

Analysis of Distance Education Environments

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Abstract

Distance education has the main function of providing knowledge to people from far regions of the country. LARC, Computer Networks and Architecture Laboratory, is a research institution belonging to the Computer Engineering and Digital System Department of Polytechnic School at University of Sao Paulo, Brazil. We have developed, in the last three years, on-line courses using media such as audio, video and animation and we have developed a Web education system called Col (On-Line Courses). We are planning Col evolution and for this reason we made a study of commercial and academic distance education environments. This paper presents an analysis between the studied systems that provides us with essential information on how to manage a distance education system.

1. Introduction

Nowadays, it is a reality people of different countries study together. The distance education approaches learners with different lives allowing a rich exchange of the knowledge. The question is: is it necessary to adopt a system to manage a distance course? I believe so, because teachers must deal with the development of the course content; they must concern to attract the student's attention. However, the teacher needs to know the data to manage the course like knowledge assessment of the students, statistics about the accesses etc and at the same time, he needs to find ways to communicate with the learners who are taking of course. Based on this, we developed a distance education system called Col, which is in the first version. The fundamental features like organization content, interactive tools and self tests are found in Col. But before we started Col's evolution we had to answer a question: how can we be sure that the system had the necessary aspects for a distance education system? Then we decided to study some commercial and academic distance education systems where it is possible to store and to organize a virtual course. The analyzed systems were:

Webct (version 3.1): developed by British Columbia University- Canada

Intralearn (version 2.5): developed by Intralearn Corporation – USA

AulaNet (version 1.2): developed by PUC – Brazil (Catholic Pontific University – Rio de Janeiro – Brazil)

UniverSite: developed by MHW – USA

Col (version 1.0): developed by LARC – USP – Brazil.

The research made it possible for us to know different ways to organize a distance education course.

2. The studied systems

We decided to study academic and commercial systems because there are academic distance education systems that are highly used in Brazil such as Webct and Aulanet. Some analyzed system characteristics are presented below and are better explained in the Analysis of the Distance Education System Features section.

2.1. Academic systems

Col is a new distance education system that has been in development since 1999. Nowadays, its first version is finished but we have been studying Col's evolution. The system tasks don't depend much on the work administrator where teachers and learners are the main characters of the course. The most important course functions are controlled by the teacher, like consulting course statistics, developing knowledge assessment and so on.

Aulanet was developed before Col. We considered it to be the first distance education system developed in Brazil. It has a simple interface and the fundamental tools to develop a distance education system are implemented in it. In general, the user doesn't have problems learning how to use it.

Distance education researchers have certainly heard about Webct and, in the most cases, they have already used it once at least. The user has no difficulty using Webct because, in the studied version, it provides a good interaction between learners and teachers, presenting a lot of tools to make it easier for the user.

2.2 Commercial Systems

Two commercial systems were studied: Intralearn and UniverSite. Intralearn and UniverSite can be found in a portuguese version. Intralearn's simple interface prevents students and teachers from having problems finding a specific tool on the screen, because tools with the same function are grouped together.

A different view is implemented by UniverSite that simulates a virtual University environment a principal, head of department, course co-ordinators, teachers and students can be found. UniverSite intends to make the users feel as if they were working in a real University. In fact, the user spends more time knowing the system and this can be more complicated if the same user works on different functions like when the head of department and the co-ordinator are the same person.

3. The main aspects in a Distance Education System

A Web-based distance education system must provide several characteristics to minimize the distance problems preventing students and teachers from giving up to use the system. The student must feel pleasure studying, having the sensation that he is acquiring new skills. The teacher's work must flow without great troubles so that he can concentrate his efforts on the material development.

In a live class it is faster to identify critical situations because students and teachers are face to face but this is not true in a virtual class. Analyzing these aspects we found important features that a distance education system must be implemented.

The facility of the system utilization, including content organization, is a fundamental point. The users cannot have difficulty accessing the system functions. There is no point in wasting time getting to know the system function if this is not the course goal.

It is no use having a good distance course content if there is no way to exchange ideas. The interactive tools like chat and forum are the oxygen that the course needs to live.

The system must have a way to show to the teacher if the course has been efficient. The teacher needs to know if the students don't get the syllabus wrong. It is very important to track student performance.

Normally, a system administrator always has a lot of problems to solve. Because of this, it is not a good practice to concentrate a lot of tasks on the administrator. The better the tasks are distributed the more efficient the course will be.

We thought that the above characteristics were the main points in a distance education system. Nevertheless, during the research new aspects were found and added to the study. In the end of the study we had a lot of important features that helped us to analyze our system.

4. Analysis of the Distance Education System Features

All the analyzed systems have similar aspects implemented in different ways such as interactive tools, navigation facility, an efficient organization of the course content and so on that make a difference among the systems. These points are shown in Table 1 and discussed in this section.

Table 1. Analyzed Features

	Webet	Col	Intralearn	UniverSite	Aulanet
Interactive tools					
Different interactive tools	√	√			
Forum themes can be created by students	√	√			
Content Management					
Upload of a group files at the same time	√	√			
Besides HTML, accepts different files format	√		√	√	√
Modules Reused	√	√			
System's workplace organization					
Facility to find a tool	√	√	√	√	√
An easy logic of navigation	√		√		√
System Management					
Good distribution of the system functions	√	√		√	
Student registration facility	√	√			√
Tracking student performance					
Statistics to follow the course	√	√	*	√	*
Facility to understand the statistics information		√	*	√	*
Different question types to verify knowledge aquisition	√		√	√	
Automatic correction of the tests	√	√	√	√	
System security					
Security access control		√	√	√	√

4.1. Interactive tools

How to minimize the distance between the teacher and the students? How can the teacher answer the student's doubts in real time? The interactive tools approaches the students and teachers, therefore it deserves a special attention in any kind of Web-based distance course. Chat and forum are essential for a good on-line course because through these the students can exchange information. The communication between the teacher and students is not an easy task. Normally people have difficulty writing their ideas, they prefer speaking to writing about something. This way, the users may not have doubts about the tool utilization, the user must find it easy to get used to do his tasks. Teachers and learners must worry only in organizing their ideas and writing them in the chat. It is not worth spending much time learning how to operate the tool because they can miss the focus of the discussion causing a failure in the leaning process.

Chat, e-mail and forum tools were found in the five analyzed systems, but one is easier to use than the others, one is more flexible to work than the others. Different interactive tools were found like Whiteboard in Webct and "chat-presentation" in Col. Both Whiteboard and "chat-presentation" allow the teacher to use alternative ways, such as a file with a picture, to explain a topic. Learners can exchange information through a file in the Whiteboard and in the "chat-presentation" only the teacher, called presenter, can show information by a html file.

The "chat-presentation" tool permits the teacher to use a presentation like a Power Point and he may send message chats at the same time. The teacher can organize a virtual meeting with the students where they can discuss about something and he might show the information by a html file. Moreover, the teacher can ask questions (objective questions such as multiple choice test) to all the chat participants and the students' answers are registered in a table where the teacher can see who answered right or wrong.

It is necessary to highlight that Webct has four chat rooms per course and one general chat room. Chat is an efficient tool when all the students have opportunity to exchange their ideas and it may become chaotic if there are a lot of people "speaking" at the same time. Thus, it is ideal to create chat groups of five to seven learners and to put these groups in different rooms [4].

Forum provides a different way to express ideas. Learners don't need to answer a question immediately, they can have more time to think about a subject. Forum is an asynchronous tool, ideal to develop skills like synthesis and evaluation [4]. In some cases, the teacher is essential to organize the exchange of knowledge, but there are times that the students must go ahead by themselves. The student may be able to create the forum themes by himself and the system must allow this. In

UniverSite and Intralearn, forum themes are created based on title lessons (Intralearn) or only can be created by coordinator (UniverSite). Students have no freedom to create forum themes. In other researched systems, the creation of forum themes is free and the students might start new discussions.

Agenda and e-mail tools were found in all the studied systems. But only Col has a doubt tool, called Web Doubt, where students can register a doubt by themselves and the teacher will respond it later. In others, the system administrator or the course responsible must register a doubt in the FAQ tool which may cause a work overload in these users.

4.2. Management of course content

Considering how the system works with the course content, the teacher's work can get easier and faster or more difficult and slower. The teacher shouldn't waste much time organizing the course content. In fact, the teacher must spend most part of the time developing the course material and not learning how to store or how to do the maintenance of the course content.

Course contents are organized in modules or lessons in all the analyzed systems. The systems make the upload of the module files except in UniverSite, where it is necessary to copy the course pages to an Internet server and to inform the page URL during the module registration.

The teacher's work can be facilitated if the system makes the compression files upload such as a Winzip file and after upload, the system should decompress the file, because in general a module has a lot of linked html pages. AulaNet and Intralearn don't work with compressed files, they do the upload file by file and as a result the teacher will have more work. Nevertheless, it is possible to store other file types such as ppt (Ms-Power Point) and pdf (Acrobat Reader) in these systems.

In some cases, the teacher may want to reuse a module that had already been used in a different course and he shouldn't need to make the module registration again. The module reuse avoids wasting time and spending more space in the disk with the copy content duplication. Webct, Col and UniverSite allow the module reuse, which doesn't happen in AulaNet and Intralearn. Intralearn permits duplication of a complete course. However, it is not possible to reuse only one module.

4.3. System's workplace organization

Both teacher and learner should not have any doubt about how to use the system. The ease of the logic navigation, a friendly interface and a good distribution of tools make a difference in the system utilization. The less

information the user has to assimilate on a Web page, the better the learning will be [10]. The course goal must be knowledge acquisition and not skills development of the system used. For instance, if a distance course is about Biology, there is no point in worrying about learning how to use the system. The teacher must teach Biology and the students must strive to learn Biology.

UniverSite has a good user interface, but in contrast has a complex user hierarchy, making the teacher and students spend a lot of time understanding the system's functionality. The UniverSite user hierarchy is showed in Figure 1.

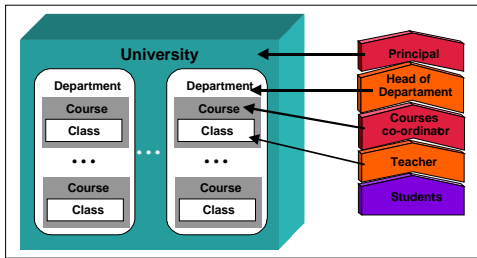


Figure 1. User hierarchy of UniverSite system

On the other hand, the other analyzed systems have a simple user hierarchy where the administrator is the system manager. This hierarchy organization is showed in Figure 2.

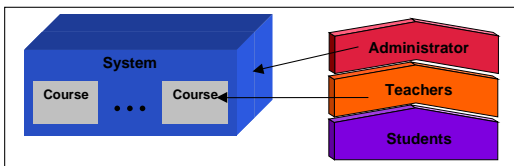


Figure 2. User hierarchy of others system

AulaNet and Intralearn have a simple interface where the users don't waste much time learning how to use the system. Intralearn has a wizard that leads the user through module registration, step by step, avoiding possible doubts that the teacher might have. Another example of easy navigation can be seen in Webct which shows the path that the user followed in the system.

Organizing tools with the same functionality together on the screen can result in more success in the learning of the system utilization, because the users can associate the roles. For instance, if a student finds a chat in somewhere on the screen and later he needs to use a forum he will associate the tools because both are interactive tools. Then the student will search for the forum in the same place where the chat is. This kind of organization is found in Intralearn and UniverSite and in some times in Webct and Col.

Webct has a tool like Windows Explorer where teachers and learners can work with their files, making copies and deletions of files, for instance. This is a good

option for users that have skills in the use of computers. In addition to this, the teacher can edit HTML files inside the system with this tool.

4.4. System Management

The system should provide some facilities to deal the information and the users. It is not a good practice to concentrate a lot of tasks on the administrator. Actually, the tasks must be done by the user related to them. The teacher must manage the course because nobody knows better than him what the course needs.

Some functions such as the student registration, should be optimized, avoiding a work overload. The registration of thirty students in a course can be a problem, for instance. In Col, the student makes the registration by himself. The teacher chooses the way students can register in a course when he creates a course class. The student registration may or may not need the teacher's approval. When the student makes a registration in a course that doesn't need the teacher's approval, his registration is made automatically. Consequently, after the student is registered he can start the course. Nevertheless, the teacher needs to accept or to refuse each registration in a course.

Both in Aulnet and in Intralearn, the student and the teacher registration are made by the system administrator. This can be a problem in courses where the administrator needs to make a lot of student registrations and it can be worse when there are a lot of courses to control.

In UniverSite the co-ordinator might have a hard time making the students', teachers' and courses registration, because most part of the course management is done by him. The user on top of the hierarchy makes the user registration of the user below in the hierarchy. For instance, the principal makes the head of department's registration and the head of department makes the course co-ordinator's registration and so on. The principal is the most important user, he has permission to access all the environments of the system. The access to the environments is controlled by the user hierarchy and this can be seen in Figure 3.

Webct presents a better solution to the student registration problems which is done by a batch file. The batch file concentrates all the student information, which is read and put in the system.

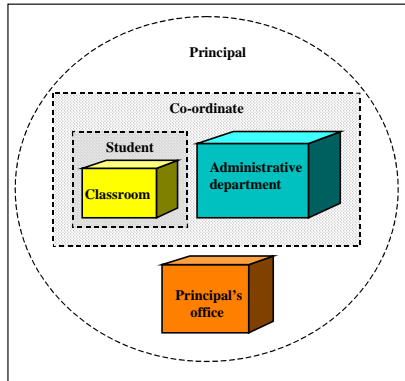


Figure 3. UniverSite environments organization

A problem found in Aulanet was the excessive messages sent to the system administrator. The administrator is notified of everything occurs in cases there are changing such as when the user modify his password. If the system has a lot of courses the administrator will have problems handling his messages.

4.5. Tracking student performance

It is not difficult tracking the student's evolution in traditional class but the same is not true in virtual class. The teacher must follow the learners' steps during a distance course to be sure that there was knowledge acquisition. Statistics and learning assessment help the teacher to identify the student learning faults and problems in the course content, because sometimes a comprehension problem is not a student failure, it can be a deficiency in the course material.

4.5.1. Statistics

Statistics is a concrete way to check information about a course syllabus but it is fundamental to understand what it want to show. Graphic presentation is the best form to check available data, because it is easier to compare the data, and the user can have a good assimilation of the result in less time.

Col has a lot of different statistics types, like page accessed per group, per student or per determinate period, more accessed page and so on which are presented in a graphic format and both administrator and teacher can access this information. The teacher can erase the statistics periodically, avoiding accumulating a lot of unnecessary data.

In the same way, UniverSite shows in a graphic format information like statistics per accessed pages and how many pages the student accessed in a course. In addition, the course might have a questionnaire where the students give their opinions about the material, the tests,

etc. The teacher and all the users down in the hierarchy can see the questionnaire answers in a graphic format where it is possible to identify critical points of the course.

Webct presents the statistics in a simple format like tables. In Intralearn and in Aulanet, only the system administrator can access the statistics (*).

4.5.2. Knowledge assessment

The student evaluation can be made by objective tests or discursive tests, but only the first alternative allows the student has an immediate grade. The system verifies the test answers automatically and registers the student grade permitting the learner to check what he really has absorbed about a specific subject.

A learner can develop skills like knowledge, comprehension, application, analysis, synthesis and evaluation according to Bloom's category [2] [4] and the assessment should provide ways to verify these.

All the studied systems have automated self tests except AulaNet. In this system, the teacher must create a text file like a Ms-Word and put it in the system. Then the student does the file download and solves the test. After that, the student must send it through the system to the teacher, who shall verify the test answers. The teacher has a hard work with this kind of tests because he has to check all the students' tests.

Col has only a multiple choice test type where the teacher may register a question set, relate it with a module and decide how many questions the self test will have. When a module has more questions than the limit registered by the teacher the system chooses the question set which the student has to solve at random. Besides this, the system changes the order of the alternative answers preventing the student from keeping the alternative sequence in his mind [11]. When the student finishes the module test, the system shows him what he answered right or wrong. If he doesn't get the minimum grade, he must do the module test again.

Both Col and Intralearn allow the teacher creates a dependence among the course modules and in this case the student must make a test when he finishes a module. The system doesn't permit the student to go ahead to the next module while he doesn't get a minimum test grade. By controlling the student's path in the course the teacher can avoid that the learner study the modules in the wrong order.

Webct, Intralearn and UniverSite have different kinds of questions, like association questions, fill in the blanks, multiple choice questions, discursive questions and so on. In all these systems, the discursive test verification be done automatically by the system, the teacher must do it manually. In Intralearn, it is possible to define normalized or weighed evaluation.

UniverSite allows the teacher makes question registration with three different difficulty degrees: easy, intermediate or difficult and the teacher decides what questions will be included in the test. In addition, he may construct a test with questions from different modules, thus a test may or may not be linked to only one module.

4.6. Security of the access control

It is essential for a distributed system to control the user access preventing no-authorized users from accessing the system. In such way that, the system must manage the user access, he is allowed to use only the resources that he is permitted.

The control access by a password is implemented in all the studied systems, but a problem was found in Webct. This system finishes a user session only when the user closes the browser. If a teacher makes a login in the system and goes to another site after having used the Webct, without closing the browser, the session will not be finished. For instance, a teacher connects to the system and does some tasks, then he goes to another site without close the browser; if the teacher goes back to Webct after navigate in another site, he doesn't need to do his login again, because the system will not check the teacher password again.

Col has a system security that controls how much time a user stays in the same course page. If the user stays more than 30 minutes in the same page, the system disconnects him avoiding that the user stays connected in the system while he goes out to drink a coffee, for instance.

5. Conclusion

The research allows us to have different views on how to implement a Web-based distance education system. We concluded that Col has the main roles, but it can become better with new functions, such as more chat rooms, other types of self test, a better logic of navigation, and some innovations that will make the teacher's work faster.

Nowadays, we have an interface group that studies forms to implement an ideal interface to a distance education system whose goal is to present a good interface where the user will not waste much time to learn the system logic. We are sure that the interface is an essential point in a distance education system. Besides that, the group studies new solutions to optimize the Col's functions.

We know that our system has important tools like "chat-presentation", which improves the communication between the teacher and students, because the students can see the information through a picture and not only read about it, avoiding comprehension mistakes.

Automated self tests may not be a good solution to verify the learning acquisition, but they may help teachers and learners to have immediate answers to check the student knowledge. We need to study and to implement new ways to check the student knowledge like a test using a discussion in a chat or implement other test types.

Tracking the student's evolution is another point that is worth taking care of. We study new statistics implementation to help the teacher to find problems in his course. Col has more different statistics types than other studied systems, and we believe it is an important point for the teacher to manage his course.

The analysis shows us that we must improve some Col's functions, but we can be sure that we are going in the right direction.

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