

E-MEMORAe2.0: an e-learning environment as learners communities support

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Abstract:

Information and Communication Technologies have transformed the way people work and have a growing impact on long life learning. Organizational Learning is an increasingly important area of research that concerns the way organizations learn and thus augment their competitive advantage, innovativeness, and effectiveness. Within the project MEMORAe2.0, we are interested by the capitalization of knowledge in the context of an organization, but also by the externalization and capitalization of tacit knowledge that's why we use a forum in an organizational learning context. We developed the E-MEMORAe2.0 environment which is based on the concept of learning organizational memory. This environment is meant to be used by a Semantic Learning Organization as support for Organizational Learning. In such an environment, actors of the organization use, produce and exchange documents and knowledge. To that end, they have to access the resources and to adapt them to their needs. In this paper, we present the organizational learning approach, we stress the role of an organizational memory in this approach and we specify the use of a forum concept in such a context. Then we present the approach MEMORAe, the environment we developed and the first evaluation of this environment.

Keywords: Learning Environment, Organizational Learning, Learners community

1. INTRODUCTION

We showed with MEMORAe project (Organizational Memory Applied to the e-learning), the interest to apply principles and methods of the knowledge management in an e-learning context. Especially, we chose to consider an academic training as an organization [Lenne 2005] and to organize its knowledge and resources by way of an organizational memory based on ontologies. A first experimentation of the memory-based environment showed that students could be more autonomous in their information research and in their knowledge learning [Benayache 2006].

However, the training objective is not only to allow students to learn knowledge and know-how, it also consists in forming the students to work in team, to share and to exchange knowledge. To add this dimension to MEMORAe project, we were interested in works on organizational learning. These works are motivated by the fact that companies, and more in general organizations, try to acquire new knowledge and competences to increase their performances and their competitiveness [McEvily 2002]. To that end, a way is to become learning organizations. A learning organization can be seen as a community of practice [Brilman 1995]. This last one places its efforts on the reasoning quality of individuals, on their shared visions, on their reflection aptitude, on the collaborative learning, and on their understanding of complex problems [Senge 1990]. An organizational learning must also make the difference between tacit and explicit knowledge [Nonaka 1997], and enable the communication of tacit knowledge via a process of externalisation.

Within the project MEMORAe2.0, we are interested in knowledge capitalization in the context of organizations and more precisely the capitalization of the resources related to these knowledge. We particularly focus on the way members of an organization could use this capitalization in a context of organizational learning. To that end, we developed an environment based on the concept of learning organizational memory. In fact the learning content is indexed by knowledge organized by means of ontologies. Ontology concepts enable to index learning resources and forum topic which facilitates the externalization of tacit knowledge. By this way this externalized tacit knowledge is capitalized.

In the following, we present the organizational learning approach, we stress the roles of an organizational memory and Communities of practice in this approach, and we specify the use of a forum in such a context. Then we present the project MEMORAe2.0, we describe how we implemented the organizational learning approach in the E-MEMORAe2.0 environment. Finally we present the first evaluations of E-MEMORAe and E-MEMORAe2.0.

2. ORGANIZATIONAL LEARNING

A learning organization (LO) is an organization in which processes are imbedded in the organizational culture that allows and encourages learning at the individual, group and organizational level [Senge 1990]. Thus a LO must be skilled at creating, acquiring, and transferring knowledge, and at modifying its behavior to reflect new knowledge and insights [Garvin 1994]. According to [Dodgson 1993], a LO is a firm that purposefully constructs structures and strategies so as to enhance and maximize organizational learning (OL). An organization cannot learn without continuous learning by its members [Nevis 1995]. Individual learning is not organizational learning until it is converted into OL. The conversion process can take place through individual and organizational memory [Child 2001]. The results of individual learning are captured in individuals' memory. And, individual learning becomes organizational learning only when individual memory becomes part of organizational memory [Cohen 1991]. Finally, OL seldom occurs without access to organizational knowledge. In contrast to individual knowledge, organizational knowledge must be communicable, consensual, and integrated [Ducan 1979].

3. ORGANIZATIONAL MEMORY

Indissociable of the memory [Lehner 1998], learning is the process which implies the discovery, the memorizing and the exploitation of stored knowledge [Moorman 1998]. Continuing work of Walsh and Ungson [Walsh 1991], Stein and Zwass [Stein 1995] define the organizational memory 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 knowledge and information in an organization, in order to facilitate their access and their re-use by the adequate organization members for their tasks [Dieng 1998]. Thus, an organizational memory seems indispensable for 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 [Brown 1991]. According to Girod [Girod 1995], there are three levels of organizational memory:

- An individual level: the individual memory indicates the knowledge held in the brain of the individual and knowledge visible in the form of documents held physically by individual (files in its office, various documents, etc).
- A collective level not centralized: this collective memory is the result of the interactions between individual memories and exchanges emergences, communications between two or several people, being able to reach a common interpretation allowing the decision-making.
- A centralized level: since the collective memory is accessed by all the actors of the organization, it becomes coordinated and centralized, like a database.

Thus, an organizational memory seems a way to facilitate organizational learning. It can include at the same time physical data like reports, articles but also information expressed traditionally without physical support such as tacit knowledge, experiments, critical incidents or details on the strategic decision-making. Ideas produced by the employees during their tasks seldom exceed the circle of a small group or a team. This abstract or practical knowledge is the key of the organizational learning [Brown 1991].

4. COMMUNITY OF PRACTICE AND COMMUNITY OF LEARNERS

A growing number of people and organizations in various sectors are now focusing on communities of practice (CoPs) as a key to improve their performance. In this section we define what a CoP is and we introduce the concept of community of learners.

4.1 Definition

According to Wenger, Communities of Practice are everywhere - at school, at work, in our hobbies... Members of such a community are informally bound by what they do together and by what they have learned each other through their exchanges about what they do [Wenger 1998]. He defines a community of practice along three dimensions:

- What it is about: the subject of interest.
- How it functions: members are engaged together into a social entity.
- What capability it has produced: a set of shared resources (vocabulary, documents, sensibilities...).

A community of practice is constituted of volunteers who are concerned by a work-related or interest-related field [Brown 1991]. Communities of practice exist in any organization even if they are not bound by organizational affiliation. They are important to the organization functioning and become crucial to those that

recognize knowledge as a key asset. They fulfil many functions with respect to the creation, accumulation, and diffusion of knowledge in an organization [Wenger 1998].

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

4.2 Community of learners

When the interest of the community is learning, what is case of a learning organization; we call it community of learners. In the context of academic organization we can differentiate two types of communities of learners:

- Communities of learners working on a common problem, this problem was given by teachers to guide the students in their learning, members of these communities have to resolve a problem by joining their efforts
- Communities of learners working on a common subject, they arise spontaneously around subject in order to acquire, exchange and capitalize a maximum of knowledge about this subject

These two types of communities must be able to coexist within training. Their aim is to facilitate sharing, exchange or the capitalization of their knowledge to allow learning. They can be supported by tools based on Web2.0 technologies. Indeed, these last ones enable to develop tools like forum in order to facilitate knowledge sharing, exchange and capitalization.

5. FORUM

In this section, we present forum. First we define it, then we give some of its limits. Finally we explain how we use forum in our approach.

5.1 Definition

Like Wiki, a forum enables visitors to exchange information. The difference is that a forum is divided into several topics. Each topic starts with a question asked by a visitor and is followed by visitors answer. Thus each visitor can read a question and the answers posted, take a new question or reply to a question. As pointed out by [George 2003], forums used in on-line educational platforms are not specific to the educational context. The communication activities are detached from the learning activities [Looi 2001].

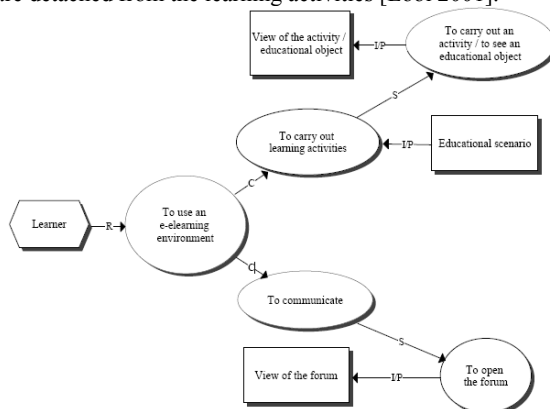


Figure 1. Typical model of the forums for on-line education [George 2003].

The Figure 1 presents the typical model of forum in an on-line education environment. This model was conceived using a representation method called “Modelling using Object Types” (MOT) [Paquette 1996]. This representation makes it possible to highlight links between procedures (symbolized by oval shapes), concepts (symbolized by squares) and actors (symbolized by hexagonal shapes). These links can be composition links (labelled C), regulation links (labelled R), input/output links (labelled I/P) and specialization links (labelled S).

In this model, learners use a computer environment to carry out learning activities and to communicate with distant teachers and other learners. Thus, on the one hand, while progressing in the educational scenario, learners see educational objects and activities. On the other hand, learners can communicate using tools of the computer environment, including a forum tool.

5.2 Limits

The MOT (model of use of forum in an e-learning context) shows us that the learning activities are not linked to the communication activities. These activities are only linked by the content of the discussion within the

forum. So, the current forums in learning platforms have little relationship with learning activities, consequently this does not encourage the learners to use them for communication [George 2002].

The only forum specific to education we found is Knowledge Forum. Knowledge Forum is a collaborative database developed for the process of "knowledge building": defining problems and hypothesizing, researching and collecting information, analysing and collaborating. The aim of Knowledge Forum is to help classrooms to become knowledge-building communities, in which all students are producers of knowledge [Scardamalia 1999]. The interface of Knowledge Forum allows users to post notes and to link them together. The students structure the notes themselves. The Knowledge Forum tool was designed to support a specific learning activity: problem-based learning. So the students' activity is by definition collaborative; the tool is used to solve a problem by a group of individuals.

Our interest is different. Our work concerns more generic forums that aim to promote discussion during each learning activities.

5.3 Our approach

Forum is an interesting tool enables learners to exchange information inside a group. This exchange facilitates externalization of tacit knowledge. However, in a learning context, its use is too general to be efficaciously exploited (cf. MOT §4.2).

Our approach consists in designing a forum structured according to the knowledge to learn, allowing the students to communicate in a more contextual way: the learning activity which is carried out. The purpose of this forum is to give the possibility of consulting messages, notes concerning the learning activity of the students, i.e. in relation to the knowledge being treated at a given time.

6. MEMORAE2.0

CoPs seem to be a key asset for facilitating organizational learning and innovation. One of the principal reasons for which they are regarded as an important vehicle for the innovation is their potential to create an environment where members feel well for sharing ideas. However, it is not because they are formed naturally that the organizations should make nothing to influence their development [Wenger 1998]. Put spaces of resources exchanges and ideas sharing at the disposal of the organization actors around a common vocabulary is a means to support communities of practice.

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 by means of a learning organizational memory. We particularly focused on the way organization actors could use this capitalization to get new knowledge. To that end, we developed the environment E-MEMORAE as support for e-learning. In such a system a learning content is indexed to knowledge organized by means of ontologies: domain and application. The domain ontology defines concepts shared by any organization; the application ontology defines concepts dedicated to a specific organization. Using these ontologies, actors can acquire knowledge by doing different tasks (solving problems or exercises, reading examples, definitions, reports...). We used Topic Maps [XTM 2001] as a representation formalism facilitating navigation and access to the learning resources. The ontology structure is also used to navigate among the concepts as in a roadmap. The learner has to reach the learning resources that are appropriate for him. E-MEMORAE was positively evaluated [Benayache 2006].

Within the project MEMORAE2.0 we are interested in using the MEMORAE approach in an organizational learning context. To that end, we take into account different levels of memory, different ways to facilitate exchanges between the organizational actors and different tools to enable knowledge externalization. We base our approach on an organizational memory that makes a difference between knowledge and resources of: a) the whole organization; b) a community of practice in the organization – the organization is constituted of different communities of practice even if it can be seen as a community of practice itself; and c) an individual.

For example, when actors need to know who works on a project, they have to access the information relative to the project itself. A way to do this is to navigate through a concept map based on an ontology defining the organization knowledge. According to their access rights, they can visualize different resources. In case of exchange resources, they can exchange ideas or information (externalization of tacit knowledge). Thus, learning can occur by means of these different resources, for example by: Asking a question to the right person (the one who is described as an expert: he worked on a project linked to the searched knowledge...); Asking a question to everyone concerned by a subject (newsgroup); Reading the right rapport, book... (Communication resources); Performing the right exercise, problem, QCM (action resources)...

To that end, we designed the learning organizational memory around two types of sub-memory that constitute the final memory of the organization:

- Group memory: this kind of memory enables all the group members to access knowledge and resources shared by them. The group is at least made of two members. We distinguish three types of group memory corresponding to different communities of practice:
 - Team memory: The team memory capitalizes knowledge, resources, communication concerning any object of interest of the group members.
 - Project memory: The project memory capitalizes knowledge, resources, communication concerning a project. All the information stored is shared by the members who work on the project.
 - Organization memory: this memory enables all the members of the organization to access knowledge and resources without access right. These resources and knowledge are shared by all the organization members.
- Individual memory: this kind of memory is private. Each member of the organization has his own memory in which he can organize, and capitalize his knowledge, resources.

These memories offer a way to facilitate and to capitalize exchanges between organization members. For this purpose, we extended MEMORAE ontologies to represent these sub-memories and exchange resources (see Figure 2).

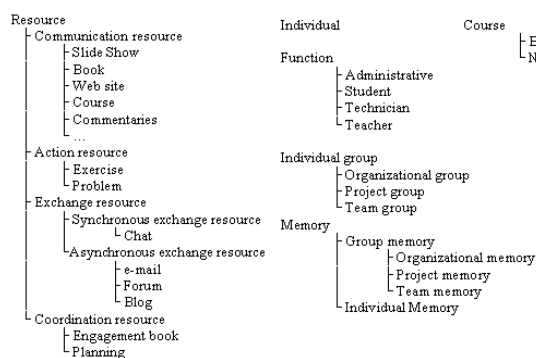


Figure 2. Part of domain ontology.

7. E-MEMORAE2.0

E-MEMORAE is an environment which enables learners to access, share and capitalize knowledge. In this section we give a description of the environment, then we explain the different ways to navigate in E-MEMORAE; we show how learners can exchange knowledge and finally we present the forum tool and how learners can use it. All illustrations come from a course on applied mathematics taught at the University of Picardy (France).

7.1 Description

Our objectives within E-MEMORAE2.0 (see Figure 3) are to help the users of the memory to access and exchange information about organization knowledge at anytime. To that end, users have to navigate through the application ontology that is related to the organization, to visualize the indexed resources thanks to this ontology, to ask for questions or make remarks thanks to this ontology... These actions are possible according to their memory access rights. It should be noted that all the memories are structured around the same ontology, they differ only by the indexed resources.

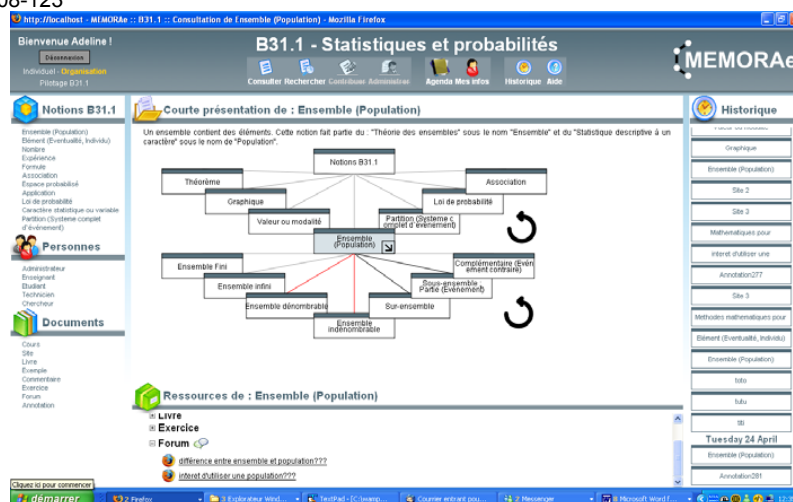


Figure 3. Vertical navigation in the memory (in French).

At each step, the general principle is to propose to the learners, 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 (see Figure 3) proposes:

- An access to different memories (in top on the left), specifying the memory visualized and allowing to access to authorized memories. By default, the user visualizes his private memory.
- Entry points (left of the screen) enabling to start the navigation with a given concept: an entry point provides a direct access to a concept of the memory and consequently to the part of the memory dedicated to notions. The person who has the access rights has to define the notions that he considers as essential to directly reach by the users of the memory considered.
- Resources (bottom of the screen) which contents are related to the current concept: they are ordered by type (books, course notes, sites, examples, etc.). Starting from a notion, an entry point or a notion reached by way of the ontology, the user can directly access to associated resources. Descriptions of these resources help the user to choose among them.
- A short definition of the current notion: it enables the learner to get a preview of the notion and enables him to decide if he has to work it or not.
- A history of the navigation: it enables the learner to remind and to be aware of the path he followed before. Of course, he can get back to a previously studied notion if he wants to.
- Least but not last, the part of the ontology describing the current resource is displayed at the centre of the screen.

7.2 Navigation

We have two ways to navigate through our environment. Vertical navigation allows to explore subsumption relations and to reach related concepts. For example, if the user wants to discover the 'Ensemble fini' notion, the best entry point is 'Ensemble (Population)'. By choosing this entry point, (s)he has access to the local taxonomy associated to the notion of Set. Among the sub-concepts of 'Ensemble', (s)he can find 'Ensemble Fini'. By clicking on this concept, a local taxonomy centred on this new concept is displayed (cf. figure 3). Thus the learner can browse the ontology using its taxonomic form.

Some presentation rules are used in order to help the user to visually explore this hierarchical organization: the current concept C is at the centre of the screen; all the sub-concepts of C that represent more specific notions are presented; at last, the super-concept of C , that represents a more general notion, is also presented. We did not find it useful to extend this representation. Our goal was to keep it understandable.

To end with the hierarchical navigation, let us finally note that the representation uses semantic axes. In order to visualize them, we used different colours for each of these axes. At this stage, their meaning is not explicit.

Let us suppose now that the learner decides to temporarily stop the navigation and to focus on a particular concept. This concept is at first described by a short definition. If the user wants to learn more on the selected notion, (s)he has access to a list of resources ordered by type. For example, Figure 3 shows that if the user wants to deepen the notion of 'Ensemble (Population)', (s)he can select among the associated resources, for example a book entitled 'Mathématiques pour l'informatique', by left-clicking on the name of this resource. A description text is then displayed in a new window (cf. figure 4). Other bibliographic information such as ISBN number,

authors, publisher, etc., are also available. When the resource is digital, it can be displayed or sent to someone by e-mail.

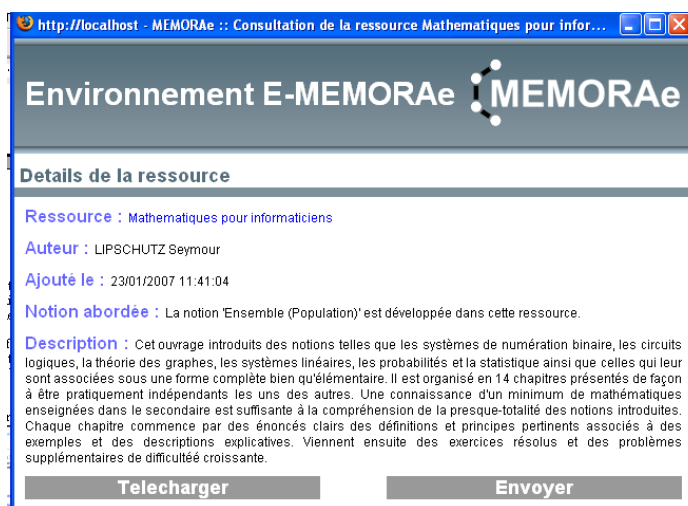


Figure 4. A book resource interface (in French)

A concept can refer to other concepts than those, which are displayed in the taxonomy. Access to these concepts is sometimes needed in order to understand some notions. Proximity relations (other than subsumption) are useful for that. Examples of these relations are: prerequisite-of, in-the-definition-of, suggests, etc. Other application specific relations such as: subset-of, has-cardinal, etc., can also be considered. We call this kind of navigation “horizontal navigation”, in comparison with the “vertical navigation” that we considered before. These relations are accessed by click on the source concept C icon: a popup menu contextually displays the available relations starting from C (see figure 5).

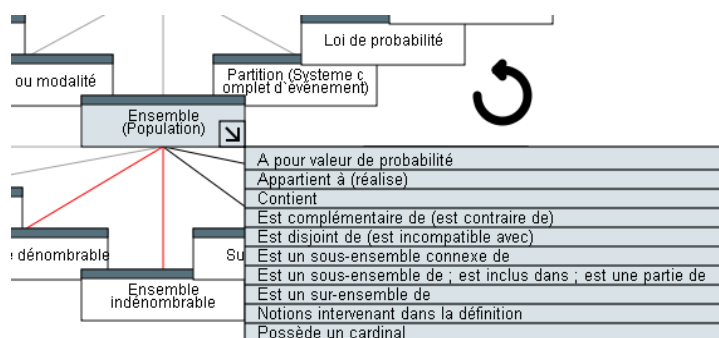


Figure 5. Pop-up menu to access horizontal navigation (in French)

Let us consider one more time the case of the ‘Ensemble (Population)’ concept (cf. figure 3). Among the available horizontal relations, the learner can choose for example ‘Notions intervenants dans la définition’ and learn more about prerequisite notions such as ‘Nombre’ or ‘Cardinal’ (cf. figure 6).

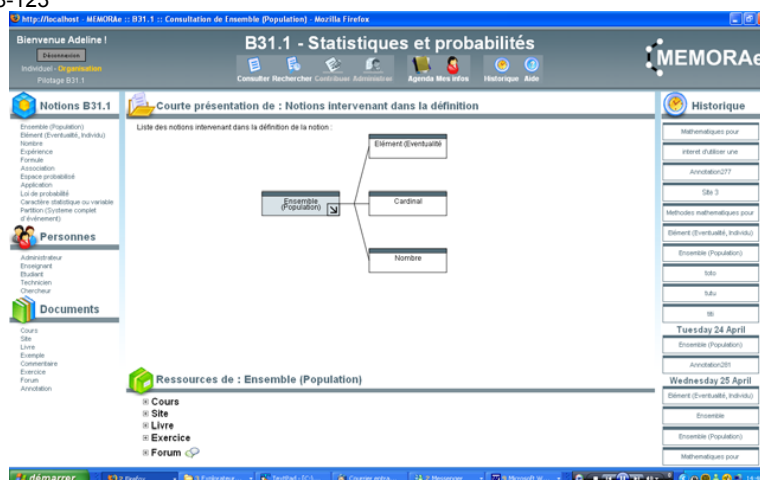


Figure 6. Horizontal navigation interface (in French)

Choosing the ‘Cardinal’ concept in the list of the concepts intervening in the definition of ‘Ensemble (Population)’ allows then to switch back to a vertical navigation centred on this new concept of ‘Cardinal’. Finally, one can see that the navigation through the application ontology is made very easy by combining vertical and horizontal moves.

After each exploration action made by the learner, the history (cf. figures 3, 6; right frame) is actualised. This history keeps track of the path followed by the user during his (her) exploration. Of course it is possible to go back to a previously visited notion by clicking on it in the history.

7.3 Knowledge exchange

When a user logs on he directly accesses to his individual memory. He can then navigate through the application ontology and access to resources which he himself added. He also can access to another memory by a click on the name of the memory in the high left part of the general menu.

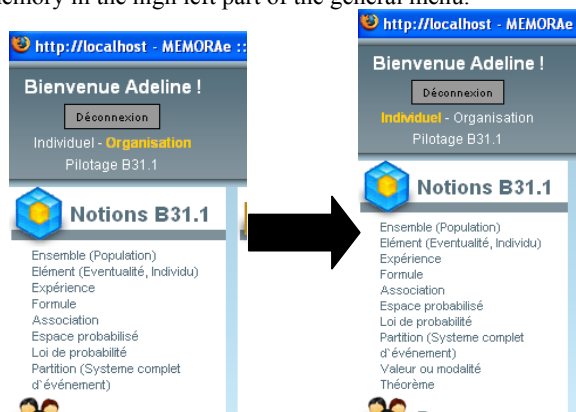


Figure 7. Visualization of the individual and organizational memory entry points (in French)

This change of memory makes possible:

- Visualization of resources capitalized by the group members (figure 8).
- Addition of entry points (figure 7) shared by all the group members.

Thus figure 8 shows different resources from different memories concerning the same concept. The user indexed two types of resources in its individual memory (delivers and comment) and can access to other resources such as courses or exercises in the organizational memory.

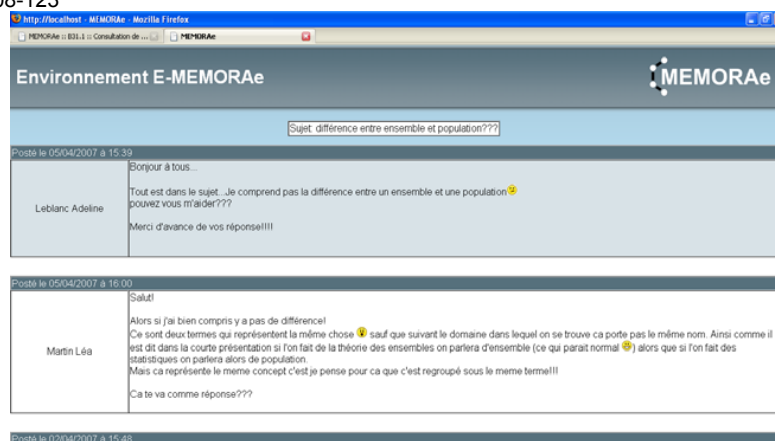


Figure 10. Visualization of a part of forum (in french)

7.4.2 Use case

A forum enables exchange of information between different users. Users can ask question in order to learn new knowledge. Users can also answer a question and by this way externalize tacit knowledge. Tacit knowledge is hardly expressible because it is rooted in actions (for example: turns of hand, intuitions, and feelings). It is individual knowledge frequently transmitted in the mode Master-Learner [Grundstein 1999], rather than by procedure or instructions. Forum facilitates discussion between users and favours this externalization and thus its capitalization.

When a user wants to post a question, he has to choice recipients: a given person or a given group. The forum is dedicated to be used by a group, if the sender wants to ask a question to a given person he will write an e-mail. To choose a group the user has to select the right memory then he has to reach the right concept (navigation, entry point), which concerned with the question. At this step, he has to access to resources indexed part and select the type 'forum'. Then, two situations are possible:

- The question is already posted: he can read answers and complete the resource. To that end, he has to click on the question: a pop-up window gives different information about the question (date of creation, author...). Then he can read the content (answers) in clicking on 'visiter' button (figure 11).

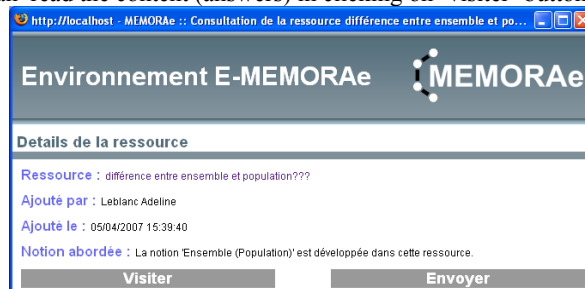


Figure 11. Information on the resources (in French)

- The question is not posted: user has to create a new question/resource thanks bubbles close to the term 'Forum'. The figure 12 shows the creation window of a new question. User has to fill the question subject and the text in order to make explicit his question.

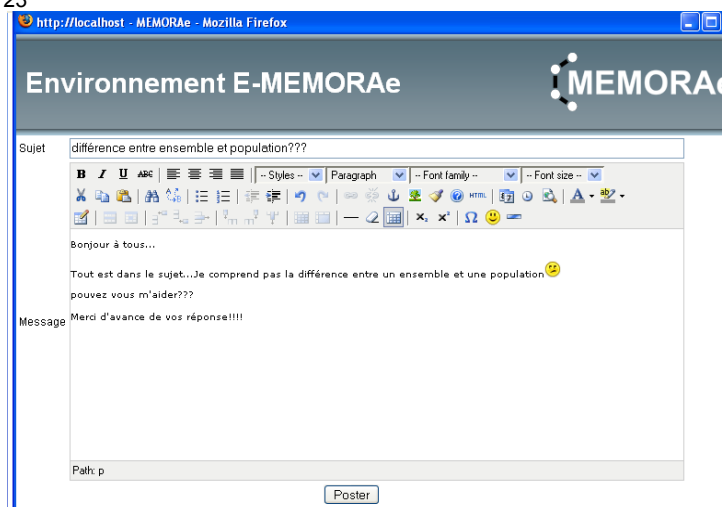


Figure 12. Creation of a new question (in French)

In the same way, when a user accesses a resource/question during his learning, he can answer it in clicking on the 'répondre' button (figure 13). All questions and answers can be seen by members of the group memory where the question/resource has been created.

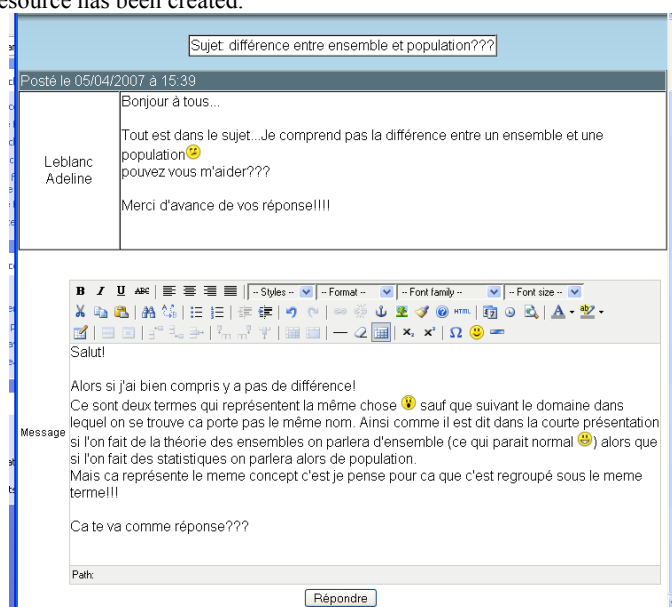


Figure 13. Answer to question (in French)

8. EVALUATION AND EXPERIMENT FEEDBACK

In order to assess our approach, we chose to build organizational memory for two academics organization: a course on algorithms and programming at the Compiègne University of Technology (France) and a course on applied mathematics at the University of Picardy (France).

In this part, we present tests that we used to evaluate E-MEMORAe and E-MEMORAe2.0, their application before stating the results obtained.

8.1 E-MEMORAE evaluation and feedback

The evaluation resulted in a test of utilisability¹ carried out near 61 students of the UPJV following the B31.1 module and 126 students of the UTC following the NF01 module. We used a test of utilisability in order to see how the students use E-MEMORAE. The utilisability is defined in the following way: a system is usable when it allows user to carry out his task with effectiveness, efficiency and satisfaction in the context of use specified. In other words, we consider that software is useful when the user can realize his task (effectiveness), when he consumes a minimum of resources to make it (efficiency) and when the system is pleasant to use (satisfaction). The concept of utilisability gave rise to its own measuring instrument: tests of utilisability

With such a test, our principal objective is to see how E-MEMORAE can enable learner to discover by oneself new concepts. More precisely, our goal is to check whether it is useful to:

- Index and structure the contents of a training by an ontology,
- Propose a tree representation of ontology in order to facilitate navigation within the resources,
- Offer a list of entry points in order to enable a fast access to the principal notions of the training.

Students made the test in classrooms and had access to a computer with an Internet connection. They had to solve problems for B31.1 or answer to a QCM for NF01. These problems or QCM concerned notions, which they had not studied before. For help, they only had E-MEMORAE at their disposal.

We implemented various means to observe the students during the test. The history of navigation of students was saved in the memory in order to enable us to understand their navigation within the environment. Observers, professors or PhD student, were participated in the tests of the UPJV. These observers had for order to note all that made the observed student and had to by no means intervene during the test.

Moreover, one questionnaire was distributed to the end of the test, it related to:

- Profile of the student,
- Taking in hand of the tool,
- Presentation of information (the structure of tree, entry points, etc).

This questionnaire enabled us to collect information on the students and their opinions on the various aspects of the environment. Finally, the tests were marked, these marks reflect the success of students and thus enable us to know if students solved exercises or knew to answer questions of the QCM.

The study of the answers of the questionnaire shows that more than 85% of students favour this type of environment and think that E-MEMORAE is a good manner to place information at their disposal. The analysis of the questionnaires, the histories of navigation and the report of observers enabled us to know how students navigated within the environment. On basis of the concepts necessary to the resolution of the problem or QCM, we studied the histories and the reports of observations in order to recall the course of students. We could note that all means of navigation were used. Thus, students mainly used the search engine or the entry points to begin their research. They however thereafter used navigation within the tree structure to refine their research. The study of questionnaires also shows that among the students who used entry points (approximately 75% of students) more than 85% of them found relevant.

Finally, with an average of 15/20 as well for UPJV students as for UTC students, we can say that the students passed the test successfully.

Nevertheless, we also noticed that the average of students favourable to E-MEMORAE is very close to the one obtained by those, which are not favourable to E-MEMORAE. A study of the histories of this latter enabled us to determine two profiles. There are first of all those which used the environment very little and which were based on their knowledge to solve the test. We can suppose that these latter did not find useful the environment because they had already knowledge necessary to the resolution of the exercise. And there are those which "scattered" in the environment, they reached many concepts without finding what they searched. This problem can be related to the fact that it acted of their first use of the environment

Let us note that remarks or suggestions that students could make on the questionnaire related mainly to the pictorial display of the environment: the posting of the tree with the bonds which are cut or the concepts which overlap, format of the resources with suggestion to pass to format HTML in order to be able to arrive directly on the part of the bearing course on the selected concept, no possibility of returning behind differently than while using the history, not assistance available on the site or that the site is not attractive enough.

8.2 E-MEMORAE2.0 evaluation and feedback

In this section we present the E-MEMORAE2.0 exploitation. Though the formation touched its end, we wanted to have a feedback concerning our environment and more especially feedback concerning the access to different memories and the forum. Our main objective was to see how our environment could facilitate exchanges within a community of learners. More precisely we wanted to be sure those learners:

- Navigate in different memories

¹http://egov.wallonie.be/docs/implication_utilisateurs/fiche13.doc

- Add new resources in their individual memory or in their group memory
- Use forum

8.2.1 The first evaluation

This experience was realized by way of an utilisability test during June 2007 with only 16 students of B31.1 training; few students attended this training at this time.

In concrete terms, the test lasted only three weeks, until the end of the academic year. Students were grouped by binomial and every binomial had a problem to solve. Each student had during these three weeks an access to the organization memory, his individual memory and his group memory; a group memory was created for each binomial. In each of group memory an entry point was added to allow to access to ontology concept representing the problem. Each problem has a type which is linked to application ontology concept by the relation: “met-en oeuvre” (to use). This relation enable to reach knowledge concerning by the problem solving.

Only login and passwords were given to students. The problem statement was not distributed, students had to access to their group memory, and then reach the concept representing their problem before reading or downloading the resource concerning the problem statement.

As illustration, the figure 14 introduces three problems of type “Prob: Loi/Estimation/Tests d’hypothèse” (Law / Estimate / Tests of hypothesis). Problem Prob2 is in the center of the ontological view and we can access to indexed resources among these we find the problem statement.

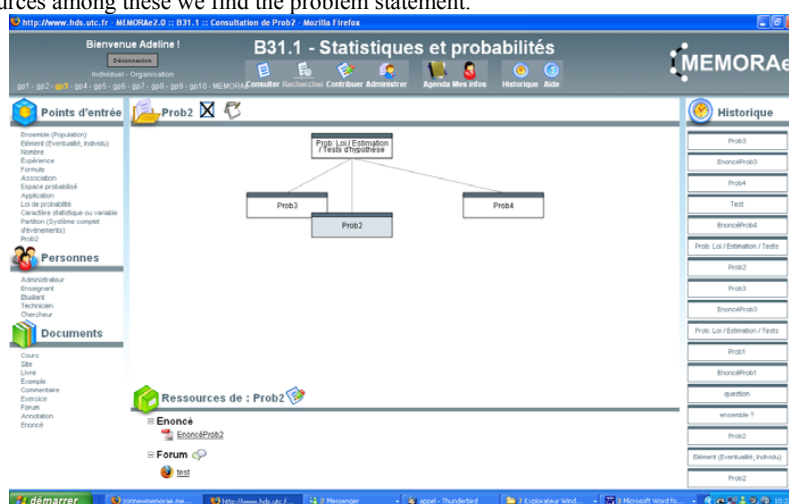


Figure 14. Access to resources indexed by problem Prob2.

The figure 15 shows knowledge useful to solve a problem of type: “Prob: Loi/Estimation/Tests d’hypothèse” (Law / estimate / test of hypothesis).



Figure 15. Visualizations of knowledge use in the problem: “Prob: Loi/Estimation/Tests d’hypothèse”.

Before using the environment the head of the training did a short presentation and explained to students that they can read the use guide (click on the dedicated icon).

A study of navigation history shows that all students reached the problem statement and used the three memories (individual, group and organization). Among those who used environment (10), i.e who did not content to only download the problem statement, all used the relation "met-en-oeuvre" (to use). Students used forum but in view of questions, it was only a test to make sure of its functioning. Finally, five students added resources (essentially web site) on their individual memory, only one resource was added in a group memory. Because the head said to students he will not give a mark to the problem solving only two groups delivered a result. Results were considered correct by the head.

8.2.2 *The second evaluation*

A second evaluation began at the beginning of the autumn semester 2007; students (38) who participate to this evaluation study mathematics and are not computer specialists.

In concrete terms, the test lasts about two months and has begun in the middle of October 2007. Like the first evaluation students were grouped by binomial and every binomial had a problem to solve. Each student benefited during these three weeks of an access to organization memory, individual memory and a group memory was created for each binomial. In each of this group memory we added an entry point allowing to access to the problem representation by a concept of ontology. Students can access to the problem type and to the useful notions to solve this kind of problem. They can also add resources or ask question via the forum.

Moreover, one questionnaire will be distributed at the end of the test. This questionnaire will enable us to collect information concerning students themselves and their opinions about the various aspects of the environment. Most questions are modelled like the following pattern: "Are you agree or not with the statement: x"; students have choice between four answers: not agree / rather not agree / rather agree / agree. The questionnaire is related to:

- Student profile: this questionnaire part concerns the student initial formation, his aptitude in probability and statistic domains, his use of Internet in order to know for example if student is familiar with Internet. Maybe this part will explain why a student didn't solve successfully its problem.
- Taking in hand of the environment: this part concerns student feelings about the use of the environment: easy or not, if he appreciated all the environment parts (definition, entry point, navigation in the tree, etc.).
- Presentation of information: in this part we question the student about the notion approach, the structure of tree, the entry point.
- Use of different memories: this part enables to capitalize the student opinion about the use of different memories. Our goal is to know if student appreciates this way to exchange and share knowledge.
- Forum: this part concerns the forum use. We ask student if he posted questions or answers in forum and why. What are his feelings about this kind of resource?

8.2.3 *Feedback*

The first E-MEMORAe2.0 evaluation gave encouraging results. Students accessed to different memories, added resources and used the forum. Students seemed to appreciate an environment such as E-MEMORAe2.0. Unfortunately the test during was not significant, however observations were encouraging. That's why a second evaluation has begun and aims to validate our approach. Here and now, we noted that many students:

- Navigate through the environment and access to different resources.
- Use their different memories.
- Access to the problem statement.
- Access to the problem type and to the useful notions to solve their problem.
- Add resources in individual or group memory, they add principally web site URLs.

For instance students don't use the forum efficiently but we wait for the end of the evaluation to have complete results (Navigation history and questionnaires). Let's note that students in mathematics see each other every day and maybe they don't need to use a forum to ask a question. To finish, we locate this test of E-MEMORAe2.0 in a context where communities are not created by practice (binomials are imposed) but have to create their own practice.

9. CONCLUSION

In this paper, we described the organizational learning approach and we showed how we implemented it in the E-MEMORAe2.0 environment for academic organizations. Our approach consists in offering a software

place to community of learners. Learners will be able to exchange ideas, information about a particular subject concerning their training. Thus, they can learn each other about this subject and then constitute a community of learners. The environment we developed is based on the concept of organizational memory and enables knowledge transfer at three levels: individual, group and organization. A memory is dedicated to each level and the transfer is facilitated by way of the use of a shared ontology. This one enables to semantically define notions to learn and index relevant resources. In such an environment we encourage discussion about notion to learn by way of a forum organized around the shared ontology.

A first evaluation of the environment E-MEMORAe2.0 gave encouraging results. Students appreciated to have access to resources indexed by the notion to learn and to add their own resources in their memories (group and individual). They didn't really use the forum maybe because they see each other everyday during the face-to-face training.

A new evaluation is in progress. Currently, students used the environment and we wait for the end of the evaluation to have more results.

In order to complete these evaluations, we plan now to make a new evaluation with more students and on a longer period. We also plan to examine to what extent industrial organizations, and companies could benefit of this approach. However it should be noted that software environments are not sufficient to promote organizational learning. It is also a question of culture, as well at university as in any other organization. If students acquire this culture at university, they should get better ready to their professional life.

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