Realization of E-University for Distance Learning

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Abstract:

In previous work [27], the authors proposed an E-University but they did not take into account some essential parts. In this paper, the system presented in [27] is modified and developed. New critical important items such as security in E-Learning, learning management, business continuity management and science park are added to the proposed university. According to the great development of IT, the current Web-based learning systems need to be as effective as human tutors. Recently, intelligent agents became one of the most interesting subjects of modern information technology. Agent-based technology has been taken as an important approach for developing advanced E-Learning systems. This paper presents architecture for implementing a multi-agent system within the context of a learning environment. The roles of intelligent agents within an E-Learning system, called E-University, are presented. The agents perform specific tasks on the behalf of students, professors, administrators, and other members of the university. Also a group of intelligent agents for learning activities such as user interface agents, task agents, knowledge agents and mobile agents is developed. Using the multi-agent technology in E-Learning system, gives user interaction facility to both users and designers, and adds ability to exchange information between different objects in a flexible way.

Key Words: Intelligent learning systems, Agent technology, E-Learning system, Science park, Security, Learning management, Business continuity management, and Multimedia.

1. Introduction

E-Learning can be considered a special form of Ebusiness. The good involved is digital content that has to be distributed, maintained, and updated. Moreover, the value of this good has to be adequately protected from unauthorized use and modification, without preventing students from using it in a flexible way. The main objective of this paper is to analyze the requirements of using E-Learning content, which result from the technical interactions between systems and the social interactions between individual students and faculty. The complexity of such cooperative systems often requires new methodologies and theoretical directions, encompassing both technically sound solutions and user - centered design [1]. In the last few years, Internet has developed so rapidly that it makes the information technology (IT) industry grow extremely fast. It is now recognized that users require assistance to avoid being overwhelmed by this wealth of information, it is also essential that information suppliers be provided with tools that help them in authoring and monitoring it. As a result, E-Learning has been a topic of increasing interest in recent years. E-Learning is generally perceived as learning via a Web browser, over the Web itself or perhaps over an internal network (intranet). Although the term E-Learning is popular, other terms such as web-based learning, online learning, technology-based learning, Web-based learning and distributed learning are synonymous to 'E-Learning'. Learning is continuously expanding beyond the traditional classrooms, as a result of information technology. There is a demand for learning anywhere and anytime. Many efforts have been made to build E-Learning systems [2-9].

Intelligent agents gained considerable attention in modern information technology. In [10], the authors defined an intelligent agent as a computer system that is capable of flexible autonomous action in order to meet its design objectives. This computer system may be linked with other applications and databases running within one or several computer environments [2,11,12,28]. A key difference between agents and other programs is their ability to operate in some degree of autonomy. Another property of some agents which differentiate them from traditional software is their ability to co-ordinate their actions with others.

Currently, there are hundreds of agents in regular use. Major computer manufactures like Microsoft, IBM, Sun, Apple, Hewlett Packard and Digital are developing their agents. Tasks that seem to be amenable to agents include electronic mail handling (an agent helps with forwarding, deleting or archiving of mail messages), scheduling of meetings (people involved run agents that will negotiate a date and time, reserve a conference room etc.) or filtering an information source such as in Usenet news. Some of the major known applications to intelligent agents are E-commerce, distributed information retrieval, network management and telecommunication systems [13].

Agent technology has been used in educational environments and a number of agents and multiagent systems have been signed specifically for educational purposes. In these systems, agents play different roles in learning process [14]. A most notable project in this area is the Technology Integrated Learning Environment (TILE) project from Massey University. As this project developed it moved to mobile agents as its core operational software [15]. An E-Learning system that incorporates a multi-agent design can give added flexibility to both users and program designers [16]. However, one of the major problems with learning these days is the increasing tendency to confuse information with learning [17]. Over the last few years, universities have made substantial progress in using the WWW for E-Learning applications. Students and instructors no longer have to meet in the same place at the same time. While E-Learning provides more convenient virtual access to learners around the world, some shortcomings limit the benefits of E-learning [2,18,28]. Although E-Learning materials have many advantages over usual textbooks and lecture notes, they have some disadvantages [19]

Here, the architecture for implementing a multi-agent system within the context of E-Learning environment is presented. The developed E-Learning system is called E-University. This paper is organized as follows: Section 2 provides the advantages and disadvantages of E-Learning, Section 3 presents review on agent's properties, Section 4 presents agents classification, Section 5 provides the general description of the proposed E-Learning system (E-University), and Section 6 is devoted to the implementation of E-University. Finally, Section 7 concludes the paper with recommendations of further work that may be undertaken in this area.

2. Advantages and Disadvantages of E-Learning

According to the great development of Internet services, the current intelligent tutoring systems need to be as effective as human tutors. The rapid growth of E-Learning has changed traditional learning behavior and presented a new situation to both lecturers and learners. Lecturers find it harder to guide students to select suitable learning materials due to more and more learning materials online. Learners find it difficult to decide which of learning materials best meet his situation and need to read [20]. E-Learning differs from classroom-based training in many ways. Therefore, converting a traditional course to E-Learning may represent a complex attempt, and as such it requires accurate planning, monitoring and control, to make the conversion effective and economical for both the educational institution and the learners.

The advantages of E-Learning include:

- It is cost efficient in comparison with traditional learning. Classroom training consumes a lot of resources, such as space, accommodation, and traveling costs.
- It works from anywhere and any time,
- It is self-paced (usually, E-Learning courses can be taken when they are necessary),
- It is faster (learners can skip material they already know),
- It provides consistent content (while in traditional learning different teachers may teach different material about the same subject),
- It allows content to be adjusted and supplied according to the progress of the learners,

- It can be easily managed for large groups of students,
- It can display interactive multimedia demonstrations to improve retention by varying the types of content (images, sounds and text work together), creating interaction that engages the attention (games, quizzes, etc.), providing immediate feedback, encouraging interaction with other E-learners and E-instructors (chat rooms, discussion boards, instant messaging and E-mail all offer effective interaction for E-learners),
- E-learners may have the opportunity to enter a risk-free simulation environment in which they can make mistakes without directly exposing themselves, eventually receiving feedback on the consequences of their actions.
- It can be integrated into on-line discussions and forums, enabling collaboration with tutors and students, regardless of time zones or geography.
- E-Learning can use real-time tools to deliver online lectures, discussions and demonstrations.
- Content that can be customized to specific needs [21-23].

On the other hand, disadvantages and risks of E-Learning may include the following:

- it may cost more to develop, and to enable technology, especially in case of advanced visually-rich content
- it requires new skills to develop the content material,
- still has to clearly demonstrate a return on investment,
- Moreover, E-Learning requires more responsibility and self-discipline for the learner to keep up with a more free and unconstrained learning process and schedule.

With careful development and good design most of the disadvantages can be overcome, while without accurate and informed instructional design none of the advantages might be achieved.

3. Agents Properties

The agents have some of the following properties:

- Autonomy; the ability to perform tasks without direct intervention of humans or other agents
- *temporal continuity;* continuously running
- *responsiveness;*: the ability to perceive the environment and respond to changes
- *pro-activeness;* the ability to exhibit goal-directed behavior in order to accomplish tasks
- *adaptability;* the ability of an agent to modify its behavior
- *mobility;* the ability of an agent to change its physical location
- *rationality;* the assumption that an agent will perform reasonably especially in relation to autonomy

- *social ability;* the ability to interact with other agents and humans
- *personality;* the ability to display properties of a person
- *reactivity*; the ability to perceive the environment in which they are situated using potentially imperfect sensors, and are able to respond and adapt to changes in it
- *veracity*; the assumption that an agent will not knowingly communicate false information
- *benevolence*; the assumption that agents do not have conflicting goals; and that every agent will always try to do what is asked of it
- *learning* (adaptive); the ability to change its behavior based on its previous experience [10, 24, and 25].

The agents can be classified according to:

- 1- Their mobility, i.e. by their ability to move around some network, into static or mobile agents.
- 2- Attributes, which ideally they should exhibit. These attributes are autonomy, learning and cooperation, and are defined above. These three characteristics derive three types of agentscollaborative agents, interface agents, and truly smart agents.
- 3- Their roles, e.g. WWW information-gathering agents. Such agents help managing the vast amount of information in wide area networks like the Internet. This class of agents is referred to as an information or Internet agent.
- 4- Hybrid agents, which combine two or more agent philosophies in a single agent.
- So, agents may be classified into: collaborative, interface, mobile, information/Internet, reactive, and hybrid [13].

4. Proposed E-University system

E-University is a web-based learning system integrates agent technology. The E-University system provides:

- 1- An efficient and easy learning system that students can interact with.
- 2- Implementation of Online Courses for the faculty of computer science and information systems.
- 3- Administration tools that provide capabilities for implementing online courses.

A Virtual Classroom Application that provides more interactivity and connectivity between students and instructors, and enhances the process of E-University learning. The whiteboard on E-University is an important tool that allows the teacher to create a classroom effect. The teacher can write notes on the whiteboard and publish the same to all the students' whiteboard attending the session.

- 4- An efficient Student Management System that presents all the functions required by the student to fully implement the concept of Distance Learning System (DLS). These functions will include: join faculties, view online courses, join classroom sessions, and self-tests.
- 5- A package of free services that include:

- Media library to provide the student of the system with as much large video library.
- Technical Dictionary, that enables the student to search for non understood computer related terms.
- 6- Certification system that enables students to attend exams and to receive certifications.

The E-University system may include any or all of the following:

- Sequential pages of course content, linked by either navigation objects or hypertext.
- Multimedia components (text, graphics, animations)
- Communication links (email, chat, shared electronic whiteboards)
- Interactive learning elements involving animations, dialogues ... etc.

4.1 E-University Resources

The resources of E-University system can be classified into three categories; namely human agents, material and technical resources. Fig. 1 shows the E-University resource components.

The Human agents:

The following human agents will interact with the developed E-Learning system:

- Student (learner): someone who is registered to learn. He can select session to enter with the aid of administrator guide and free notes (agent); navigates freely through the available courses; communicate with the teacher and with other students in the same session (E-discussion); supported by automatically generated feedback, information pages, notes and explanations; assessment through online tests; search for a topic; or get certificates.
- Professor (Tutor): someone who is licensed to assist students during the learning process. He can select the course plan; put the contents of the course; update the course; provide corrective feedback via E-mail to the students; evaluate the students' progress through the on-line tests; interact with one another; or upload materials to servers.
- Designer: someone who has a good knowledge and ability in designing. He can add new courses; modify a course; delete a course; or communicate with other designers or teachers to exchange and improve design methods.
- Administrator: someone who is responsible to administrate the learning system. His role is to decide the courses for every class; evaluate the system; add user (learner, tutor, or designer); remove user; prepare for sessions; or provide statistical analysis about the system.

These human agents and their relationships are presented in Fig. 2.

4.2.1 E-University Web-Site Structure

Fig. 3 shows the suggested web site structure for the developed E-University system. This structure presents the pages of the web-based system and the navigation paths the user can take through the site.

• My E-University

This section is a personal tool allows the student to create and manage his profile so that he can view information about his performance.

• Courses

The details of the course are supplied here. Once the student joined a course his performance is monitored and can be reported any time according to the demand of the student himself, the professor, or the administrator via the Certification section.

Assessments

Certifications for the courses that the student takes on E-University can be provided to evaluate the students' performance. The evaluation system of E-University provides feedback tests which are answered during the session and the final test that the student will answer at the end of a session.

Whiteboard

The whiteboard on E-University is an important tool that allows the professor to create a classroom effect. The professor can write notes on the whiteboard and publish the same to all the students' whiteboards who attending the session.

• Syllabus

The course catalogue provides information about the course including the period of the course; the type of the course (audio/video/text); availability of the course; course teacher; etc. The course catalogue is updated every time a new course is included on the site. This information is free for all.

4.2.2 E-University Database Design

To add, access, and process data in E-University database, we choose to use MySQL (http://www.mysql.com/), one of the most popular opensourced SQL database management systems.

- 1. The DBMS of the E-University has many objects that should be represented:
- 2. STUDENTS: who will join the E-University.
- 3. INSTRUCTORS: who will teach the prEjoined users the required courses.
- 4. COURSES: those are available in the E-University.
- 5. FACULTIES: more than one faculty exists on the E-University.
- 6. CERTIFICATIONS: that will be given to students who pass an exam related to a previously attended course.
- 7. TECHNICAL DICTIONARY: a free service provided by the E-University that facilitates the finding and understanding required computer-related vocabularies.

8. MEDIA LIBRARY: another free service provided by the E-University that enables the user to watch/listen to media/audio files that are useful to E-Learning system and aids in facilitating understanding of complex issues that needs further understanding.

The important relationships that exist between the defined entities are:

• STUDENTS *attend* COURSES. This relation is M:N because more than one STUDENT *attends* more than one COURSE at the same time.

• INSTRUCTORS teach COURSES. This relation is 1:M as only one INSTRUCTOR teaches the COURSE at certain term, the same INSTRUCTOR can teach more than one COURSE.

• STUDENTS register in FACULTIES. This relation is 1:M as more than one STUDENT can register at only one FACULTY, but the STUDENT can't register to more than one FACULTY at the same time.

• COURSES have CERTIFICATIONS. This relation is 1:1 as each COURSE must have one CERTIFICATION; it is not acceptable to have more than one CERTIFICATION for the same COURSE.

These relations are represented in Fig. 4.

The attributes for each entity are described in the following table:

Entity	Attributes
STUDENTS	ID, Name, Gender, Age, Address (street, City, Country), E-mail, User- name, password, DOB (Date
	Department.
INSTRUCTORS	ID, Name, Address (street, City, Country), E-mail, and Biography.
COURSES	ID, Name, Description, Syllabus, Number of chapters, Chapter ID, Chapter Name, Chapter Description
FACULTIES	ID, Name, Number of years, Department.
CERTIFICATIONS	ID, Name, Description, Duration, Number of questions, Level, Question ID, Header, Choice 1, Choice 2, Choice 3, Choice 4, Correct choice.
TECHNICAL DICTIONARY	Category ID, Category Name, Term ID, Term Name, Term Definition.
MEDIA LIBRARY	Category ID, Category Name, File ID, Title, File Description.

4.2.3 Agent roles and interactivities

The proposed system based on intelligent agents. In this paper, we focus on the potential of intelligent agents in an E-Learning system. The artificial agents in E-University, are designed to cooperate with the professors and administrators to achieve learning tasks. These artificial agents can be started or stopped as the users (professors or learners) need. The basic problem is the modeling of human learners and instructors so that the agent can facilitate personalized learning. The multi-agent system (MAS) presented here replaces the human teacher, administrator, and controls the E-Learning system. Five types of agents are used in designing our system. Agents may implement a variety of tasks to provide effective help to learners and instructors. When thinking on the scope of agent abilities we looked first at the course objectives and the proposed learning environment, which let us to decide the skills our agents needed to have. Some on-line courses are relatively simple and direct in their implementation; such courses utilize a single graphical interface agent, with local knowledge about the current page, and the ability to give simple descriptions of any page elements. Their usefulness is limited, and consequently they tend to have limited abilities beyond scripted responses to a user query. In a large course consisting of multiple hyperlinked pages the ability to offer contextual help becomes more critical. To do this effectively a pedagogical agent needs to track the user's passage Multi-Agent Design in Flexible Learning Environments through the course, and to know what the content of the current page is.

Our system consists of several agents. In the following, we present each agent and its role.

1. User Interface Agents (UIA)

E-University tried to develop a user-friendly graphical user interface. The user interface agents (UIA) that used here provide assistance to the user when using the proposed E-Learning system. These agents allow the communication between the users (students, teachers, and administrators) and the system. This paper presents the Student User Interface Agent (SUIA), which has two functions:

a) It can present the learning materials to the students

b) It can interpret the students' goals from their choices so it can decide what to do next.

This agent also can give instructions to students when needed. It can display messages when the user tries to do not available function, e.g. when a student tries to display not available course.

Through interacting with student, SUIA can record the student's learning history, information

Also, there is the Teacher user interface agent (TUIA), which is an agent associated with teacher's interface. This agent controls the access to the teacher's courses, exams, etc. It facilitates the communication with other teachers, students, designers, or administrator.

2. Task Agents (TA)

These agents receive the user goals and perform certain specific tasks, such as providing services, knowledge, and information resources also communicating with the other agents. For example if a student wants to see an introduction of a signed topic, solving exercise, or to communicate with a teacher or another student, and then TA sends them to corresponding destination. Because the TA is shared by many users, so requests are queued, in its processing capability in accordance to their priority.

3. Knowledge Agents (KA)

These agents provide access to the knowledge (student or sources) so they are able to intelligently solve requests about the related sources, i.e., they identify and extract the required information from the sources and then analyze and reason about it to produce an answer. Some of the possible requests are: to select an exercise, to choose a sub-topic to be presented, or to obtain a concept. These agents may answer requests related to another courses. This important function extracts the concepts and skills shared among different subjects. In the same time, these agents cooperate with teachers to manage the materials.

4. Evaluation Agents (EA)

In E-University we proposed an assessment system for evaluating the student achievement. EA can assess the answers of the E-students in the feedback or exams at the end of the session. It can also generate adaptive online exams to learners who want to self-evaluate his learning progress. EA also can provide online feedback to the learner after submitting the test, and then records the scores for the learner.

5. Mobile Agents (MA)

This kind of agents is very useful as mentioned earlier. As mobile agent systems are generally computer and network independent, they support distributed systems and resources sharing. The proposed agent-based learning system will deploy MA that can exchange information in a flexible way. This agent can be sent by TA.

5. E-University implementation

In the design and implementation of the E-University system, there were some design principles:

1. avoid the use of detailed sections of text, which could be better presents using the traditional learning process or E-books;

2. divide the topics into short and easily designed sections;

3. provide the facility for students to interact with each other at the end of each section by using the chat room;

4. provide links to other internet sites, E-books, and journals relevant to the topics being studied, as a means of expanding the knowledge base;

5. present the course content in an interactive design using Macromedia Flash;

6. provide short notes as a student works through a section using HTML (a role of an agent)

7. questions at the end of each short section as a selfassessment tests which is a very powerful interactive device.

We designed an E-Learning system applied to courses in computer science. The user provides a user-name and password, and then selects from a list of user profile categories and purpose-of-visit options. Next the user views a brief Flash movie that provides some historical information and describes the E-University system and its services. Your personal information is only used for E-University's internal administration and identification purposes. After that, the introduction interface, the user interface agent describes how to navigate the interface and how to explore the various services. Agents in euniversity are described in Fig. 5 and the E-University home page is shown in Fig. 6.

Once the user selects a particular service, the agent provides navigational guidance via animations. The user is free to switch services at any time during the session, e.g., a glossary search or links to other relevant websites. E-University has four categories of users: students, instructors (professors), designers, and administrators. When the user provides his personal data, the UIA search in the DB to ensure about that data. We choose IBM's Aglets platform to support our MA because it is a free platform, Java-based and runs in the Internet. Aglets can create, destruct, move, clone, and persist mobile agents.

5.1 User Interface Agent

5.1.1 Interface Agents overview

Interface agents emphasize autonomy and learning in order to perform tasks for their owners. Interface agents collaborate with the user in the same work environment to provide personal assistants. Essentially, interface agents support and provide proactive assistance, typically to a user learning to use a particular application such as a spreadsheet or an operating system. The agent observes and monitors the actions taken by the user in the interface, learns, and suggests better ways of doing the task. Interface agents learn to assist their users in the following ways:

1.by observing and imitating the user;

2. through receiving positive and negative feedback from the user;

3. by receiving explicit instructions from the user;

3. 4. by asking other agents for advice.

The benefits of using interface agents are threefold. Firstly, they make less work for the end user and application developer. Secondly, the agent can adapt, over time, to its user's preferences and habits. Finally, knowhow among the different users in a community may be shared. Example for interface agent is the Calendar agent that assists its user in scheduling meetings. It can learn, over time, the preferences and commitments of its user, e.g. does not like to attend meetings on a Friday, or prefers meetings in the morning. Another example is NewT, news filtering agent that helps users filter and select articles from a continuous stream of Usenet Netnews [26].

5.1.2 E-University UIA

In E-University, when a student wants to attend a course and log on, an agent called *interface agent* will look at his profile, his background knowledge, and course historic records. This interface agent communicates with other agents (like Task agent). Also, the student can enter some keywords, and identifies his preference, such as the chat rooms and discussion. Then, the Task agent will send a request to the knowledge agent (KA) to monitor all course chat room activities then respond to the learner's interface agent when it observes any discussion regarding this topic. Learner can decide his next action in terms of the agent's response. For example, when the learner is required to write a report to give his opinion related to a specific topic, he can ask the TA to collect opinions about that topic from chat rooms by authorizing the interface agent. With the collected information, the learner continues working on his report. The student may get a remember message from the TA that his report is due to tomorrow. Then the learner should finish the report and submit it to the tutor's interface agent (TUIA). The TA may send an email message to the student that the tutor received his report. After the tutor read the report, the TUIA will send the mark to EA to record in the certification DB.

6. Evaluation System

Assessment is the means for evaluating student achievement. The EA provides certification for the courses that a student takes on E-University to evaluate the student's performance. The tests are categorized in two types; one is the regular test that the student will answer at the end of a session, while the other tests are answered during the progress of the session.

This part of the E-University has two items: *attend a test* and *My Certifications*. In the test part (evaluation system) we only provide only one type of questions, multiple choice Question MCQ, but we intent to extend this evaluation system to have more than one type of questions.

7. Security System

When trying to increase user acceptance, a standard approach taken by many E-Learning researchers and vendors is to incorporate interactivity and to improve multimedia capabilities of the system. Although these features may contribute to the success of the E-Learning system, we consider security as the crucial part when it comes to user acceptance. The reason why security can be seen as an enabling technology in this context is that people often refrain from using systems that they do not trust. When analyzing the requirements of security in complex cooperative systems, we have drawn data from the risk analysis of several previous projects touching this issue. The goal of security in E-Learning is to protect, for instance, authors' E-Learning content from copyright infringements, to protect teachers from students who may undermine their evaluation system by cheating, and to protect students from being too closely monitored by their teachers when using the software. Since these intertwined requirements are not met by existing systems, new approaches are needed. The following security requirements are basic both for computer and network security. All other requirements that one encounters can be traced back to one of the following four:

1. Secrecy: Perhaps the most well-known security requirement is secrecy. Users may obtain access only to those objects for which they have received authorization. They will not be granted access to information they must not see.

2. Integrity: Integrity of data and programs is just as important as secrecy even though it is often neglected in daily life. Integrity means that only authorized subjects (i.e. users or computer programs) are permitted to modify data (or executable programs). Secrecy of data is closely connected to the integrity of programs and operating systems. If the integrity of the operating system is violated, then the reference monitor might not work properly any more. The reference monitor is a mechanism which insures that only authorized subjects are able to access data and perform operations. It is obvious that secrecy of information can not be guaranteed if this mechanism that checks and limits access to data is not working. For this reason it is important to protect the integrity of operating system in order to protect the secrecy of data itself.

3. Availability: Many users have become aware only through the Internet that availability is one of the major security requirements for computer systems. If Internetbased applications are not available or the network is too slow, users can not work efficiently. For instance, a denial of service attack, which compromises the system's availability, may dramatically degrade the performance of a Web-based authoring tool. Authors do not only require more time to complete their work, but the resulting frustration may make them even less productive. There are no effective mechanisms for the prevention of denial of service, which is the opposite of availability. However, through permanent monitoring of applications and network connections one can automatically detect when a denial of service attack occurs. Appropriate counter measures can then limit the impact of such attacks.

4. Non-repudiation: The fourth important security requirement is that users are not able to plausibly deny to have carried out operations. According to Avizienis [37], non-repudiation can also be seen as a secondary security attribute consisting of the availability and integrity of the identity of the sender. Let us assume that a teacher deletes his/her students' exam results. In this case it should be possible to trace back who deleted them. In addition, these log files must be reliable and tamper-proof. Auditing is the mechanism used to fulfill this requirement.

The essential requirements regarding security for digital content are:

1. Readers must be able to rely on the correctness of the content.

2. Readers must be able to read unobserved.

3. Content must be protected against unauthorized use.

4. Content must be protected against unauthorized modification.

5. Content must be protected against destruction and loss of data.

A) Securing courses

Here, we highlight measures that we recommend to protect:

1. Discussion boards

Forum discussions should enable anonymous postings, because some students would not publish controversial topics if their identity could be revealed. Furthermore, the IP-addresses of those making the postings should not be recorded. The explicit non-monitoring of systems can also be some form of security. If discussion servers are largely unprotected, messages can easily manipulated, forged, and deleted. However, if this fact is known to everyone, privacy can be gained.

2. Electronic teaching materials

For most electronic teaching materials a sound back up system will suffice to guarantee availability. In case someone modifies the data without authorization, the data can be restored. Finding the culprit usually does not have priority compared to unmonitored browsing. If in presence teaching course materials such as slides are offered to students, there is the risk that these materials will be reused in an altered form. For example, if the slides are offered as PowerPoint files, colleagues can insert their own names into footer text. There are various ways of minimizing this risk. The simplest way is not to offer the teaching materials electronically, but only in printed form. The advantage in terms of security is that the quality of scan is poor and the expenditures excessive so that nobody will simply reuse the slides. The best and most common option is to offer the slides as PDF files (2-6 slides per page). The PDF format enables some security measures such as the prevention of copying text or graphics. Additionally, the slides can not be modified. One option to protect teaching material is interactivity. Interactivity does certainly not entail any disadvantages for honest users. Furthermore, interactivity is obviously useful even irrespective of its potential to protect. If used appropriately, the teaching material becomes more attractive, and complicated subject matters can be taught more effectively. If interactive examples or simulations, i.e. interactive applications, are used, there are relatively reliable methods to protect them [1]. If the value of the electronic material is higher than average, it is expedient to consider stronger security measures. Such measures are not easy to implement.

3. Email communication

There are some basic measures to improve security in emails. If one and the same email is sent to a number of people who do not know each other, their addresses should remain hidden by using Bcc instead of CC. Bcc stands for "Blind carbon copy" and means that the name remains invisible to all other addresses of the email. In this way, the addresses of the email are prevented from receiving everybody else's email address. Confidential emails should be encrypted and, if integrity and authenticity are required, digitally signed. The addresses must be able to decrypt the email and check the signature. Setting up the infrastructure for exchanging encrypted emails requires a lot of effort. Especially for smaller institutions, organizationally means to increase security can be sufficient and more cost effective. Should encryption and signatures of emails be impossible for organizational reasons, it is recommended to distribute confidential information in a different way (e.g. by telephone). If, for instance, the authenticity of the information is important (e.g. grades), the email should be confirmed over the phone or another independent channel. Particularly with regard to mass courses, a secretary's office should not enter grades on the basis of an email, which was allegedly written by teacher. In order to protect the students' privacy, all emails should be deleted after a while. This includes the destruction of backup copies. This procedure is relatively laborious, but if the process is well planned from the beginning, it is fairly simple to distinguish between information has to be achieved permanently and information that is to be available for a short period only. Furthermore, public contributions to a discussion and particularly personal notes in learning platforms should be deleted, or at least students should be offered the possibility to delete them.

B) Securing Administrative Work

There are two activities typically for administrative work:

1. Course registration

In small-scale courses registration usually proceeds without any problems and also the cancellation of registration generally does not entail any security risks. In large-scale courses with waiting lists, however, the cancellation of a registration should not be possible via email, or students can easily obtain a place by means of forged emails. The expenditure on security should be measured according to how significant the risk is (e.g. lack of places, importance of the courses for the progress of students' studies,...). Normally, it is sufficient to allow a renewed registration to students who have mistaken canceled their registration (or had it canceled by dishonest colleagues).

2. Monitoring system activity to ensure availability and track down illegal use.

In order to ensure the availability of the system, a minimum of monitoring is necessary. Due to the distinction between critical and less critical systems, the granularity of monitoring can vary. That is to say, sensitive systems are monitored more carefully, and expectations of privacy are limited. For example, it stands to reason that on examination systems all input is recorded. Nobody expects the possibility of holding private conversations during an exam. Nonetheless, in all application areas the degree of monitoring should be stated openly.

C) Securing Exams

Here, we will take a closer look at all stages of an exam to highlight potential threats. As the German word "klausur" indicates, examinees are usually locked up during the exam in order to make cheating more difficult. However, security considerations have to commence prior the beginning of the actual examination.

1. Setting up an exam

The secrecy of exam questions and appropriate answers can be security requirements. Contrary to this, open collections of questions have become common recently so that students know that the exam will consist of questions taken from this open catalog of questions. In this case it is important to keep the selection of questions chosen for the exam secret. Furthermore, it is important to protect the integrity of the questions and the template answers used for corrections. Particularly with regard to multiple choice exams, incorrect template answers used for the correction of the exam would not immediately be noticed.

2. Beginning of the exam

Before the beginning of an examination, the exam questions must be delivered to the examination room. This process of delivery must be secured to guarantee secrecy and integrity. A central aspect of examination is establishing the candidates' identity. In this respect there is no real alternative to examination centers. It is possible to establish the identity by means of elaborate (e.g. biometric) processes. However, the major difference to other applications such as home banking is that the examination candidate might want someone else to take the exam in his/her name. The availability of the system is an obstacle for large-scale exams, which is not to be underestimated. Particularly in connection with mass examinations, switching to a traditional backup system is not possible in most cases. On the other hand, large-scale examinations that have to be cancelled due to a computer error have particularly damaging consequences.

3. Holding an exam

Most teachers are aware of students' methods to achieve better examination results by dishonest means. One classical method is the exchange of information among examination candidates. This can be prevented by computer-generated examinations, which provide all candidates with different exams. In case of exams that are not written on paper but on a computer, the nature and extent of the security risk as well as the expenditure on security measures have to be contemplated, even more so in connection with large-scale exams. The advantage of saving time on correcting multiple-choice tests is at least initially offset by additional expenditures on security. Before entering the computerized lecture hall, students should leave bags, mobile phones, and other electronic equipment outside. This is usually achieved by a firewall, in which all connections but the one to the examination server are prohibited. Additionally, the sequence of events during the exam has to be planned. All possibilities of cheating must be anticipated and appropriate counter measures should be prepared. For example, the communication with fellow students outside the examination room during the exam is an increasing problem. Mobile phones with a hands-free set and the use of SMS enable cheating without attracting attention. Interfering transmitters to render cell phone connections impossible can be used to improve the situation. In case badly prepared students realize that they are running the risk of failing, they might try to cause the computer-based examination system to crash. To the students' advantage the exam would not be assessed and students could reset

the exam. Therefore, this aspect has to be taken into consideration when implementing examination software.

3. Submitting the exam

Students must be prevented from cheating when chaos breaks out while other students submit their exams and leave the room. Furthermore, one has to make sure that each student finishes the examination application or that the application terminates automatically at the end of the examination time. Otherwise it can happen that by mistake some tests will not be assessed.

4. Grading the exam

Even in connection with automated marking of multiple choice exams, the non-repudiation of the marking process must be ensured. Students must be allowed to take a look at their results, and faculty need to correct wrong grades at this point too. Obviously only authorized faculty should be allowed to change grades. For example, a student might forge an email and pretend to be the teacher, asking the register's office to correct grades. In order to be able to access exams even after migrating to another E-Learning system and due to legal requirements, it might be useful to print and archive exam questions, students' answers and correct answers and correct answers on paper. The advantage of paper – trails are widely discussed for voting machines in the US [29].

5. Alternative forms of assessment

E-Learning should not only entail a better quality of learning, but also improvements in the methods of assessments. In E-Learning there are more effective methods compared to traditional teaching to determine whether or not the learning target has actually been reached. For example, assessment may be based on the quality of presence. Quality of presence refers to the quality of replies to questions in forums and problemsolving during the course. In this way, one can dispense with traditional exams. This form of assessment allows more detailed grades than a grading system from 1-5. Moreover, assessment over a longer period of time is frequently regarded as more reliable because outliers can be avoided. Even today, learning environments offer various opportunities of using such methods of assessment and enable teachers to analyze and evaluate postings clearly. The sheer number of postings is not crucial, of course, and therefore the course manger has to grade the content of the postings as well.

6. Home exams

Take home exams, i.e. exams that can be written at home, have been in use in the USA for quite some time. In this case, there are no additional risks owing to the use of E-Learning. Also without computers one has to rely on the fact that students work on their own and do not use illegitimate aids. However, by integrating computers, cheating has become more difficult with regard to take home exams. Systems fighting plagiarism have become very effective by now. For examples, teachers can upload term papers such as TurnItIn.com or MyDropBox [30,31]. Before the teachers receives the students' assignments, the system checks within one day whether the student copied verbatim sources on the Internet, articles in proceedings or journals. Copied sections of the assignment are highlighted in color and the source is identified. The teacher then only needs to check whether a verbatim quote is indicated before or after the colored passage. A system like this should become standard for all these, dissertations, and academic articles. Some of the services term and conditions, however, are problematic concerning copyright. If seminar papers and contributions to forum discussions are required in order to be assessed in a course, the risk that somebody gives a false identity will diminish. A good (or well-paid) friend can easily site a two-hour exam, but asking and answering questions, discussing, and writing seminar papers during the entire semester constitutes incomparably more effort. Moreover, in case of doubt the teacher can easily find out in a short conversation whether or not a student wrote the paper by himself.

8. Learning Management and Learning Content Management Systems

A Learning management system (LMS) is software that is used for the administration of teaching and training programs. Main activities include the registration of users, tracking their progress and generating reports. The focus of a content management system (CMS) is to manage content. This means it is designed to support the process of designing, creating, testing, approving, deploying, and maintaining content. A learning content system (LCS) is a CMS that is specifically designed to manage learning content. This usually includes importing and exporting learning objects that adhere to a standard such as SCORM [32]. Today almost all LMSs, CMSs, and LCMSs are Web-based applications that require only a browser as a client software. Most systems are built as three-tier architectures just as any other Web applications, too. Even though specific recommendations to improve security depend on the requirements; that can be systematically collected in a security risk analysis; and the E-Learning system used, some general considerations can be made simply by looking at the architecture. The obvious place for many security improvements is the database and the file system storing all data. Backups and access controls can and should be placed at this level. Many E-Learning systems, however, implement securitycritical processes such as authentication on the application server. For the connection to the database the E-Learning application uses the same username and password for all users; it is only the application logic that decides who is authorized to perform which action. The major drawback of such an approach is that attackers who want to access or modify data have two targets. They could try to find vulnerabilities of both the database and the application. Nonetheless, the server-based applications are usually fairly well secured by system administrators, at least compared to security threats found at clients. The weakest link in the system is the client computer. Trojans, for instance, that capture locally stored information could transfer exams questions that teachers prepare using local word processors. Entering all information only in the Web browser may offer some advantage but keystroke loggers may record passwords and an attacker may later log in a dorm room. Restricting logins of sensitive accounts to specific IP address ranges or normal working hours are precautionary measures. In addition, all client computers used by faculty and students should have anti-virus software installed and automatically updated. A common question is whether open source products are more secure than closed secure. Bruce Schneier [33-35] provides a clear explanation: "To analyze the security of a software product you need to have software security experts analyze the code. You can do that in the closed - source model by hiring them, or you can do that in the open source model by making the code public and hoping that they do so for free. Both work, but obviously the latter is cheaper. It is not guaranteed. There is lots of open-source software out there that no one has analyzed and is no more secure than all the closed-source products that no one has analyzed and is no more secure than all the closed-source products that no one has analyzed. But then there are things like Linux, Apache and OpenBSD that get a lot of analysis. When open-source code is properly analyzed, there's nothing better. But just putting the code out in public is no guarantee."

9. Business Continuity Management

Business Continuity Management (BCM) encompasses crisis management and disaster recovery, risk management. Disaster recovery needs to address physical security and information security with a focus on contingency planning. Most issues concerning physical security can be addressed by common sense. Common sense, however, is not so common. We thus briefly summarize the main ideas. Computer systems used to operate E-Learning servers can be damaged by natural disasters, human vandals and by unauthorized access and use. Natural disaster include floods, fire, power loss or heat. Human vandals could destroy a server with a sledgehammer or pour liquid into the ventilation openings of a server. Unauthorized access and use can be prevented with access control, which is typically what everyone thinks of first when talking about security. Contingency planning is necessary to ensure that E-Learning infrastructure can be replaced after disaster. Backups are necessary to recover the data. In addition contingency planning should also include the replacement of destroyed hardware and possibly deploying it at an alternate site if the primary site is no longer available. It depends on the scope of the E-Learning project whether all these considerations have to be made within the project. IT centers of most universities have business continuity plans readily available and managers of E-Learning projects simply have to define how their projects interface with existing plans. The MIT, for example, makes a public version of its business continuity plan available on Web [36].

10. Science Park

The idea of "Science Park" and its educational handling are considered good strategies. This is to enhance and support the relationship between teacher and student. In addition, this may direct the student's behavior towards more balanced trends. Of course this is the role of the university which is to service the surrounding environment by directing the behavior of the students to actually attain the scientific degree and build a very good personality. From the educational point of view, science park is considered an important economical aspect. So, this may make the graduates; which is the output of the learning process; more qualified for meeting the market's demands. This will not happen unless good successful educational strategies are found. Such strategies should link the student with the teacher to prompt more educational results. The student and his teacher are in a mission together to achieve the same goal. So, science park is considered one of the teaching strategies which aim to increase the development of educational technology. Furthermore, it establishes a competitive feature locally to push the university towards the universality in order to achieve its goals. In addition, it will increase the learning level and educational quality. Moreover, it has a positive effect on establishing good student's personality. In near future, it is expected that science park will be one of the quality assurance criteria. Examples of science park are applied in Cambridge, Oxford, Aston, Bristol, Hong Kong, and Singapore. The construction of this strategy may include three parts. First, "IT Space" which is an area coved with Internet Network but it is wireless that the student can use Internet any where in the university or at any place in the city at which the university is located. Second, a place to held a meeting between the student and his teacher periodically where the student practices various university activities. The student may meet his teacher in sport, culture, or art places. Third, a place for exchanging the academic and innovative experiences among the students. In addition, it is the place where old electronic/computer devices may be arranged. The student can use these devices to learn some skills of decomposing and composing the electronic devices. The idea of science park implies that the student will be connected directly with the teacher via university. This allows the student to communicate with the teacher by his phone, site, E-mail, and at the place in the university in which they can meet in suitable times. This is considered very important strategy at the level of high education institutes.

The experiment is applied on a research sample consists of 200 students with various specializations. They are divided into two groups. The first group is the experimental group which consists of 100 students. The second group includes the other 100 students who do not participate in the proposed science park. Here, science park is considered an independent variable while learning and behavioral adjustment are two dependent variables. We study the effect of science park on these two variables. A pre-test to measure the effect of science park on the experimental group is held. After that, a post test is applied to both groups to specify which group is affected by the increase of learning and the direction of the student's personality. The study is performed in one academic year at Mansoura university. Then, questionnaire and judgment cards are made for teachers and students about "science park" followed by the student's marks and their personal profiles in dealing with their relatives and teachers. The results of this study indicates the following:

1. The students' ability to learn by observing their marks is increased.

3. Purposeful education strategies are developed to increase learning.

4. The change of the teacher's role from prompter to instructor in the educational process is an important result.

5. The student recognize more through direct interaction with his teacher in science park.

6. Creating natural and cultural environment gives the university a competitive feature leads the university to the uniqueness phase among other analogous universities.

7. By applying the strategy of science park, the university is developing a positive culture which helps in supporting the knowledge and prompting rapid changes in culture.

11. Conclusion

An integrated intelligent E-Learning system has been presented. A proposed multi-agent system; to implement an open, adaptive and multi-subject E-learning system; has been introduced. This system allows the students to use interactive tasks and open communication channels among students and teachers; using a series of intelligent agents that are performing learning tasks on the behalf of teachers, learners, and administrator. The idea has been applied to design an E-University learning system. The interface has been implemented by using agent technology. Furthermore, the proposed system has been developed considering learning management and business continuity management. In addition, security in E-Learning has been discussed. Moreover, a new project called "Science Park" has been described.

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Fig.1. E-University Resources.



Fig.2. Human resources.



Fig.3. Web-site Structure of E-University system.



Fig.4. E-University DB entity-relationship diagram.



Fig.5. Agents in E-University.



Fig.6. User interface.