

# A WEB PLATFORM FOR INNOVATION PROCESS FACILITATION

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**Abstract:** Innovation is the prerequisite of knowledge creation and the essence of knowledge management. It has become a crucial factor in company performance and survival. It can be seen as a process and not only as a result. As a result, innovation is relative to the company's capabilities to learn – way, from which new knowledge can be developed, distributed and used. As a process, it concerns the design of products or new services. It concerns also the emergence, the circulation and the achievement of new ideas. It is located at the core of a progressive collective learning which needs old experiences voluntary capitalization. Finally, we consider it as a complex process which reifies mainly three intertwined sub processes: A social process, an organizational learning process and a knowledge management process. The main link between these sub processes is organizational knowledge. In this paper we present these three sub processes and put forward their needs of a dedicated computarized support which allows organizational knowledge sharing. Then we specify how we took them into account in the framework of the project MEMORAe2.0 to design a web platform fostering innovation process.

## 1 INTRODUCTION

Innovation is the prerequisite of knowledge creation and the essence of knowledge management. It has become a crucial factor in company performance and survival. It can be seen as a process and not only as a result. This process concerns the design of products or new services. It concerns also the emergence, the circulation and the achievement of new ideas.

As a result, innovation is relative to the company's capabilities to learn – way, from which new knowledge can be developed, distributed and used (Sinkula, 1997).

As a process, innovation concerns people and organizations which identify problems and select, integrate and augment information to create understandings and answers (Teece, 2004). It is located at the core of a progressive collective learning which needs old experiences voluntary capitalization. Thus the most important resources of the innovation process are tacit knowledge, understanding and learning. In this sense, it is a complex process which reifies mainly three intertwined sub processes:

- A social process involving diverse actors who requires support of collaboration that allows a rich expression and discussion of ideas/proposals under specific problem contexts.
- An organizational learning process which can be seen as a collective capability based on experiential and cognitive processes and involving knowledge acquisition, knowledge sharing and knowledge utilization (Zhang, 2007).
- A knowledge management process. Indeed, innovation needs an efficient storage and retrieval of codified knowledge produced during discussion.

The main link between these three sub processes is organizational knowledge. In the following we are interested in these sub processes in an innovation process context. In section 1 we explain the role played by communities of practice in the social process. In section 2 we specify the organizational learning process. In section 3 we present the concept of organizational memory or corporate memory which facilitates the organization's knowledge

management process. For each of these processes we put forward needs of dedicated computerized supports. Finally, before to conclude, we present in section 4 the project MEMORAe2.0 and the built platform. This last one was designated in taking into account the three processes above.

## 2 SOCIAL PROCESS

A social process is a process involved in the formation of groups of persons. It is a way that information coming from individuals or people groups surrounding us affects our thoughts, our actions and our feelings.

A way to favour such a process is to allow social networks establishment. A social network is in a way a community of practices. According to (Wenger, 2008), when we speak about practice, it is always question of a social practice. That's why he defines communities of practice as groups of people who engage in a process of collective learning. This learning can be the objective of the community members or is the results of their interactions. They provided a new approach, which focused on people and on the social structures that enable them to learn with and from each other. Because they offer informal training situations, organizations have interested in this approach for few years. Wenger explains this interest by different reasons:

- Communities of practice enable members to take collective responsibility for managing the knowledge they need.
- Communities among members create a direct link between learning and performance.
- Members can address the tacit and dynamic aspects of knowledge creation and sharing, as well as the more explicit aspects.
- Communities are not limited by formal structures: they create connections among people across organizational and geographic boundaries.

Acting as a community of practice seems a prerequisite to an organization to enable its members to share experiences, knowledge and competencies i.e. to learn each other.

Let's note that in their study (Correira, 2007) recommend "organizations promote the role of Virtual Community of Practice as sources of innovation which create competitive advantage by developing a culture where knowledge sharing and reuse of information is recognised and valued."

According to (Dubé, 2006), Virtual Communities of Practice, without excluding face-to-face meetings, rely on Information Communication Technologies to connect their members. Web 2.0 technologies facilitate the creation of social networks and thus these Virtual Communities of Practice.

## 3 ORGANIZATIONAL LEARNING PROCESS

The role of organizational learning for company's survival and performance has been described in (Argyris, 1996)(Senge, 1990). Organizational learning is the process by which organizations learn. Thus a learning organization is an organization in which processes are imbedded in the organizational culture that allows and encourages learning at the individual, group and organizational level (Sunassee, 2004). A learning organization must be skilled at creating, acquiring, and transferring knowledge, and at modifying its behaviour to reflect knew knowledge and insights (Garvin, 1996). Thus it can be considered as a constellation of interconnected communities of practice which deal with specific aspects of the company's competencies (Wenger, 1998). Knowledge is created, shared, organized, revised, and passed on within and among these communities.

Finally, organizational learning seldom occurs without access to organizational knowledge. In contrast to individual knowledge, organizational knowledge must be communicable, consensual, and integrated (Duncan, 1979). According to (Chen, 2003), being communicable means the knowledge must be explicitly represented in an easily distributed and understandable form. The consensus requirement stipulates that organizational knowledge is considered valid and useful by all members. Integrated knowledge is the requirement of a consistent, accessible, well-maintained organizational memory. Such a memory could serve as support for communities of practice. In his reflection about communities of practice development, Wenger specified that "organizations must to build organizational and technological infrastructures that do not dismiss or impede the organizational learning process, but rather recognize, support, and leverage it" (Wenger, 1998). According to him, communities of practice structure an organization's learning potential into two ways: through the knowledge they develop and through interactions.

## 4 ORGANIZATIONAL MEMORY

The capacity of a company to develop an internal knowledge base and to exploit external knowledge is crucial for supporting an innovation process (Hamdouch, 2008). Indeed, such a base is constituted of the set of information and knowledge produced, acquired and combined by company members in order to innovate. It represents the company “knowledge capital” (Laperche, 2007). According to (Stein, 1995), an organizational memory is defined as “the means by which knowledge from the past is brought to bear on present activities and may result in higher or lower levels of organizational effectiveness”. It can be regarded as the explicit and persistent representation of knowledge and information in an organization, in order to facilitate their access and their re-use by the adequate members of the organization for their tasks (Dieng, 1998). Thus, an organizational memory seems indispensable to collect the company “knowledge capital” and then to foster organizational learning. An integrated organizational memory provides a mechanism for compatible knowledge representation, as well as a common interface for sharing knowledge, resources and competencies.

Organizational memory can be made of both hard data such as reports, articles but also soft information such as tacit knowledge, experiences, critical incidents, and details about strategic decisions. We need ways to store and retrieve both kind of information. Indeed, ideas generated by employees in the course of their task seldom get shared beyond a small group of people or team members. This informal knowledge or non canonical practice is the key to organizational learning (Brown, 1991). New collaborative technologies should be designed based on this informal knowledge, or communities of practice. The use of information systems to manage organizational memory improves precision, recalling, completeness, accuracy, feedback, and reviewing, far better than the human beings currently involved in organizational memory.

However, although they are essential components in most organizational settings they are not efficient for effective knowledge sharing (Gold, 2001). Web 2.0 technologies offer interaction possibilities that contribute to stimulate innovation process, reactivity and agility. In a learning organization context, they allow to:

- Identify individual profile as resource;

- Perform information in a logic flow that could evolve;
- Favour conversation;
- Give an easy access to information;
- Create a learning ecosystem;
- Capitalize any information to contribute to an organizational memory.

In order to facilitate information retrieval, it is useful to associate web semantic approach to web 2.0 technologies. In the context of the Semantic Web, data on the web are published in machine-readable format using shared ontologies to give them a formal semantic, and inter-linked on a massive scale. Thus data can be retrieval easily.

Thus designing a computerized organizational memory linking web 2.0 and semantic web modelling should better support sharing knowledge.

## 5 THE PROJECT MEMORAe2.0

One of the main reasons that communities are considered as an important vehicle for innovation process is their potential to create an environment where members feel comfortable for sharing ideas (Wenger, 1998).

In the framework of the project MEMORAe2.0, we associated knowledge engineering model, semantic web approach and web 2.0 technologies to build the E-MEMORAe2.0 learning collaborative platform as support for community of practice. With such a platform, we took into account social, organizational learning and knowledge management processes (Leblanc, 2007). It is based on a Learning Organizational Memory model. Thus, extending the definition given by (Dieng, 1998), we propose the concept of Learning Organizational Memory for which users’ task is learning.

In order to assess our approach, we chose to build Learning Organizational Memory for academics organization. This choice of applications is justified by two observations:

- A course is made of actors (learners, instructors, trainers, course designers, administrators, etc.), resources of different types (definitions, exercises, etc.), written in various forms (books, reports, etc.) and on various supports (paper, video, audio, etc.). In this sense, a course is an organization.
- Learner which have a course must get ready to their professional life and thus with an organizational learning.

Let us specify that in the context of an organization of academic type, organizational knowledge is knowledge teachers want to transmit and learners must assimilate. The actors of such an organization must thus be able to exchange about this knowledge.

Examples of this article come from the course about applied mathematics at the University of Picardy.

The project MEMORAE2.0 is an extension of the project MEMORAE (Abel, 2006). Within the project MEMORAE, we were interested in the knowledge capitalization in the context of organizations and more precisely the capitalization of the resources related to this knowledge. We particularly focused on the way organization actors could use this capitalization to get new knowledge. To that end, we developed the platform E-MEMORAE as support for e-learning. In such a platform resources are indexed to knowledge organized by means of ontologies.

“Provided with an ontology meeting needs of a particular community of practice, knowledge management tools can arrange knowledge assets into the predefined conceptual classes of the ontology, allowing more natural and intuitive access to knowledge” (Davies, 2003).

Thus ontology provides a means for sharing knowledge (Chandrasekaran, 1998).

We used Topic Maps (XTM, 2001) as a representation formalism facilitating navigation and access to the resources. Thus ontology structure is used to navigate among the concepts as in a roadmap. The user has to reach resources that are appropriate for him. In such a platform, the general principle is to propose to the users at each step, either precise information, resources on what they are searching for, or links allowing them to continue their navigation through the memory. To be more precise, the user interface proposes:

- Entry points enabling to start the navigation with a given topic: an entry point provides a direct access to a topic defined by an ontology concept of the memory and consequently to the part of the memory dedicated to topics.
- A short definition of the current topic: it enables the learner to get a preview of the concept and enables him to decide if he has to work it or not.
- A part of the ontology describing the current topic is displayed at the screen centre.
- A list of resources which contents are related to the current topic: they are ordered by type (books, course notes, sites, examples, comments, etc.). Starting from a topic, an

entry point or a topic reached by the mean of the navigation, the user can directly access to indexed resources. Descriptions of these resources help the user to choose among them.

- Navigation history: it enables the learner to remind and to be aware of the path he followed before. Thus, he can get back to a previously reached topic if he wants to.

E-MEMORAE was positively evaluated in academic contexts (Abel & al, 2006).

Within the project MEMORAE2.0 we are interested in developing memory collaborative functionalities and social processes. To that end, we take into account:

- Different levels of memory;
- Different ways based on semantic web 2.0 tools to facilitate exchanges and communication between the organizational actors.

Thus in such an environment, we distinguish knowledge and resources of:

- The whole organization;
- A group of individuals in the organization – the organization is constituted of different groups of individuals even if it can be seen as a group itself;
- An individual.

To that end, we modelled different level of memories.

In order to facilitate the externalization and capitalization of tacit knowledge we modelled a semantic forum.

Our semantic forum is an internet forum that has an underlying model of the knowledge described in its content. Such content is formed by users' questions and answers about specific topics concerning the forum themes. All the questions and their answers are microcontents that we can describe by the author, the date of posting but also by the theme and the topic it is about. In our context, in order to not be disconnected with the innovation process, topics are defined by ontology concepts. All this knowledge is defined semantically although users don't aware of this definition and language used to do it.

The idea is to foster and capitalize exchanges concerning any topics of the organization defined by ontologies. Microcontents are considered as micro resources and indexed and reached like any resources in the memory.

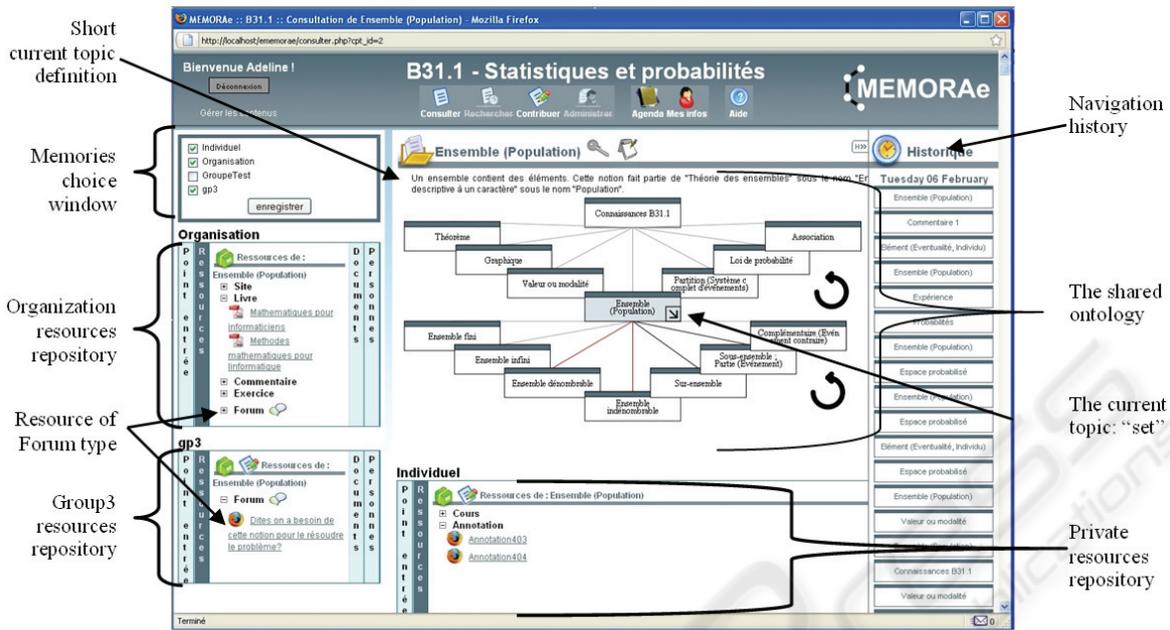


Figure 1: E-MEMORAe2.0 navigation interface (in French).

In order to put into practice our modelling we developed a new environment called E-MEMORAe2.0 (cf. Figure 1). It re-uses general principles of E-MEMORAe and gives the possibility of learners to have a private space and participate to share spaces according to their rights. All these spaces (memories) share the same ontologies but store different resources and different entry points. Resource transfers can be done following two mainly ways:

- Users can visualize different spaces/memories content at the same time and make a drag and drop to transfer a resource from a specific memory to another one.
- Users can interact about specific topic via exchange resources. We developed semantic forum to foster tacit knowledge externalization. We developed in the same way semantic e-mails, semantic chat. Semantic agendas are under construction.

In such a way, each group memory has its own forum organized around the shared ontology. Each interaction is automatically indexed without users do anything. All the forum contributions are distributed in the resources space among the other resources. Users don't access to the forum itself but to the memory resources space and then select resources of Forum type to participate to the forum.

## 6 CONCLUSIONS

Innovation can be seen as a collective process. It implies individuals who may belong to multiple communities. Companies have thus to facilitate the emergence of innovation at individual or group level. Indeed, implementation of interactive groups aims at integrating specialized individuals with complementary skills into supple structures in order to foster creativity (Hamdouch, 2008). Communities enable to convert their members' tacit knowledge into codified knowledge, making it more easily available to support exchanges, learning and facilitate innovation.

Thus the most important resources of innovation process are tacit knowledge, understanding and learning. In this sense it is a complex process which mainly reifies three intertwined sub-processes: social, organizational and knowledge management.

In this paper we presented these three sub processes and how they are linked in an innovation process context. Each of these processes can be supported by a computerized platform; although these platforms can support parts of innovation process, designing a unique platform taking into account the three sub-processes requirements should foster it. That is why we defined the concept of learning organizational memory and designed a platform based on this model, semantic web approach and web 2.0 technologies.

Currently our platform is used by academics (organizational learning and social processes). We have also contacts with industrials in order to evaluate such an environment to foster innovation in their organization.

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