USING KNOWLEDGE MANAGEMENT IN HIGHER EDUCATION: RESEARCH CHALLENGES AND OPPORTUNITIES

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ABSTRACT

During the past decade, higher education faces many pressures and changes. Understand and positively influence these changes calls for coordinated, controlled, larger and precise action plans. This requires effective management of the intellectual capital. Knowledge management wants more than necessary and universities can not escape. The present communication investigates an experiment of implanting the knowledge management within the university IBN ZOHR of Agadir. We propose an approach based on the e-learning and its components to establish an organizational memory of the scientific, technical and administrative holdings of the university. We were particularly interested in the constitution of a repository of resources intended for the training and for the research. This deposit of explicit knowledge include: administrative documents, courses, training pads, electronic books, etc.

Keywords: *Knowledge management, e-learning, University organization, organizational memory, documents, Knowledge, information and communications technology.*

1. INTRODUCTION

To understand what the higher education sector has to offer, it is necessary to consider the changes that have occurred in the last years. Indeed, during the past decade, higher education faces many pressures and changes: globalization, mass education, academic rivalry on large-scale, budget cuts, reforms, competitiveness, need to adapt to new requirements, etc.

Moreover, actors are more demanding than the past. For example, students becomes very demanding in terms of content, tools for interaction and education. The classical question like "I wish to have more explanation about a concept" might be enriched by additional constraints such as "An author explains that concept from another point of view" or "I would like some links in the internet or other exercises to complete my understanding".

Teachers, for example, are generally in a position to create or search for new information and knowledge. The purpose of this research is to achieve the basic documentation (books, journal articles, etc.), to satisfy a need to create a course, writing research papers, or documentation to complete a course, etc.

More than that, students are transformed into a new generation, called the "Net Generation" [1]. The students prefer receiving information quickly; wish multi-tasking and non-linear access to information; have a low tolerance of lectures; prefer active rather passive learning; rely heavily on communication technologies [2]. At the same time, people are becoming more mobile while demanding lifelong learning to meet their educational needs. Also, the university need to innovate and expand to provide learning tailored to

the needs of companies, in terms of skills and knowledge.

Educational systems in higher education have to be modified in accordance to the new needs and changes of people, society, economy and generally the word. This requires new models of management of its intellectual capital.

For most institutions in higher education, change is inevitable. In order to develop a distinctive model of these institutions, we thank that two elements must be present: (1) appropriate technology and (2) knowledge management. If those two elements exist and function normally then the use of technology will promote the better communication of knowledge.

The University as an organization is a fertile and natural scope for knowledge management. Several reasons may explain this double feature [3]. Firstly, the profession of a teacher requires a fairly natural culture of sharing. Thus, for example, a teacher who can write computer programs could easily pass his skills to his students. In general, a teacher-researcher is always in search of approaches and models that usually publish in journals or books. Similarly, for a student, the thirst to find people who share, identify new resources and acquire new knowledge and skills constitutes its own "raison d'être".

KM can help universities to ensure the right information as well as knowledge and gets the right people at the right time to take the right decisions, using knowledge management Systems (KMS). KMS refers generally to a system for managing knowledge in organizations for supporting capture, creation storage and dissemination of knowledge. The idea of a KMS is to enable organizations to have an easy access to the documentation, facts, sources of information, competencies and solutions. A key principle of KMS is to improve the search mechanisms of information and knowledge. This is particularly true for public organizations such as universities and research centers, where the sharing and reuse of knowledge plays a central role.

The main goal of this paper is to explore an experiment of implementing KM within the IBN ZOHR University, located in Agadir city, Morocco. It analyzes the strengths and characteristics of KM in higher education. It also suggests some avenues for supporting KM within university organizations.

In the following, we particularly propose an e-learning based approach to build an organizational

memory of the scientific, technical and administrative inheritance of the university. This memory is alimented by an ontology, which represents the main concept we have identified. We present in the next few aspects related to the concept of KM. We then propose in Section 3, some specific features related to KM in higher education. Part 4 will address the importance of KM in university organizations. Finally, the last two sections are devoted to a proposed approach to managing knowledge for creating an organizational memory applied to an institution of the University of Agadir ZOHR IBN. We also show a view of the future architecture of the KMS considered.

2. LITERATURE REVIEW

The knowledge management (KM) is a broad concept that addresses a range of strategies and practices used in an organization to identify, create, organize, represent, store, share, disseminate, search, analyze and improve its insights and experiences. Such insights and experiences include knowledge, either embodied in individuals or embedded in organizational processes or practice [4]. These strategies of KM are generally composed by the methods and software tools which can help to capture and to organize knowledge, in terms of resources, materials and skills to achieve strategic goals [5].

Little work was carried out in the application of KM within university organizations. Most of the attempts presented in the literature do not exceed the first steps of a project and arise in the form of questionings and of prospects. Among these, we can mention the work in the Czech Republic (Czechoslovakia), presented in [3] (Mikulecká, 2000). This work demonstrates the importance of the KM in universities and colleges by giving some examples of KM processes such as student registration, budget allocation, etc. Similar work was done by the ISKME1 U.S. research institute [6]. This paper explores the extent of the KM approaches in education; it also presents a roadmap for the next coming years. The main objective of this work was to propose recommendations for practical solutions to improve knowledge sharing and reform decision-making within university institutions. Other more recent proposals [7] address the application of KM in universities using the ERP (Enterprise Resource Planning) and/or e-learning. Finally, we emphasize actually a

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[1] ISKME : Institute for the Study of Knowledge Management in Education

surprising enthusiasm on Virtual Learning Environments (VLE), whose goal is to provide educational content, administrative information, online documentation, etc.

3. ASPECTS OF KNOWLEDGE MANAGEMENT

The concept of KM generally raises the problem of the exact meaning of knowledge. In this section we try to demystify this concept in a general framework. We then present some aspects of KM that are unique to academic environments of interest.

3.1 The Concept of Knowledge
3.1.1 Data, information knowledge

The definition of knowledge is an important issue that has conducted many debates in epistemology. In the domain of knowledge management, several definitions and visions of this concept are available in the literature [8][9][10][11][12]. As part of our work, we adopt a practical and operational vision of making a distinction between data, information and knowledge according to a hierarchical model.

In this model, data is considered as a raw element completely out of any context. Information is a data set in context. Information is not knowledge, but may become so if it is understood and assimilated by an individual.

3.1.2 Tacit and explicit knowledge

To be more precise and to extend what knowledge is, some authors like [8][9] makes an important distinction between tacit and explicit knowledge. In this perspective, tacit knowledge, as opposed to formal or explicit knowledge, can be integrated in people's heads, in their experience and rooted in the action, in the routines, in a specific context. The explicit knowledge is knowledge codified and transmitted in a formal and systematic language (documents, information systems, etc.). Such knowledge is not static; a dynamic process enriches and transforms them persistently.

3.1.3 Individual and collective knowledge

Knowledge can be individual or collective. Individual knowledge is a part of the tacit or explicit knowledge held by an actor in the organization. The collective knowledge is represented by the accumulation of organizational

knowledge stored in rules, procedures, routines and shared norms that guide problem-solving activities and patterns of interaction between organizational agents. Among the collective knowledge, some are easily transmissible (explicit knowledge), others are more difficult to capture, clarify and disseminate within the organization (tacit knowledge).The collective knowledge is build and feed through individual knowledge flows circulating within or originating from outside the organization [13].

3.2 Knowledge Management Systems

Knowledge management is concerned with strategies and practices for supporting capture, creation, representation, storage, usage and evolution of knowledge. KMS refers generally to a system for managing the knowledge within organizations. To build effective KMS technologies, we can say that a KMS could be any of the following:

- **Document based:** It uses technologies that enable the creation, management and sharing of documents such as the Web, distributed databases, document management features, etc;

- **Ontology based:** Knowledge is classified of a set of entities, classes, proprieties and relations. Moreover, a KMS is supporting knowledge sharing and reuse by covering semantic search methods;

- **Semantic Web rooted:** KMS is a ontology based, they can so be used to explicitly represent semantics of semi-structured and textual information on the web;

- **Based on AI technologies:** Artificial Intelligence techniques are introduced for representing and reasoning about knowledge;

- **Service based:** KMS must deploy knowledge management tools for networks of participants of a project;

- **Social computing tools** are being set up to provide an efficient and natural approach to creation of a KM system. It helps knowledge providers to explicit their implicit knowledge and to formalize knowledge in general.

In the next sections, we will focus our presentation on all of these aspects in the higher education domain. We will particularly explain the importance of KM in the field of education; specify the architecture of a KMS and the procedure to

acquire and to represent an ontology in that domain.

4. CHARACTERISTICS OF KM IN HIGHER EDUCATION

A university organization is primarily a traditional organization, composed of a set of individuals that structure, order and drive resources (material, human, financial) to achieve a common goal. It is however quite specific and can be characterized through three main elements:

- **The nature of its various actors** - a university organization aimed at different actors with special needs. It can be organized around five main types of actors (students, teachers, administrators, technical staff and partners). The expectations of these actors depend on many factors, generally difficult to imagine. Teachers and students, for example, create or search generally information and knowledge. The purpose of this search is to achieve the basic documentation (books, journal articles, thesis, etc.), satisfy a need to create a course, writing research papers or documentation to complete a course, etc.;

- **The heterogeneity of resources** - In addition to conventional resources, an university organization offers a variety of resources to different types of actors. We list among others: Administrative Documents, courses, training pads, training catalogs, library catalogs, electronic books, electronic journals, patents, reports of committees, learning objects, etc. All these funds are resources to serve every customer's conceptions of the formation or administration.

- **The distinction between these different missions** - the university since its inception has two primary missions: teaching and research. In these missions comes more specific objectives [9], namely the initial and ongoing training, scientific research and technology and the dissemination and exploitation of its results orientation and professional integration, dissemination Culture and information science and technology, international cooperation, etc.

The challenge now is to formalize and clarify the knowledge in all its forms: documents, procedures, routines and processes, etc. To make it readily usable, accessible and reusable by all the stakeholders, including external partners. In the following, we focus on explicit knowledge, particularly in heritage resource materials shared by the different actors involved in training within a subsystem of the university system.

5. PROPOSED MODEL FOR KNOWLEDGE CAPITALIZATION

The phase of capitalizing knowledge uses different methodologies from the field of engineering knowledge. Among these, we can cite: the CommonKADS methodology [14][15], MKSM [16] and REX [17]. These methodologies have been put in place to handle the whole process of learning, from the gathering of knowledge to the development of a complete system.

In the case of University System (US) considered, we opted for a more natural option, incremental and participatory, which involves different actors in the creation of knowledge. It is actually a solution based on e-learning.

For that we used the educational platform Moodle. In this section, we present mainly the capitalization of the knowledge for the administration staff. Thus, the staff takes courses on the platform, answered questionnaires, file documents, make annotations to documents filed in response to individual or collaborative assignments.

5.1 The choice of an institution

The work that we propose concerns the establishment of a resource center in a university for training and research. We chose the National School of Commerce and Management (ENCG) as the first institution of the University of Agadir IBN ZOHR on which our study focused view of our membership in that institution.

The ENCG for 2010 includes about 900 students, 45 teachers and 15 people with administrative, technical, and service, as well as library staff. Several types of training are provided, we can mention: the diplomas ENCG, the Masters, continuing education and doctoral training. This is a learning environment where actors change with different production requirements, research and exploitation of knowledge. Knowledge generally used are distributed, heterogeneous and difficult to find, with the exception of library books and student papers. Some existing databases in each department, however, allow locating some resources.

5.2 The choice of learning content

Two modules were followed by administrators as learners and creators of knowledge. The first module is to introduce first the importance of using Information Technology in various daily tasks of these actors, and also to deepen their basic knowledge in computing. This module includes courses on the use of the Internet, and also the Microsoft office tools (Word, Excel, FrontPage, PowerPoint). The second module focused on techniques for knowledge management. A part related to the production and archiving of documents have also been the subject of a collaborative work.

5.3 Description of content

The Moodle platform (Figure 1) is the main entry point to the knowledge of the particular organization, and also to information found on the web. In the platform developed different types of educational resources have been developed to meet various objectives initially set. The various tools such as forums, chats, assignments and multiple choices, helped to extract most of tacit and / or explicit knowledge. They constitute a first draft to the memory MUS (Memory of the University System).

Figure 1. Moodle Learning Portal.

6. ONTOLOGY & ARCHITECTURE

The knowledge captured through the methodology presented above provides a resource dedicated to the representation of ontological knowledge. The ontology is used to index documents and resources, to facilitate their search and navigation between related concepts. This section presents some elements of a domain ontology that we developed.

6.1 Indexing resources

By adding metadata to the documents capitalized through the e-learning platform, we add semantic descriptors to the organizational memory. In that case, it is possible to make complex queries and for example find documents according to their authors (name, function, etc.).

Finally, another level of the semantics is developed by semantic relations between terms (working with, is connected to, is a component of, is a partner, interacts with, prerequisite for, complete, etc.). These types of relationships are used to suggest further research to the user or to perform an automatic extension of research. For example, if a learner is seeking a course, he is generally happy to know that this course requires pre-requisites, and a revised case study is linked to this course.

6.2 The ontology

In the case of the MUS project, we used the editor Protégé2000 [18]. The model protégé2000 offers a graphical environment for the design of ontologies (Fig. 2). It helps to define the classes and hierarchies with multiple inheritance, attributes, etc.

We take this work to illustrate some examples of implementation from the ontology "Ontologie_US_ENCG" (Fig. 2).
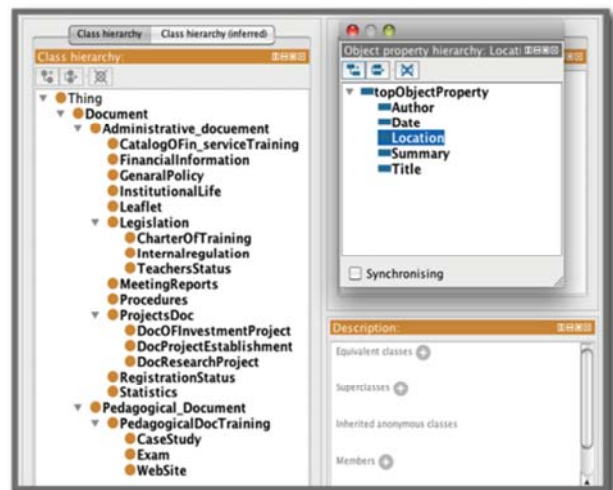

Figure 2. A Part of the ontology "Ontologie_US_ENCG".

6.3 The architecture of the system

The architecture of the KMS (Fig. 3) is composed of five levels: exploration, capitalization, management, retrieval and knowledge base.

Profile management is based on user profile ontology.

MUS memory takes into account the context of use. The definition of context based on context ontology that allows for the actor to present the knowledge required to execute a given task (for a teacher for example the results of a search for the
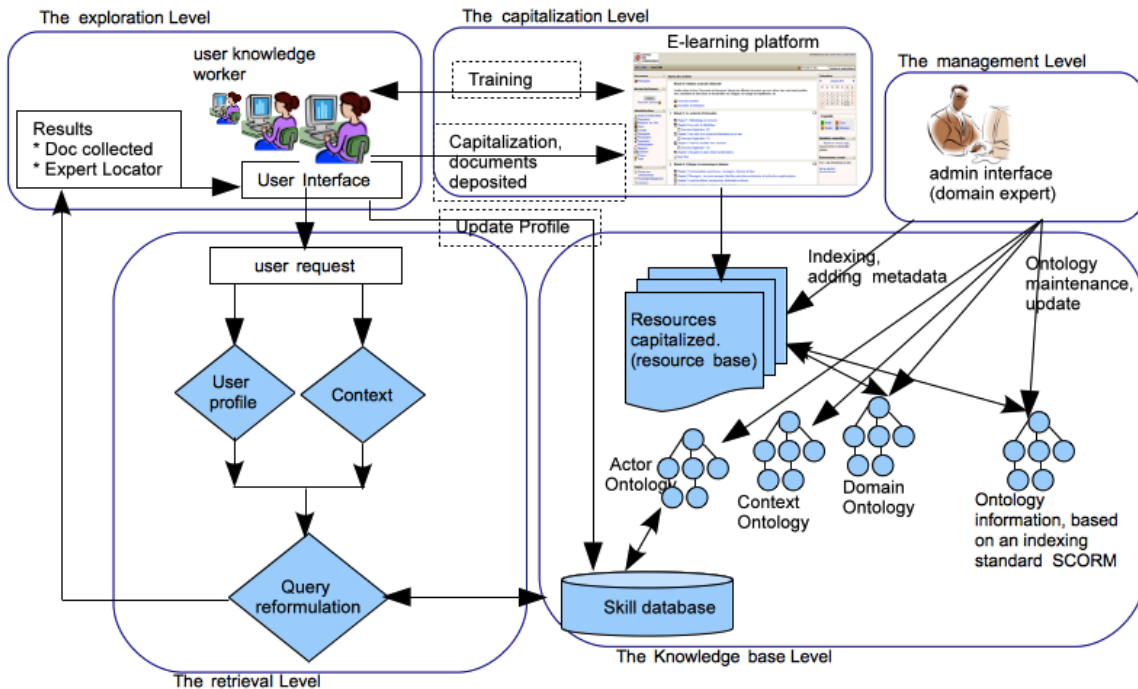

Figure 3. Architecture of Knowledge Management System for a university system

6.3.1 The Capitalization

This is the basis and the main core of our system, this level will provide two main tasks: staff training and subsequently the capitalization of knowledge

6.3.2 The Exploration

Exploration of the memory of the University system includes a number of services adapted to the different actors. The proposed interfaces allow users to manage their profile as well as the specification of the context of their research on the use of the platform.

Profile management allows to take into account the expectations and interests of each actor according to its category (teacher, administrative or student), with some degree of specificity (doctoral student, studying in continuous training, etc.).

creation of a course must be different from the result for writing an article for scientific research).

6.3.3 The Management

The layer of knowledge management is responsible for put the functionalities needed for the integration of new knowledge in the system available to experts. These features allow inserting and updating the implicit knowledge.

For explicit knowledge in the form of documents delivered on the platform, they are analyzed by a domain expert who provides design and maintenance of the domain ontology. It also provides indexing by adding metadata for each resource capitalized.

6.3.4 The Interaction and Extraction

Layer interaction and extraction is charged after submitting a user request to reformulate it so as to take into account the user profile and context of

use. With this discreet and transparent operation, data retrieved from the knowledge base will reflect the highest needs and goals of the user for a given context.

6.3.5 Level knowledge base

The layer knowledge base is built on the basis of four ontologies shown in Figure 3. It is the user profile ontology, domain ontology MUS, the ontology of context and ontology information.

7. CONCLUSION

This paper proposes a methodology of knowledge acquisition in the context of higher education institutions. This methodology is based on collaborative learning. to capture a part of the intellectual capital of actors. A software architecture that enables Knowledge Management services is also proposed. It is based building a specific ontology which constitutes the first step and an important component to an organizational memory. Our research proposal is distinguished by the fact that organizational memory is not only on pedagogical knowledge (courses, etc.), but also by different knowledge used in the context of a university system, whether administrative, educational or techniques.

In addition, construction of the ontology is done by a new and natural methodology using collaborative e-learning. In other words, actors are trained to explain their knowledge, which empower and motivate them to develop it. This has particularly enabled the actors to experience elicitation and a collaborative culture of creation and indexing of knowledge.

The goal of the next step is to lead to the development of a stable model of knowledge management adapted to the constraints and specificities of the culture of our institution and to generalize this experience to all academic institutions. In the actual state, the ontology of domain is functional. We plan to develop a prototype of the system to integrate all ontologies proposed and to validate this feature in several universities.

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