functionalities and KM principles. This can be attributed to the technological advancements in areas such as parallel multi-core processing, distributed computing, and wireless communications. There are some improvements in the area of languages, but still not fully deployed in KMT such as natural language, semantic web, fuzzy logic, neural networks. One of the greatest developments in the area of applications in the last decade is the ERP systems, but more importantly, the introduction of the next generation of enterprise resource planning (ERP II) systems (Mohamed and Fadlalla, 2005).

One of the most prominent recent additions to KMT is the introduction of eXtended Markup Language (XML) and the web services in the area of content management. XML is a tagging markup language that raises the level of communication to machine-to-machine level. Mohamed *et al.* (2007) report: "XML itself is nothing more than a collection of tags on how information is structured for storage and search." It adds meaning to the document sharing only when all parties understand the tag references. This better fits the specific domain classification that narrows the epistemological spectrum, hence, the epistemic community concept is very critical to the success of such effort. In the area of KMT applications, there is a significant development in the field of knowledge maps, taxonomy, ontology, yellow pages and collaborative systems including the virtual communities of practice portal.

The future of KMT

Hitherto, KMT is relatively powerful in regard to the domain of structured data (statistical, discovering patterns and modeling capabilities), but fairly weak in the area of unstructured data inference, self-learning, and tacit knowledge elicitation. As integration and interoperability have guided business software such as ERP, collaborative systems, and distributed database to succeed. A modular KMT systems are the futuristic vision of almost all KMT designers and developers. The most promising phase of the language evolution is the fourth generation languages which is already implemented in AI, neural networks and databases is in its way to the market. One example is the encapsulation of logic, data and methods or functions within the object-oriented (O-O) database systems. This will be a great addition to the backend cognosphere of the KMT systems. The heredity and the polymorphism of the O-O, is in fact, a reflection of the main KM concepts. In the near future, a comprehensive KMT system is expected to be deployed in handheld wireless devices with voice recognition and imaging capabilities. In addition, a searchable knowledgebase of an expert system for a critical knowledge can be achieved with a touch of a button, key words and few seconds. More functionality such as dynamic profiling, summarization, autotaxonomy and automated filtering are in the horizon. Eventually, there will be a method to streamline KMT systems to carry out a complete KM lifecycle processes (Figure 1) such as capturing, synthesizing, discovering, integrating, applying, and reporting.

References

Beckett, A.J., Wainwright, C.E.R. and Bance, D. (2000), "Implementing an industrial continuous improvement system: a knowledge management case study", *Industrial Management & Data Systems*, Vol. 100, pp. 330-8.

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Blumentritt, R. and Johnston, R. (1999), "Towards a strategy for knowledge management", *Technology Analysis & Strategic Management*, Vol. 11, pp. 287-300.

Cavaleri, S.A. and Fearon, D.S. (2000), "Integrating organizational learning and business praxis: a case for intelligent project management", *The Learning Organisation*, Vol. 7, pp. 251-8.

Cheng, G. (2001), "The shifting information landscape: re-inventing the wheel or a whole new frontier for librarians", *New Library World*, Vol. 102, pp. 26-33.

Frey, R.S. (2001), "Knowledge management, proposal development, and small businesses", *The Journal of Management Development*, Vol. 20, pp. 38-54.

Gorsky, M., Razumov, I. and Teslinov, G. (1999), "Danger of development of a global catastrophe and the need for new information concepts", *Kybernetes*, Vol. 28, pp. 929-38.

Gurteen, D. (1998), "Knowledge management and creativity", *The Journal of Knowledge Management*, Vol. 2, pp. 1131-42.

Hedelin, L. and Allwood, C.M. (2002), "IT and strategic decision making", *Industrial Management & Data Systems*, Vol. 102, pp. 125-39.

Herbig, P.A. and Kramer, H. (1994), "The effect of information overload on the innovation choice process", *Journal of Consumer Marketing*, Vol. 11, pp. 45-54.

Hibbard, J. and Carillo, K. (1998), "Knowledge revolution, news on review", available at: www.informationweek.com

Kumaraswamy, M., Palaneeswaran, E. and Humphreys, P. (2000), "Selection matters – in construction supply chain optimisation", *International Journal of Physical Distribution & Logistics Management*, Vol. 30, pp. 661-80.

McDermott, R. and O'dell, C. (2001), "Overcoming cultural barriers to sharing knowledge", *Journal of Knowledge Management*, Vol. 5, pp. 76-85.

McIvor, R., Humphreys, P. and Huang, G. (2000), "Electronic commerce: re-engineering the buyer-supplier interface", *Business Process Management Journal*, Vol. 6, pp. 122-38.

Melgoza, P., Mennel, P.A. and Gyeszly, S.D. (2002), "Information overload", *Collection Building*, Vol. 21, pp. 32-43.

Mohamed, M. and Fadlalla, A. (2005), "ERP II: harnessing ERP systems with knowledge management capabilities", *Journal of Knowledge Management Practice*, Vol. 6, pp. 1-13.

Mohamed, M., Stankosky, M. and Murray, A. (2006), "Knowledge management and information technology: can they work in perfect harmony?", *Journal of Knowledge Management*, Vol. 10, pp. 103-16.

Mohamed, M., Stankosky, M. and Ribieri, V. (2007), "The key requirements for deploying knowledge management services in a semantic grid environment", *International Journal of Knowledge Management*, Vol. 3, pp. 105-18.

Newman, V. and Chaharbaghi, K. (2000), "The study and practice of leadership", *Journal of Knowledge Management*, Vol. 4, pp. 64-74.

Raisinghani, M.S. (2000), "Knowledge management: a cognitive perspective on business and education", *American Business Review*, Vol. 18, pp. 105-12.

Reneker, M.H. and Buntzen, J.L. (2000), "Enterprise knowledge portals: two projects in the United States Department of the Navy", *Electronic Library*, Vol. 18, pp. 392-402.

Snowden, D. (2002), "Complex acts of knowing: paradox and descriptive self-awareness", *Journal of Knowledge Management*, Vol. 6, pp. 100-11.

Stankosky, M.A. and Baldanza, C. (2000), *Knowledge Management: An Evolutionary Architecture toward Enterprise Engineering*, International Council on Systems Engineering (INCOSE), Reston, VA.

المنارة للاستشارات

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Tuomi, I. (1999/2000), "Data is more than knowledge: implications of the reversed knowledge hierarchy for knowledge management and organizational memory", *Journal of Management Information Systems*, Vol. 16, pp. 103-17.

Wah, L. (1999), "Making knowledge stick", *Management Review*, Vol. 88, pp. 24-5.

Wilson, P. (1996), "Interdisciplinary research and information overload", *Library Trends*, Vol. 45, pp. 192-203.

Yolles, M. (2000), "Organisations, complexity, and viable knowledge management", *Kybernetes: The International Journal of Systems & Cybernetics*, Vol. 29, pp. 1202-22.

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