

Towards the Development of a Learning Management System: a case study of students' use of Information

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Abstract

Motivating and fostering the use of knowledge and learning management tools in education can be very helpful not only for the students but also for the society with the advantages that can be obtained from this. By joining the Knowledge Management framework to an electronic device with adequate mobility and flexibility, such as a Pocket PC, great advantages can be obtained in the educational environment. As a first step in developing tools for application of knowledge management techniques in education we analyze in this investigation the students' preferences regarding the information resources and techniques they use in their daily learning. From these results we expect to find out the tendency of students toward the use of electronic devices for their education, and detect in what ways we can improve the use of these resources by the students.

1. Introduction

In an educational environment where the student work relies on information and learning, and how these concepts are managed to build knowledge and extend our capabilities as humans, Knowledge and Learning Management are important concepts which have to be taken into consideration.

In many universities around the world, including ours, professors and students are using the Web as a regular tool to share and store class materials, documents, projects, investigations, new findings, etc. Although not necessarily intentional, as a consequence of this situation many people have

found these documents to be of assistance for their personal development.

If we could improve the way students' access and share resources, the learning process itself could be improved. This initiative not only applies to documents but also the knowledge and learning techniques that students use.

We do not only need people making new discoveries and inventing new devices. We also need to have access to them in order to continue our development. Many times students and professors have to "reinvent the wheel" in some of their work because they do not know that someone else has done a similar job that could be used as a base or as a reference, or they do not have complete access to that kind of information. Many professors and students, as mentioned before, have Web pages where they post information or documents, but not many people are benefiting from them. The problem does not necessarily depend on the production of knowledge and new learning techniques per se but on the way knowledge and information are managed, stored and shared.

If a professor publishes materials for one of his/her classes, only his/her immediate students or casual students browsing the Web could know the existence of these materials. For any student taking the same course but with another professor it would be very difficult for him/her to find it. If we could make the university to provide a user-friendly framework where students and professors could publish and semantically look for resources the learning process could benefit from it.

This research is based in the aforementioned framework: develop a basic set of tools for a handheld computer and a server for the application of Knowledge Management in the learning activities of students. The sample population we are using as a case study is undergraduate students of the Electrical and Computer Engineering Department of the University of Puerto Rico, Mayagüez Campus.

2. Knowledge Management

Knowledge Management (KM) refers to a set of tools and strategies that make use of novel information and communication technology to promote construction of knowledge and innovation. The ability of KM to promote construction of knowledge may become an important support to improve the quality of education, particularly in regard to the development of skills and competences for lifelong learning.

Knowledge Management enriches the relation between humans and information, by providing tools and processes related to collaborative work within an environment of interactivity, allowing the conversion of data into information, and information into knowledge. KM may help students to develop personal models of reality instead of just memorizing facts about any particular subject.

3. Survey and Results

By means of surveys, informal interviews and observations we have annotated some of the types of information that students actually use in their sessions, how they manage them and their preference to use electronic devices.

Our observations show that many students depend directly or indirectly on technological devices such as Desktop and Laptop computers to support their education activities. Most of them are constrained to the bounds of computer centers and the library; despite the fact that most of them do not like to be enclosed in a room. Now, with the installation of the new wireless network across the campus, many of the students are beginning to use their own Laptop computers for their work.

Our survey goal was to determine the students' preferences regarding their studying and learning techniques, and the types of resources used by them. Beyond the fact that the survey has a small sample size of 65 compared to the 1,180 undergraduate students that the Electrical and Computer

Engineering Department has, the survey confirms expected preferences.

Of the 65 students used for the survey 65% are males and 35% are females; 48% are from Computer Engineering and 52% from Electrical Engineering; 46% are in their 4th year of study, 15% in their 5th and 18% in their 6th year. It is important to note that the Engineering at the University of Puerto Rico are five-year programs.

The majority of the sampled students (66%) showed a preference for the use of Desktop computers but most will be willing to use a PDA (42%) or a Laptop (23%) in the future. They also expressed that they use the Internet very frequently as a tool to study for their classes (69%), as well as other materials like books (94%), previous exams (78%), homework assignments made by them (68%), and their class notes (93%). They also illustrated the fact that they use past homework assignments of other students as references when they were studying (51%) and when they are doing their own homework assignments (58%).

The study also presents that students at some time have employed tools such as MS Word (69%), MS Excel (65%), MS Power Point (60%) and Web pages (65%) in order to organize the information they capture. Not only are they using these tools now but they are considering using them in the future: 74% Word, 62% Excel, 66% Power Point and 66% Web pages.

The students established that the main reason for them not acquiring new electronic equipment and/or programs for their education is the price of these items. 71% recognized that the prices of the equipment are out of their personal budget range, while 43% claimed the same about software.

Furthermore, most students (96%) indicated that taking notes is their primordial way of recording their knowledge assets, although some (27%) memorize data at some point. Electronic tools were also preferred for organizing data (57%). Moreover, the students stated that their preferred classroom aid used by the professors was the blackboard (95%), transparencies (57%) and computer simulations (48%).

The students expressed that they record (62%) and share with other students (58%) their learning and studying techniques constantly, because doing so improves their outcome in their classes. These facts validate the purpose of this investigation, proving the

need for a tool to organize and share the students' knowledge assets.

These facts exhibit how students are already involved in a collaborative culture and using electronic devices for that purpose. In point of fact, this gives the project an advantage since collaboration and sharing is one of the most difficult limitations that people encounter when trying to develop a knowledge management system [6], and the surveyed students from the Electrical and Computer Engineering Department are already depending on it. This makes it more attractive to develop the knowledge and learning management tools to help students in their learning process and to improve the teaching-learning system itself.

The results obtained are valid for both, the Electrical Engineering and the Computer Engineering students. We found no correlation between these results and the students' GPA.

4. Future Work

Based on these results, a pilot knowledge management system will be developed, for which ontology for an application in the learning management context will be designed as a first step.

An ontology as established by some AI researchers [3] is a description of the concepts and relationships that can exist for an agent or a community of agents. It is a set of definitions of formal vocabulary and typically consists of:

- concepts relevant for the domain,
- their relationships, and
- axioms about these concepts and their relationships.

Since the Extensible Markup Language (XML) has emerged in the past few years to be the standard language for data interchanges on the Web, we will be using its syntax as one of the tools to make our Ontology and therefore our Learning Management client/server tools and metadata set.

In conjunction with XML another languages are been taken into consideration for the development of our demonstrative tools, such as: the Resource Description Framework and the RDF Schema Language (RDFS), which uses XML to exchange descriptions of Web resources and is a foundation for processing metadata, [5] the Ontology Interchange Language (OIL), and the DARPA Agent Markup Language+OIL.

The individual characteristics of each language [9] is been taking into consideration in order to select which will be used in our project. It will also depend in the analysis of the data produced by the students and how any of these languages will help to handle it more efficiently.

In addition to these languages, projects such as the On-to-Knowledge Project, whose objective is to build an ontology-based tool suite to process documents found in Internet efficiently [7], and the Handheld Learning Resource (HandLeR) Project, which aims to develop mobile technologies for learning [8], will be used as guidelines. Both projects have similar approaches of managing resources for the learning process, which provides a good foundation for our next stages of the project.

5. Conclusions

Using the survey and informal observations we can infer that, since many students are relying every day more on the use of Internet and electronic devices for education, a common tool to organize their educational resources would be of immense assistance. It would not only reduce the time spent by the student looking for information but also would lower the redundancy and duplicity of documents, and save valuable disk space on the servers holding the resources.

This study and analysis pinpointed the students' needs with certain accuracy regarding a learning management tool for PDA's and computers. Now, we will be able to create a system that provides functionality intended to meet the aforementioned students' needs. It will be important to develop tools for course material management and sharing, as well as other tools for time and knowledge management. The students' reaction relating the idea of using programs in the future for managing their documents and data was very positive, so we believe that the development of new software tools for a PocketPC would be a successful one.

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