

CAHIER DU LAMSADE

250

Avril 2007

Knowledge Management System as a Sociotechnical System

Michel Grundstein, Camille Rosenthal-Sabroux

KNOWLEDGE MANAGEMENT SYSTEM AS A SOCIOTECHNICAL SYSTEM

Michel Grundstein
Associate Researcher,
LAMSADE Paris Dauphine University, France
Consulting Engineer, MG Conseil, France
mgrundstein@mgconseil.fr
<http://www.mgconseil.fr>

Camille Rosenthal-Sabroux
Professor,
LAMSADE Paris Dauphine University, France
sabroux@lamsade.dauphine.fr
<http://www.lamsade.dauphine.fr>

Keywords

Knowledge Management (KM), KM Governance, Sociotechnical approach of KM, KM Research Areas, KM pattern of reference, Knowledge Management System (KMS), Model of Global Knowledge Management within the Enterprise (MGKME).

Abstract

The research effort started at the 2006 Hawaii Conference on System Sciences identifies seven key areas of KM research: KM Foundations, Knowledge Transfers, KM Systems, KM Research Methods, KM Success, Ethical Issues in KM, and KM Education (Jennex, 2006).

In this paper, we refer to MGKME, our Model for Global Knowledge Management within the Enterprise (Grundstein & Rosenthal Sabroux, 2005; Grundstein, 2005; Grundstein, 2006). Thus, considering that KM is rooted on a Sociotechnical World that constitutes the underlying fabric on which KM approaches and researches must be established, we argue that the question of Sociotechnical World must be added as another key area to the research effort initiative.

INTRODUCTION

In his editorial preface untitled *Establishing the Foundations of the Knowledge Management Discipline* Jennex (2006) relates conclusions raised from the workshop that Dave Croadell and himself led at the 2006 Hawaii Conference on System Sciences (HICSS) “which started a research effort that we hope results in formal establishment of the theoretical foundations of knowledge management. (p.i) ” Seven key areas were identified: KM Foundations, Knowledge Transfers, KM Systems, KM Research Methods, KM Success, Ethical Issues in KM, and KM Education.

As mentioned by Jennex (2005) we all agree, “There is no common evidence about what KM is.” In our research group, we consider that knowledge cannot be processed as an object independently of the person who has to act. Thus, it appears that KM must address activities that utilize and create knowledge, more than knowledge by itself. With regard to this question, since 2001, our group of research has adopted the following definition of KM:

“KM is the management of the activities and the processes that enhance the utilization and the creation of knowledge within an organization, according to two strongly interlinked goals, and their underlying economic and strategic dimensions, organizational dimensions, sociocultural dimensions, and technological dimensions: (i) a patrimony goal, and (ii) a sustainable innovation goal.”

This paper refers to MGKME, our Model for Global Knowledge Management within the Enterprise (Grundstein & Rosenthal Sabroux, 2005; Grundstein, 2005; Grundstein, 2006), and supplies a global vision that integrates the four dimensions of Knowledge Management, namely: economic and strategic dimension, organizational dimension, sociocultural dimension, and technological dimension. Based on this vision of KM, we argue that KM is rooted on a Sociotechnical World that constitutes the underlying fabric on which KM approaches and researches must be established. So the question of Sociotechnical World must be considered as another key area for the over mentioned research effort.

BACKGROUND THEORY AND ASSUMPTIONS

After having considered the Knowledge Management Governance perspective drawing a link with the Corporate and IT Governance principles, we emphasize the importance of distinguishing the notion of KM pattern of reference versus the notion of KM System (KMS).

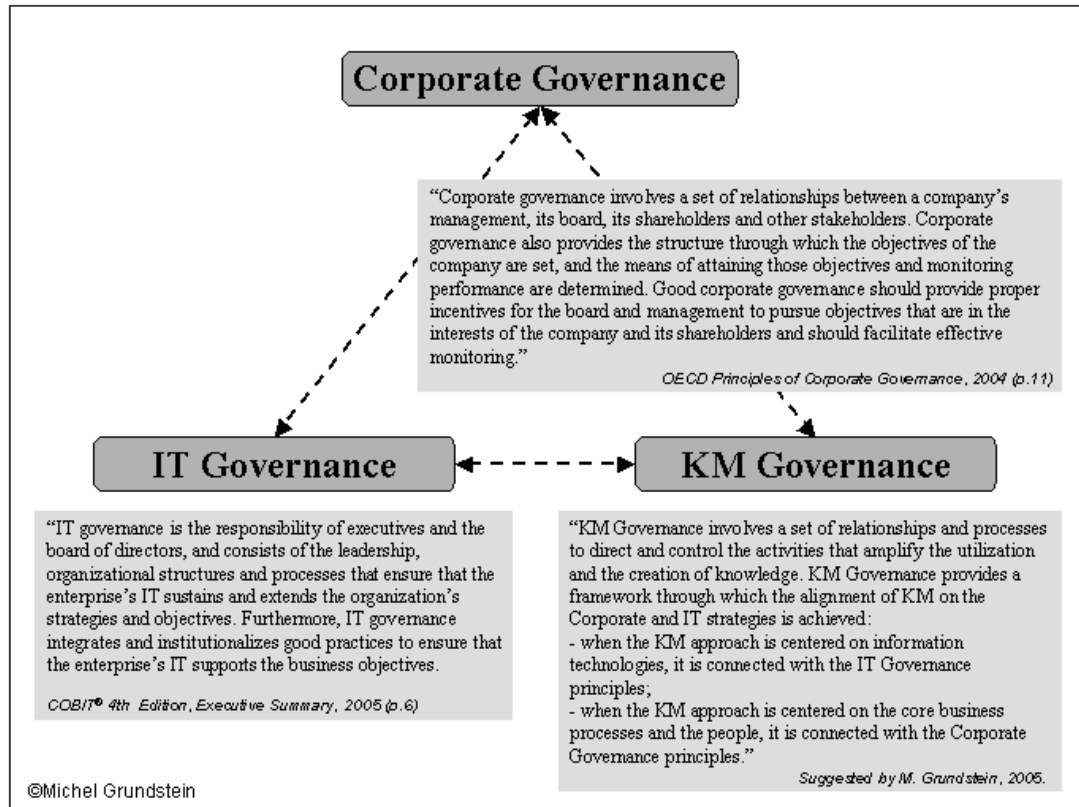
The KM Governance Perspectives

Corporate Governance (OECD, 2004, p.11) and IT Governance (COBIT, 2005, 4th Edition, Executive Summary, p.6) do not explicitly mention Intellectual Capital as a resource to be considered in the enterprise strategies. Even so, as pointed out by Edvinsson and Malone (1997): *“The core of the so-called knowledge economy is huge investment flows into human capital as well as information technology. And, stunningly, neither of these appears as positive values in traditional accounting. Rather, it is often just the opposite. Yet, these investments are the key tools of the new value creation”* (p. 12). However, as highest international institutions sponsor Corporate Governance, we are encouraged to think that the knowledge economy will oblige to take into account Intellectual Capital. Consequently, we need to study the link between KM, and Corporate Governance and IT Governance (ref. figure 1). However, despite the fact that numerous KM Frameworks have been suggested all over the world, it does not exist a unify KM pattern upon which KM Governance principles could be established.

For example, let us consider the European Project Team in charge to elaborate The European Guide to Good Practice in Knowledge Management on behalf of the European Committee for Standardization Workshop on Knowledge Management. This Workshop was running from September 2002 till September 2003 (CEN-1, 2004). The Project Team has collected, categorized and analyzed more than 140 KM Frameworks. Nevertheless, as contributors to this project, we have observed that few of them were “people-focused” as highlighted by Wiig (2004). Furthermore, we have distinguished two main approaches underlying KM: (i) a technological approach that answers a demand of solutions based on the technologies of information and communication (ICT), (ii) a managerial approach that integrates knowledge as resources contributing to the implementation of the strategic vision of the company.

Therefore, we can suggest two KM Governance Perspectives depending on the first or the second approach. On the one hand, the technological approach leads to reduce knowledge to codified knowledge that is no more than information. In that case, we manage KM projects in the same way than Information System projects. KM Governance should be connected with IT Governance principles by means of specific criteria and specific IT tools inherent to KM functionalities. On the other hand, the managerial approach that integrates knowledge as a resource focuses on the core business processes and the people. In that case, KM Governance should be connected with Corporate Governance principles by taking into account the risks linked to the utilization and creation of knowledge.

Figure 1. KM Governance Perspective



KM Pattern of Reference versus KM System (KMS)

KM becomes a reality in the implementation of a system, which is, paraphrasing Joel de Rosnay (de Rosnay, 1975): “A set of components in dynamic interaction organized according to a purpose” (p. 93). The purpose of this system is to amplify the utilization and the creation of knowledge to improve the enterprise’s effectiveness. This system is often called Knowledge Management System (KMS) although this term “*does not seem to have a consensus definition*” (Jennex, 2005, p. i). Therefore, we have to distinguish between the notion of KM pattern of reference, and the notion of KMS, which is the implementation of this pattern in the real world.

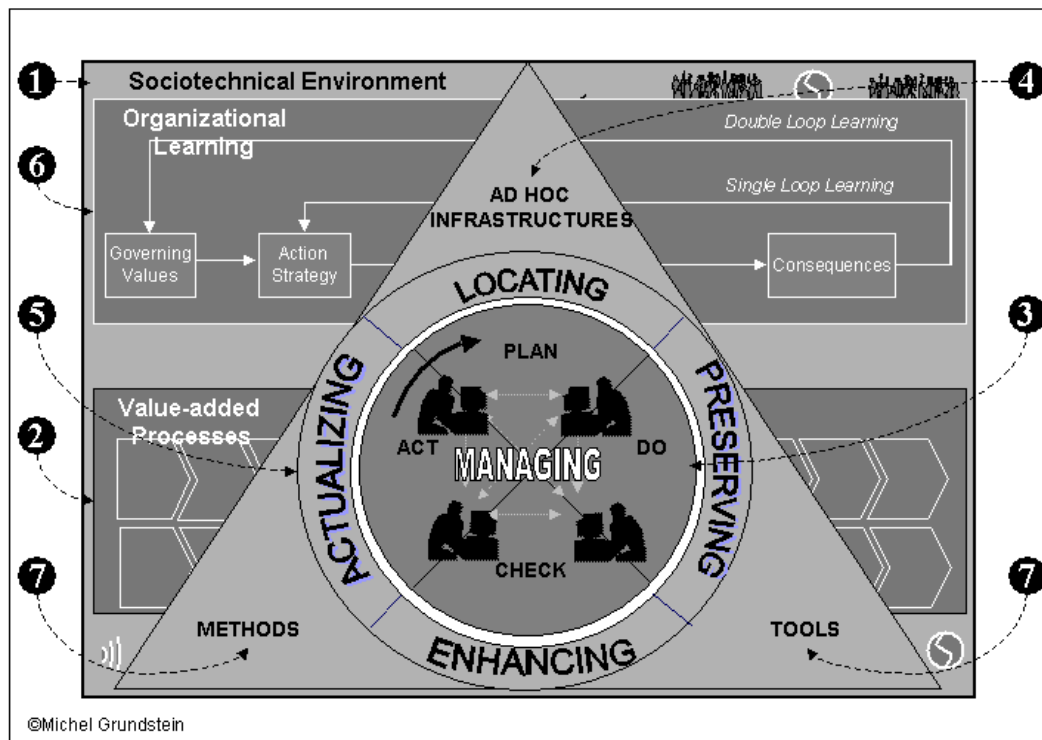
To implement KMS components, Enterprises need a framework that is a pattern of reference in order to integrate KM Governance principles in their strategic vision, and to use KM as a factor that enable improving performance. In this paper, we refer to MGKME, our Model of Global Knowledge Management within the Enterprise (Grundstein & Rosenthal Sabroux, 2005; Grundstein, 2005; Grundstein, 2006).

MGKME, A MODEL FOR GLOBAL KM WITHIN THE ENTERPRISE

MGKME supports our full meaning of KM as defined in the introduction. It is an empirical model (ref. Figure 2). It materializes a synthesis vision of more than twenty years experience in the KM field. It rests on the General System Theory first established by von Bertalanffy who cares very much on the humanist approach (Bertalanffy, 1968, p. XI). The work of Morin and Le Moigne (1999) that focuses

on Complexity inspires it. Moreover, the MGKME presents an attempt to articulate the Deming's Cycle (Martin, 1995, p. 207) and the Single-Loop Learning and Double-Loop Learning defined in the Argyris & Schön's organizational learning theory (Argyris & Schön, 1996). Thus, we point out the key contribution of KM to Change 2 defined by Watzlawick and Fisch (1975). Moreover, the suggested "ad hoc infrastructures" derives from the SECI model (Nonaka & Takeuchi, 1995), and the concept of "BA" (Nonaka & Konno, 1998)

Figure 2. Model for Global Knowledge Management within the Enterprise (MGKME)



MGKME is composed of two main categories of elements: (I) the underlying elements consist of sociotechnical environment, and value-added processes (ref. Table 1); (II) the operating elements focus on the underlying elements. They consist of managerial guiding principles, *ad hoc* infrastructures, generic KM processes, organizational learning processes, and methods and supporting tools (ref. Table 2).

Table 1. MGKME 's Underlying elements

Model Level	Elements	Key Issues
(I) UNDERLYING ELEMENTS	① Sociotechnical Environment	- Enterprise 's Activities (sector, key value-chain elements, geographical distribution, Size, Market, mass or batch manufacturing processes, product lifecycle, oral or written culture) - Relations and Interactions between ICT, Structure, and People: their roles, their tasks - Capability to learn and Innovate - Social and Intellectual Capital Management Involvement

	② Value-added Processes	- Running Processes - Business Processes - Design and Development Processes - Innovative Product and Services Processes
--	---	--

Table 2. MGKME 's Operating elements

Model Level	Elements	Key Issues
(II) OPERATING ELEMENTS	③ Managerial Guiding Principles	- Vision - KM Governance Principles - Main Development Axes - Indicators
	④ ad hoc Infrastructures	- Content and Document Management Systems - Collaborative Information Systems - Organizational conditions encouraging interaction, communication, and knowledge sharing
	⑤ Generic KM Processes	- Locating Process - Preserving Process - Enhancing Process - Actualizing Process
	⑥ Organizational Learning Process	- Team Learning Processes - New Organizational Structures Experiments - Global Vision, and Systemic Approach - Routines (defensives and constructive) - Knowledge Dissemination - Constant Evolution versus Change (Norbert Alter, 2000)
	⑦ Methods and Supporting Tools	- General Methods and Tools - Researches Issues - Knowledge Engineering, Artificial Intelligence (Semantic WEB and Ontology) - CSCW -Computer Supported Cooperative Work (Multi-agents Systems) - Social Networks (Identification, Visualization, and Informal Social Network Analysis Systems)

MGKME A PATTERN FOR IMPLEMENTING SOCIOTECHNICAL KMS

MGKME suggests a sociotechnical approach defined as “*the study of the relationships and interrelationships between the social and technical parts of any system*” (Coakes, 2002, p. 5). Therefore, the KMS that materializes MGKME is composed of organizational, human, and technical components. Thus, taking MGKME as a pattern of reference, avoids limiting the notion of KMS to the notion of Information Technology (IT) based system that reduces a KMS to a data processing system. This is often the case as shown, for example, by the Raman, Ryan and Olfam’s study (2006, p. 34). These authors, when speaking about KMS, refer to the works of Alavi and Leidner (2001), and Gupta and Sharma (2004). In this way, KMS is “*developed to support and enhance the organizational knowledge processes of knowledge creation, storage, retrieval, transfer and application*” (Alavi & Leidner, 2001, p. 114). Furthermore, “*knowledge management systems are divided into several major categories, as follows: groupware, including e-mail, e-log, and wikis; decision support systems; expert systems; document management systems; semantic networks; relational and object oriented databases; simulation tools; and artificial intelligence*” (Gupta & Sharma, 2004).

Therefore, we must consider underlying elements as the fundamental components of the KMS. We describe these elements hereafter.

MGKME 's Underlying Elements

The core knowledge is embodied in people heads and their abilities to utilize them, and to generate new knowledge at the same time. The information technologies and the tangible technical resources enhance their competence, while value-added processes and organizational infrastructures are structuring their activities. Nevertheless, their social interactions (Cohen & Prusak, 2001), supported by ICT tools are essential factors, which leverage their potentialities, and that actually enable them to achieve effective results. Therefore, from our perspective, sociotechnical environment, and value-added processes are fundamental elements that constitute the underlying elements of MGKME.

The Sociotechnical Environment①

The Sociotechnical Environment constitutes the social fabric where autonomous individuals supported by ICT and tangible resources interact and are conversing through physical or virtual places (coffee machines, collaborative work spaces, weblogs, wikis, CoPs). Interacting is not enough. Thus, Stewart (2001) observed what happen when interacting without conversing: *“Stories are not told and associated sense of adventure is lost; knowing is not shared because questioning is not fostered; people become isolated, angry, resentful and do what they do with no real joy; while a business may be profitable it is likely that it is not operating at anywhere near its potential”* (p. 17).

Actually, as mentioned by Grundstein and Rosenthal-Sabroux (2003): *“(Employees) become decision-makers who use and produce more and more knowledge as a basis for their efficiency... Commonly pointed out as « Knowledge-Workers», (they) have to access know-how and skills widely distributed in the global and influence spaces of their organization... The computerized workstation becomes a window opened on the company’s planetary space of activities”* (p. 979). As a result, the information and application portals have become essential for the knowledge workers who have to share with colleagues disseminated all around the world.

Thus, portals are collaborative information systems, as mentioned by Chua and Brennan (2004) in their study on Collaborative Knowledge Management System (CKMS) defined as follows: *“A Collaborative Knowledge Management System (CKMS) is an integrated systems tool that enables collaboration between its users and its components”* (p. 171). They emphasize, *“One of the most important components of CKMS is the knowledge workers, which are also the users of the system, and the workspaces they are associated with”* (p.172). Moreover, analyzing ISO/IEC 9126 (1991) Quality Standard, Chua and Brennan point out that, *“existing interpretations of ISO 9116 account for their role as users however not for their role as systems components”* (p. 172).

The sociotechnical approach leads to emphasizing the link between knowing and action, with due regard to the basic constraints of the social system that is to give a sense to working time. Thus, KM initiative should result in a KMS that takes into account the individuals, both as components and users of a system that allows them to be autonomous and to achieve their potentialities.

The Value-added processes②

Value-added processes derive from the value chain described by Porter (1985) who identifies nine value-adding activities that he classifies into two main categories. The *“primary activities”* are: 1) in-bound logistics, 2) operations, 3) out-bound logistics, 4) marketing & sales, and 5) Services. The *“support activities”* are: 1) business infrastructure, 2) human resource management, 3) technological development, and 4) supplies. In this way, Value-added processes represent the organizational context for which knowledge is essential factors of performance. It is in this context that is implanted a KM initiative.

As pointed out by Tonchia and Tramontano (2004): “*Process Management, with the concepts of internal customers and process ownership, is becoming one of the most important competitive weapons for firms and can determine a strategic change in the way business is carried out.*” These authors specify that: “*Process Management consists in the rationalization of processes, the quest for efficiency/effectiveness, a sort of simplification/clarification brought about by common-sense engineering*” (p. 20). As Process Management engenders structural changes, when doing Business Process Reengineering we should consider KM activities in order to identify knowledge that is essential factor to enable value-added processes to achieve their goals efficiently.

DISCUSSION AND FUTURE TRENDS

Our world is fundamentally a Sociotechnical World, which is a world deeply characterized by human and technological interactions. These interactions drastically affect people relationships with space and time. Therefore, if we considered that the core knowledge is embodied in people heads and their abilities to utilize them, and to generate new knowledge at the same time, we cannot speak about KM without taking into account these interactions. In this way, beyond the economic, organizational, and cultural dimensions, the specific sociotechnical context characterizes every KM initiative development.

Mostly spread, the technological approach leads to ignore an essential factor linked to the notion of Social Capital. To avoid this risk, we need to elaborate KM Governance principles. Thus, we have introduced our own experience and research by proposing an empirical Model for Global Knowledge Management within the Enterprise (MGKME). MGKME stands on a sociotechnical approach that highlights two levels of elements: underlying elements, and operating elements. It is an ideal status to reach. It is a pattern of reference used in order to assess the KM maturity of an enterprise. We expect that it will contribute to enhance the sociotechnical approach of KM.

To conclude, let us consider the seven key KM research areas identified by the workshop that Croadell and Jennex led at the 2006 Hawaii Conference on System Sciences (HICSS): KM Foundations, Knowledge Transfers, KM Systems, KM Research Methods, KM Success, Ethical Issues in KM, and KM Education. We observe that sociotechnical approach is not explicitly mentioned, although, Sociotechnical World is an underlying part of KM research. We do think that “Sociotechnical World” must be an additional key research area to introduce into the research effort initiative.

REFERENCES

- Alavi, M., & Leidner, D.E. (2001). Knowledge Management and Knowledge Management systems: Conceptual foundations and research issue. *MIS Quarterly*, 25(1), 107-136.
- Alter, N. (2000). *L'innovation ordinaire*. Paris, France: Presses Universitaires de France
- Argyris, C. & Schön, D.A. (1996). *Organizational Learning II. Theory, Method, and Practice*. Readings, MA: Addison-Wesley Publishing Company.
- CEN-1 (2004). Knowledge Management Framework. In *European Guide to Good Practice in Knowledge Management* (Part 1). Brussels: CEN, CWA 14924-1:2004 (E). Retrieved June 19, 2004, from <ftp://cenftp1.cenorm.be/PUBLIC/CWAs/e-Europe/KM/CWA14924-01-2004-Mar.pdf>
- Chua, B.B. & Brennan, J. (2004). Enhancing Collaborative Knowledge Management Systems Design. In D. Remenyi (Ed.), *5th European Conference on Knowledge Management* (pp.171-178), Proceedings. Reading, UK: Academic Conferences Limited.

- Coakes, E. (2002). Knowledge Management: A Sociotechnical Perspective. In E. Cokes, D. Willis & S. Clarke (Eds), *Knowledge Management in the Sociotechnical World* (Chapter 2, pp.4-14). London, Springer-Verlag.
- COBIT® (2005). *Control Objectives for Information and Related Technology. Control Objectives, Management Guidelines, Maturity Models*, (4th Edition). Rolling Meadows Illinois: IT Governance Institute.
- Cohen, D., & Prusak, L. (2001). *In Good Company: How Social Capital Makes Organizations Work*. Harvard Business School Publishing.
- De Rosnay, J. (1975). *Le macroscopie. Vers une vision globale*. Paris : Éditions du Seuil.
- Edvinsson, L. & Malone, M. (1997). *Intellectual Capital, Realizing Your Company's True Value by Finding its Hidden Brainpower*. New York: HarperCollins Publishers, Inc.
- Grundstein, M. & Rosenthal-Sabroux, C. (2005). Towards a Model for Global Knowledge Management Within the Enterprise (MGKME). In M. Khosrow-Pour (Ed.), *Managing Modern Organizations with Information Technology*, (IRMA05 Proceedings pp. 1259-1262). Hershey, PA: Idea Group Publishing.
- Grundstein, M. (2005). MGKME: A Model for Global Knowledge Management within the Enterprise. *2nd International Conference on Intellectual Capital, Knowledge Management and Organizational Learning*, Proceedings. American University in Dubai, UAE, (ICICKM05 Proceedings pp.201-211). Reading, UK: ACL.
- Grundstein, M. (2006). Towards a Pattern of Reference to Elaborate KM Governance Principles: The MGKME Example. ISOneWorld Conference 2006: *Grand Challenges in Technology Management*, Proceedings. Washington DC: The Information Institute. Gupta, J.D., & Sharma, S.K. (2004). *Creating knowledge based organizations*. Hershey, PA: Idea Group.
- ISO/IEC 9126 (1991). *Information technology -Software Product Evaluation – Quality characteristics and guidelines for their use*, International Standard.
- Jennex, M. E. (2005). Editorial Preface: What is Knowledge Management? *International Journal of Knowledge Management*, Vol.1 No.4, pp. i-v. Hershey PA: Idea Group Publishing.
- Jennex, M. E. (2006). Editorial Preface: Establishing the Foundations of the Knowledge Management Discipline. *International Journal of Knowledge Management*, Vol.2 No.3, pp. i-iii. Hershey PA: Idea Group Publishing.
- Morin, E. & Le Moigne, J-L. (1999). *L'Intelligence de la Complexité*. Paris, France: L'harmattan.
- Martin, J. (1995). *The Great Transition. Using the Seven Disciplines of Enterprise Engineering to Align People, Technology, and Strategy*. New York, NY: AMACOM, a division of American Management Association.
- Nonaka, I. & Takeuchi, H. (1995). *The Knowledge Creating Company*. New York: Oxford University Press.
- Nonaka, I. & Konno, N. (1998). *The Concept of "Ba": Building a Foundation for Knowledge Creation*. California Management Review, spring 1998, Vol. 40 No. 3, 40-54.
- OECD (2004). *OECD Principles of Corporate Governance*. Retrieved September, 2005, from http://www.oecd.org/document/49/0,2340,en_2649_34813_31530865_1_1_1_1,00.html
- Porter, M. E. (1985). *Competitive Advantage: Creating and Sustaining Superior Performance*. New York: The Free Press.
- Raman, M., Ryan, T., & Olfam, L. (2006). Knowledge Management Systems for Emergency Preparedness: The Claremont University Consortium Experience. *International Journal of Knowledge Management*, Vol.2 No.3, pp. 33-50. Hershey PA: Idea Group Publishing.

- Shimizu, H. (1995). *Ba Principle: New Logic for the Real-Time Emergence of Information*. Holonics, 5/1, 67-79
- Stewart, A. (2001). *The Conversing Company, its culture, power and potential*. Retrieved June 2004, from <http://www.knowledgeboard.com/download/3343/conversing-company.pdf>
- Tonchia, S., & Tramontano, A. (2004). *Process Management for the Extended Enterprise*. Berlin-Heidelberg: Springer-Verlag.
- Von Bertalanffy, L. (1968). *General System Theory*. New York: George Braziller. Translated into French language by Jean-Benoist Chabrol (1973), *Théorie générale des systèmes*. Paris: Dunod.
- Watzlawick, P., Weakland, J., & Fisch, R. (1975). *Changements : paradoxes et psychothérapie*. Paris: Éditions du Seuil. (Original title: *Change. Principles of Problem Formation and Problem Resolution*).
- Wiig, K. (2004). *People-Focused Knowledge Management. How Effective Decision Making Leads to Corporate Success*. Burlington, MA: Elsevier Butterworth-Heinemann.

CONCEPT DEFINITIONS

Deming 's Cycle

Well-known by Quality Management practitioners as PDCA cycle, the Deming's Cycle is presented as a simplified cycle of activities to achieve design and continual improvement of a product or of a process. This process as first advocated by W. Edwards Deming (Deming, 1992). The cycle consists of four stages: (i) **PLAN** to establish the objectives and processes necessary to deliver results in accordance with customer requirements and the organization's policies in order to induce a structured program of actions. (ii) **DO** to develop the program, and test conformity to protocols. (iii) **CHECK** to verify, to analyze, to understand, and to report the results. (iv) **ACT** to react, to propose and to decide the modifications and the improvements.

The PDCA cycle has inspired the NF EN ISO 9004-2000 Quality Standards (ISO 9004, 2000) in order to get a continuous process improvement of the Quality Management System.

Double-Loop Learning

Double-Loop Learning is "learning that results in a change in the values of the theory-in-use, as well as in its strategies and assumptions" (Argyris & Schön, 1996, p.21)

Japanese concept of "Ba"

The concept of *Ba* was originally proposed by the Japanese philosopher Kitaro Nishida and was further developed by Shimizu (Shimizu, 1995). To describe this concept, we will express our own understanding by paraphrasing Nonaka and Konno (Nonaka & Konno, 1998, p. 40):

Ba can be thought of as a shared space for emerging relationships and interactions between knowledge stakeholders. This space can be physical (e.g., office, dispersed business space), virtual (e.g., e-mail, teleconference), mental (e.g., shared experience and, ideas) or any combination of them. It can be a network of persons who share common objectives; a place would allow achieving the synthesis of the rationality and of the intuition as a wellspring of new knowledge; a place where would take place a shared knowledge creation; a platform that would allow individual and collective knowledge to progress. So, participate in a *Ba* stimulates the involvement of the individuals by giving them the possibility to transcend the borders and the limits of their own perspectives.

Single-Loop Learning

Single-Loop Learning is “instrumental learning that changes strategies of action or assumptions underlying strategies in ways that leave the values of a theory of action unchanged” (Argyris & Schön, 1996, p.20).

Sociotechnical perspectives

“Sociotechnical perspectives can be characterised as holistic, and whilst not being panoptic in character, take a more encompassing view of the organization, its stakeholders in knowledge and the environment in which it operates, than many other organizational views which are limited by their origins and paradigms.

The world sociotechnical, in its origins, is a combination of two paradigms: the social and the technical. It was thus intended to describe a broader view of the role of technology in an organization than either paradigm could offer on its own. Technology, it was argued, should be seen, discussed and developed not just as a technical artefact but in the light of the social environment in which it operated” (Coakes 2002, p. 4).

Watzlawick’s Change 2

In their studies on the human behavior and change Watzlawick, Weakland, and Fisch (1975) infer that: “There are two types of change. The first one takes place inside a given system that, in itself, remains unchanged: they call it *Change 1*. The second one modifies the system itself: they call it *Change 2*.” (p. 28-29).