ABSTRACT
Very often, Knowledge Management System is considered from a technological viewpoint that induces to consider the knowledge as an object, and so to disregard the importance of people. In this paper we suggest a global vision of Knowledge Management within the Enterprise that is represented by an empirical model so-called MGKME (Model for Global Knowledge Management within the Enterprise). That leads to emphasizing the link between knowing and action, with due regard to the basic constraints of the sociotechnical environment. Thus, a Knowledge Management initiative within the enterprise should result in Knowledge Management System Components that take into account the individuals, and which has to allow them to be autonomous and to achieve their potentialities.

Keywords:
Knowledge Management (KM), Sociotechnical approach, Pattern of reference, Knowledge Management System Components (KMSC), Model for Global Knowledge Management within the Enterprise (MGKME), Enterprise’s KM Maturity level.

1. INTRODUCTION
In this paper we refer to MGKME, our Model for Global Knowledge Management within the Enterprise [1]. MGKME suggests a sociotechnical approach. So, the Knowledge Management System Components (KMSC) that materialize MGKME are composed of organizational, human, and technical components. Thus, taking MGKME as a model of reference, avoids limiting the notion of KMSC to the notion of Information Technology (IT) based system that reduces a Knowledge Management System (KMS) to a set of data processing components.

After having put down background theory and assumptions, we make a brief description of MGKME that highlights sociotechnical environment as a key component of enterprise’s knowledge management system. Then we open a discussion that attempts to stress the need to integrate sociotechnical environment as an underlying part of KM researches.

2. BACKGROUND THEORY AND ASSUMPTIONS
The Two main Approaches Underlying KM
Very often, Knowledge Management (KM) is considered from a technological viewpoint that induces to consider the knowledge as an object, and so to disregard the importance of people.

For example, let’s 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 [2]. The Project Team has collected, categorized and analyzed more than 140 KM Frameworks. It may be noted that this work has produced a high-quality practical outcome that can be used as a reference point to achieve a good understanding of the KM. Nevertheless, as contributors to this project, we have observed that few of them were “people-focused” as highlighted by Wiig [3]. We can underline the predominant positivist paradigm and the technological approach of KM that have inspired the project team. As a result, the authors consider a system of interrelated objects that can be described independently of individual. That has induced them to consider the knowledge as an object, and so to disregard the importance of people.

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. On the one hand, the technological approach leads to reduce knowledge to codified knowledge that is no more than information. In that case KM projects can be managed in the same way than Information System projects. On the other hand, the managerial approach that integrates knowledge as a resource is centered on the core business processes and the people.
KM Pattern of Reference versus KM System

Meanwhile, KM becomes a reality in the implementation of a system, which is, paraphrasing Joel de Rosnay [4]: “A set of components in dynamic interaction organized according to a purpose.” This system is often called Knowledge Management System (KMS).

One can observe that numerous authors are 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 [5] (p. 34). These authors, when speaking about KMS, refer to the works of Alavi and Leidner, and Gupta and Sharma. In this way, KMS is “developed to support and enhance the organizational knowledge processes of knowledge creation, storage, retrieval, transfer and application” [6] (p. 114). in addition, “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” [7].

These authors place too little emphasis on knowledge creating activities that, as mentioned by Davenport and Prusak [8], “take place within and between humans” (p. 6). To implement KMS components, enterprises need a framework that is a pattern of reference in order to integrate sociotechnical perspectives in their strategic vision of KM, and to use KM as a factor that enable improving performance.

In our research group, considering that knowledge could not be processed as an object independently of the person who has to act, it appeared 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, socio-cultural dimensions, and technological dimensions: (i) a patrimony goal, and (ii) a sustainable innovation goal.”

This definition implies three postulates: (i) company’s knowledge includes two main categories of knowledge; (ii) knowledge is not an object; and (iii) knowledge is linked to the action. We define these postulates below.

(i) Company’s knowledge includes two main categories of knowledge

Within a company, knowledge consists: on the one hand, in explicit knowledge composed of all tangible elements - we call it “know-how”; and on the other hand, in tacit knowledge - we call it “skills” (Ref. Figure 1). The tangible elements are formalized in a physical form (databases, procedures, plans, models, algorithms, analysis and synthesis documents) and/or are embedded in automated management systems, conception and production systems, and in products. The intangible elements are inherent to the individuals who bear them, either as collective knowledge (the “routines” – non-written individual or collective action procedures [10]), or as personal knowledge (skills, crafts, “job secrets”, historical and contextual knowledge, environmental knowledge – clients, competitors, technologies, socio-economic factors).

<table>
<thead>
<tr>
<th>KNOW-HOW (explicit knowledge)</th>
<th>SKILLS (tacit knowledge embodied by individuals)</th>
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<tbody>
<tr>
<td>Collective knowledge</td>
<td>Collective knowledge</td>
</tr>
<tr>
<td>Knowledge that can be thought as objects</td>
<td>Knowledge that is incorporated into routine and regular processes</td>
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<tr>
<td>Knowledge that is formalized when documents and/or systems into data bases</td>
<td>Knowledge that is incorporated into routine and regular processes</td>
</tr>
<tr>
<td>Information source of knowledge for someone</td>
<td>Defensive Routines</td>
</tr>
<tr>
<td>Knowledge that are obstacles to change</td>
<td>Constructive Routines</td>
</tr>
<tr>
<td>Knowledge that lead innovation and change</td>
<td>Knowledge that is tacit and non-writable</td>
</tr>
<tr>
<td>Figure 1: The Two Main Categories of Company’s knowledge</td>
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</tbody>
</table>

(ii) Knowledge is not an object

Knowledge lies in the interaction between an interpretative framework incorporated within the head of an individual or embedded into an artifact, and data.

This postulate is based on the theories developed by Tsuchiya [11], who deals with the construction of tacit individual knowledge. According to his research, the tacit knowledge, which lies within one’s brain, is the result of the meaning one allocates – through one’s interpretative schemes – to the data that one perceives as part of all the information received. This individual knowledge is tacit and it may or may not be expressed. It becomes collective knowledge as soon as it is shared by other individuals, whose interpretative schemes are “commensurable”, i.e. schemes that enable a minimal common level of interpretation, which is shared by all members of the organization.

(iii) Knowledge is linked to the action

From a business perspective, knowledge is created through action. Knowledge is essential for the functioning of business and projects processes, and is finalized through their activities. Hence, one has to be interested in the activities of the actors – decision-makers – engaged in the processes contained in the company’s missions. This point is included in the use of the concept of knowledge, which cannot be separated from the individual placed within the company, his/her actions, decisions and relations with the surrounding systems (people and artifacts).

Enterprises need to refer to a pattern of reference in order to launch KM initiatives that become a reality in the implementation of KMS components. In this paper we refer to MGKME, our Model of Global Knowledge Management within the Enterprise. This model supports the definition and the postulates described above. Moreover, it brings a global vision of KM, which integrates technical, organizational and sociological dimensions.
3. MGKME, A MODEL FOR GLOBAL KNOWLEDGE MANAGEMENT WITHIN THE ENTERPRISE

MGKME should be seen as an empirical model (Ref. Figure 2). It materializes a synthesis vision of our researches standing against more than twenty years experience in the KM field. It suggests a sociotechnical approach defined as “the study of the relationships and interrelationships between the social and technical parts of any system” [12] (p. 5).

MGKME is composed of two main categories of elements: (I) the underlying elements consist of sociotechnical environment, and value-adding processes; (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.

The 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-adding processes and organizational infrastructures are structuring their activities. Nevertheless, their social interactions [13], 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-adding processes are fundamental elements that constitute the underlying elements of MGKME. These elements are described hereafter.

The Sociotechnical Environment

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 [14] observed what happen when interacting without conversing. He states “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).

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 KMS components 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-adding processes

Value-adding 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 [15]: “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-adding processes to achieve their goals efficiently.

The MGKME’S Operating elements

The operating elements of the MGKME focus on the underlying elements. They consist of managerial guiding principles, relevant infrastructures, generic KM processes, organizational learning processes, and methods and supporting tools.

The Managerial Guiding Principles

The Managerial Guiding Principles should bring a vision aligned with the enterprise’s strategic orientations, and should suggest a KM Governance principles by analogy with COBIT® [16]. In particular, KM indicators must be established. Numerous publications and books relates to that subject. From our viewpoint, two main categories of indicators should be constructed in order to monitor a KM initiative: (i) a category of indicators that focus on the impacts of the initiative favoring enhancement of intellectual capital; (ii) a category of indicators that insure monitoring and coordination of KM activities, measuring the results, and insuring the relevance of the initiative.

In addition, we should find a way to get a good articulation between the Deming’s cycle and Organizational learning (Ref. Figure 3). Firstly, we refer to the PDCA cycle of activities - plan, do, check, and act [17] (p. 207). This cycle, first advocated by Deming, is well known as the Deming’s Cycle by Quality Management practitioners. The PDCA cycle has inspired the ISO 9004 (2000) Quality Standards in order to get a continuous process improvement of the Quality Management System. Secondly, we refer to the Single-Loop Learning and Double-Loop Learning defined in the Argyris & Schön’s organizational learning theory [18]. Thus, we point out the key contribution of Knowledge Management to Change 2 defined by Watzlawick, Weakland and Fisch [19].
The Relevant Infrastructures

The Relevant infrastructures are adapted sets of devices and means for action. Beyond a network that favors cooperative work, it is important to implement the conditions that will allow sharing and creating knowledge. An ad hoc infrastructure must be set up according to the specific situation of each company, and the context of the envisaged KM initiative. This infrastructure could be inspired by the Japanese concept of Ba that “can be thought as a shared space for emerging relationships” [20] (p. 40).

Ba can inspire infrastructures that bring the dynamism to continually create new knowledge through a cycle of converting tacit knowledge into explicit knowledge and then reconverting it into tacit knowledge.

The Generic KM Processes

The generic KM processes answer the problem of capitalizing on company’s knowledge defined in the following way [21]:

“Capitalizing on company’s knowledge means considering certain knowledge used and produced by the company as a storehouse of riches and drawing from these riches interest that contributes to increasing the company’s capital” (p. 263).

Several problems co-exist. They are recurring problems with which the company was always confronted. These problems constitute a general problematic that has been organized in five categories. Each of these categories contains sub-processes that are aimed to contribute a solution to the set of overall problems. Thus, we have identified four Generic KM Processes corresponding to the resolution of these categories of problems (Ref. Figure 4). These processes are described below.

The Locating Process deals with the location of Crucial Knowledge, that is, Knowledge (explicit or tacit) that is essential for decision-making processes and for the progress of the value-adding processes. It is necessary to identify it, to locate it, to characterize it, to make cartographies of it, to estimate its economic value, and to classify it. One can mentioned an approach named GAMETH® [22] specifically aimed to support this process.

The Preserving Process deals with the preservation of know-how and skills: when knowledge can be put into words, it is necessary to acquire it with the bearers of knowledge, to represent it, to formalize it, and to conserve it. This leads to Knowledge Engineering activities that are notably described in Schreiber et al [23]. When knowledge cannot be put into words, then interactions through communities of practice or other types of networks must be encouraged.

The Enhancing Process deals with the added-value of know-how and skills: it is necessary to make them accessible according to certain rules of confidentiality and safety, to disseminate them, to share them, to use them more effectively, to combine them, and to create new knowledge. Here is the link with innovation processes.

The Actualizing Process deals with the actualization of know-how and skills: it is necessary to appraise them, to update them, to standardize them and to enrich them according to the returns of experiments, the creation of new knowledge, and the contribution of external knowledge. Here is the link with business intelligence processes.

The Organizational Learning Processes

The Organizational learning processes underlay the whole Generic KM processes. The aim of the organizational learning process is to increase individual knowledge, to reinforce competencies, and to convert them into a collective knowledge through interactions, dialogue, discussions, exchange of experience, and observation. The main objective consists in fighting against the defensive routines that make barriers to training and change. So, it is a question of helping the members of the organization to change their way of thinking by facilitating an apprenticeship of a constructive way of reasoning instead of a defensive one.

The Methods and supporting tools for KM

The methods and supporting tools relevant for KM can be determined only when considering the enterprise context and the envisaged KM initiative. One can find the descriptions and the characteristics of technologies, methods and supporting tools relevant for KM in many publications.

Among all these tools, the information and applications Portal, that supplies a global access to the information, can meet the needs of KM. Actually, as mentioned by Grundstein and
Rosenthal-Sabroux [24]: “(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 Knowledge 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. In that case, the digital information system integrates the functional software and the tools answering the ends of KM. Consequently, the conception of the digital information system has to take into account the nature of the information that the individual, as a decision-maker, must be able to access. Thus, one must distinguish three natures of information: the Mainstream-Data, the Source-of-Knowledge-Data, and the Shared-Data [24].

4. PERSPECTIVES

One can consider MGKME as an ideal status to reach. We expect that it will serve as a pattern of reference to enable assessing the Enterprises’ KM Maturity level, and adapting their KM programs.

For example, let consider an instantiation of MGKME into a KMS (Ref. Figure 5).

![Figure 5: Enterprise’s Knowledge Management System Components](image)

Identifying the KMS components included into the MGKME elements enable to measure the status of the knowledge management system within the enterprise. This status combined with the characteristics of the IT Governance Maturity Model suggested in COBIT [16] (p. 166), enable to assess the Enterprise’s KM Maturity level (Ref. Table 1).

<table>
<thead>
<tr>
<th>Maturity levels</th>
<th>Characteristics</th>
</tr>
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<tbody>
<tr>
<td>Level 0 Non-existent</td>
<td>There is a total absence of recognizable Knowledge Management System. The company did not become aware that Knowledge Management must be studied and be considered.</td>
</tr>
<tr>
<td>Level 1 Initial/Ad hoc</td>
<td>The company became aware of the importance of Knowledge Management. However, she has no global vision. There are no standardized processes but approaches in this sense tend to be applied on an individual basis. The implementation of Knowledge Management System or one of its components is not organized.</td>
</tr>
<tr>
<td>Level 2 Repeatable but intuitive</td>
<td>Knowledge Management System is badly identified and is characterized by a partial implementation of the MGKME’s elements. The processes are developed until the stage where different persons executing the same task use similar procedures. There is no formal training or no communication of standard procedures, and responsibility is left with the individual. One rests a lot on individual knowledge increasing so the probability to make errors.</td>
</tr>
<tr>
<td>Level 3 Defined Process</td>
<td>Knowledge Management System is well identified and is characterized by a partial implementation of the MGKME’s elements. Procedures were standardized, informed and communicated by way of sessions of training. However, their use is left with the initiative of each, and it is likely that abnormalities will be noticed. Procedures are not sophisticated but formalize existing practices.</td>
</tr>
<tr>
<td>Level 4 Managed and Measurable</td>
<td>Knowledge Management System is well identified and is characterized by a partial implementation of the MGKME’s elements. It is possible to control and to measure correspondence to procedures, and to act when processes seem not to work correctly. Processes are in constant improvement and correspond to a good practice. The automation and the use of tools are made in a limited or partial way.</td>
</tr>
<tr>
<td>Level 5 Optimized</td>
<td>Knowledge Management System is well identified and is characterized by a total implementation of the MGKME’s elements. Processes reached the level of the best practices, further to a constant improvement and to a comparison with the other companies.</td>
</tr>
</tbody>
</table>

5. CONCLUSIONS

From our viewpoint, our world is fundamentally a sociotechnical world that 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’s 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, cultural, and technological dimensions, the specific sociotechnical context characterizes every KM initiatives in which they are developed. Mostly spread, the technological approach of KMS leads to ignore this essential factor linked to the notion of sociotechnical environment. To avoid this risk, we have introduced our own experience and research by proposing an empirical Model for Global Knowledge Management within the Enterprise (MGKME). MGKME rests on a global vision of KM that leads to a sociotechnical approach that highlights two levels of elements: underlying elements, and operating elements. We expect that MGKME will helps to stress the need of integrating sociotechnical environment as a component of an Enterprise’s Knowledge Management System. Moreover, we think that it can help to assess the Enterprise’s KM Maturity level.

6. REFERENCES


