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E-Learning and Management Information Systems For E-Universities

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Abstract

During our work as supervisors in Faculty of Computers and Information Sciences in Mansoura University, Egypt, we were really frustrated with the number of graduation projects entitled or include "E-Learning" leading to the spread of a type of E-Learning graduation projects that focuses on the managerial aspects of the "University", and abstracting the learning process in the uploading of presentations to be available for students later after lectures. In our attempt to clarify this confusion, we thought about surveying a prototypical E-Learning model and presenting one of the University Management Information Systems model, hopefully presenting them side-by-side will help clarifying the confusion by presenting differences. The main objective of this paper is to clarify the difference between E-Learning and the University Management Information Systems and overcome this confusion.

***Keywords*—** Management Information Systems, E-Learning, LMS.

1. Introduction

When you type "E-Learning" in any of the on-line search engines, you can easily find out that E-Learning has been widely used to refer to computer based systems that "not necessarily" help main objectives of "Learning". E-Learning researchers believe that one of the goals of introducing E-Learning is to revolutionize the learning process; either by facilitating many of the challenges that face instructors and learners daily, or by presenting opportunities that might have not existed before. Utilizing modern technologies and new approaches to achieve brighter future of learning is a dream that almost all of us have. E-Learning evaluation is a wide and tough research field that needs more work. Some E-Learning researchers believe that utilizing technology within the learning process has not achieved objectives because requirements were not addressed correctly and clearly. Besides, the learning process and its main activities were neglected for sake of introducing and focusing only on technological aspects. The same group believe that the solution starts by addressing effective future E-Learning requirements, and current E-Learning shortages and today technological limitations. Others believe that E-Learning has achieved quiet bit success and diffusion. University of Phoneix "http://www.phoenix.edu/" as a living example of E-Learning success, besides the many of the daily delivered on-line courses.

2. E-Learning

E-Learning can be thought of as the learning process created by interaction with digitally delivered content, services and support [1-3]. E-Learning involves intensive usage of Information and Communication Technology (ICT) to serve, facilitate, and revolutionize learning process. [4-8].

2.1 Learning Models

Figure 1 shows the three main learning models that we have seen over the years [4-7]:

- **Traditional Learning:** is the learning model where students head to a school/college to learn. Usage of ICT can enhance the learning process. Data show and presentations; as an example; can be thought of as an implementation of E-Learning within traditional learning institutions [5].
- **Distance Learning:** is the learning model in which instructor and students are separated by time, location, or both. Education or training courses are delivered to remote locations via synchronous or asynchronous means of instruction [9]. Distance education does not preclude the use of the traditional classroom [10].
- **Blended Learning:** is the combination of multiple models to learning [11]. It refers to learning models that combine traditional classroom practice with E-Learning solutions. For example, students in a traditional class can be assigned both print-based and on-line materials [4].

3. Management Information Systems

E-Learning tends to revolutionize and manage the learning process [12], not only to manage universities. University Management Information Systems are not by itself the e-Learning. Ignoring the "Learning" process while designing and developing "E-Learning Systems" lead to the result of "Management Information Systems (MIS)". MIS are important in managing educational institutions activities

and helped educational institutions achieve mature level of automation.

3.1 University Management Information System

Managing universities activities requires University Management Information System (UMIS). UMIS refers broadly to a computer-based system 'collection of hardware, software, people, data, and information' that provides managers with the tools for organizing, evaluating and efficiently running their departments [13, 14]. Examples of UMIS components include Student Information System (SIS), Library Information System, Faculty Information System, and Finance System as illustrated in figure 2. In the following section, I present each component in brief details, listing the reasons why it can't be considered part of an "E-Learning" system.

3.1.1 Student Information System (SIS)

SIS is the information system responsible for managing students' data within the faculty and/or university. SIS typical student record includes ID, SSN (Social Security Number), Name, Age, Gender, Address (Street, City, Country), Email, Username, Password, DOB (Date Of Birth), Faculty, Year, Department [15].

SIS by itself is not an E-Learning system because personal data that SIS provides and manages differs in nature than data required for education [16]. Learner should be able to get a student profile that includes data like

- Detailed records of what learners have already learned (at the level of learning object, rather than a module or program).
- Profile of learning preferences.
- Development portfolio of transferable skills. A learning portfolio might also include a history of their interactions with their tutors, peers, and other significant learning conversations they may have had.

This kind of data is intended to be used to force learning process to be a learner oriented process[1] by adapting learning system to fit learner requirements, personal characteristics and capabilities. Unfortunately, SIS does not serve this purpose, and does not handle such data.

3.1.2 Library Information System

Library Information System is responsible for managing and automating libraries within faculties and/or universities. Automated Libraries are libraries that contain material in digitized form [17]. Automated Library Information System database record reflects the managerial tasks performed by librarians in order to effectively manage libraries. A typical Library Information System record will include Book ISBN, Name, Author(s), Keyword(s), and data like Section, List of all the books, List of books available, List of borrowed books, who is borrowing, when they should return, etc.

Automated Library Information System by itself is not E-Learning because library information systems do not serve the learning process. Learner should be able to access fully available digital libraries as part of the learning process.

3.1.3 Faculty Information System

Faculty Information System is responsible for managing and automating managerial activities related to Instructors, Employees, Courses, and intersection between them. A typical faculty information system database record includes Faculty data; ID, Name, Departments, Courses data; Course ID, Name, Description, Instructors data; ID, SSN (Social Security Number), Name, Age, Gender, Address (Street, City, Country), Email, Username, Password, DOB (Date Of Birth), Faculty, Year, Department; and Employees data; same as instructor's data with customized data about job [15].

Faculty Information System by itself is not E-Learning its main goal is to organize faculty and/or university managerial activities; the learning process is not the main orientation. Faculty information system capabilities are to generate courses report(s), for example, that includes course managerial issues. In order for faculty information system to be an E-Learning enabler, learning considerations should be considered, not just managerial.

3.1.4 Finance System

Finance system is responsible for managing financial issues related to any organization, even if this organization is a faculty and/or university. However, I believe financial issues of the educational institution doesn't have anything to do with E-Learning at all. Though E-Learning systems might encompass some financial issues of selling courses, that doesn't entitle E-Learning system to include complete set of university financial system.

3.2 UMIS Role

UMIS achieved success over the years and proved efficiency and effectiveness within educational institutions. UMIS is required for any successful E-Learning implementation in the three learning models, but with constraints about the role it should play. UMIS manages educational institutions, and more attention should be paid to the learning process with the presence of UMIS [18].

4. Prototypical E-Learning

Researchers attempt to define a prototypical E-Learning system over the years, resulting in different points of

[1] Informative model is the model that forces one way of information transformation from instructor to learner, no matter what personal differences are, instead, learner oriented model modifies the system to fit each individual learner based on personal data, because people are different.

views, and variety of acronyms. Each acronym reflects its presenter point of view, and E-Learning system features that must exist; from her/his point of view. Acronyms used to express usage of ICT in the learning process include [19]: Distance Education [20,21], Telecast [22], Adaptive Teaching System [23], Authoring System [24], CAI: Computer Assisted Instruction [25,26], Electronic Courses [27], On-line Courses [27], CIT: Computer-Information-Television [28], Computer Managed Learning System [29], Computer Assisted Learning [29], Integrated Student Information System [30], CBT: Computer Based Training [31], LMS: Learning Management System [32], Interactive Learning Environment [33], Course Management System [34], Courseware Authoring Tool [35], Assessment Management System [36], Integrated Learning System [37], CAPA: Computer Assisted Personalized Approach [38], Collaborative Learning [39], Virtual College [27], VLE: Virtual Learning Environment [40], Virtual Conference [41], Virtual Classroom [42], WBT: Web Based Training [43], LCMS: Learning Content Management Systems [43], Web-based Interactive Course [44], PLE: Personal Learning Environment [45], Virtual University [46], Enterprise Course Management System [47]. A deeper analysis of the previous acronyms and their different features is combined and presented via the diagram available at: http://www.helghareeb.net/eLearningFeaturesSurvey.jpg

By studying all mentioned acronyms, it is clear that there is confusion between tools, features, and concepts. In attempt to organize those acronyms, extract features, and tools, clarify concepts, and keeping in mind that the learning process is the main concern, figure 3 attempts to clarify one of the ways to categorize them altogether .

E-Learning implements technology that enables Virtual/Digital University, and/or Personal Learning Environments. Virtual/Digital University is the University that implements Online Learning Management Systems / Virtual Learning[2] Environments and provides tools for Virtual College. E-Learning is the main concept that includes enabler technologies implementation for both Virtual/Digital University and Personal Learning Environments (PLE).

PLE represents a new trend in E-Learning that claims student's right to use only one gateway to be able to access different LMSs provided by different universities. Those different LMSs should be personalized and integrated within this gateway [45] and be able to interchange educational student data and information, so provide students with portability between different systems.

Universities and colleges are digitized by implementing ICT. The maximum extent of digital university is the Virtual University; where the whole learning process is managed and maintained digitally. LMS/VLE and Extended LMS are the main implementation of E-Learning today and will be discussed in the following sections.

4.1 Learning Management System / Virtual Learning Environment

LMS and VLE are different acronyms for the same concept. For the rest of this thesis, LMS will be used to refer to both LMS and VLE. LMS is the Software that automates the administration of training. The LMS registers users, tracks courses in a catalog, records data from learners; and provides reports to management. An LMS is typically designed to handle courses by multiple publishers and providers. It usually doesn't include its own authoring capabilities; instead, it focuses on managing courses created by a variety of other sources [2,3]. A prototypical LMS is presented in [40]. LMS features can be categorized into four main separate systems as depicted in figure 4. Those four separate systems are concerned with Courses, Exams, Assessments, and Collaborative features. LMS can be thought of as the integration of four separate systems, each system presents specific functionalities via specific tools. Figure 5 depicts the most common features that should be available in each of those four separate systems.

4.2 Extended LMS

Extended LMS includes functionalities that don't have to be provided by LMS obligatorily to provide the e-Learning, but are preferred to exist of course. Intercommunication means and digital library are two examples of those functionalities. Virtual intercommunications means enhances communication between instructors, students, and instructors/students, and enables virtual communities to exist.

4.2.1 On-line Conferencing

Conference is a prearranged meeting for consultation or exchange of information or discussion, especially one with a formal agenda [48]. Providing conference capabilities over Internet is what is called On-line Conferencing. On-line Conferencing can be presented in one of three main forms:

- **Data Conferencing** [49]**:** Sharing data interactively among several users in different locations. Data conferencing is made up of white boards and application sharing and are often used in conjunction with an audio or videoconferencing connection.
  - **White boards:** A white board is the electronic equivalent of the chalkboard or flip chart. Participants at different locations simultaneously write and draw on an on-screen notepad viewed by everyone.

[2] Learning Management System (LMS) and Virtual Learning Environment (VLE) reflect the same implementation of the same concept. LMS as an acronym is widely used in the United States and was presented in 1980. VLE as an acronym is widely used in United Kingdom and it was presented in 1983 [20].

- **Application Sharing and Application Viewing:** Application sharing is the same as remote control software, in which multiple participants can interactively work in an application that is loaded on only one user's machine. Application "viewing" is similar to application "sharing;" however, although all users can see the document, only one person can actually edit it.

- **Audio Conferencing:** An audio communications session among three or more people who are geographically dispersed. It is provided by a conference function in a mu-ltiline telephone or by the telephone companies or using Internet [50].
- **Video Conferencing:** A real time video session between two or more users or between two or more locations. Videoconferencing may comprise any number of end points [51].

4.2.2 Virtual Classroom

Virtual Classroom can be defined as the on-line learning space where students and instructors interact [10]. Virtual Classroom provides unique on-line features [52]

- Chat: two participants can exchange text to share thoughts between them.
- Discussion: Chat between more than two participants. Discussions can be public or private among part of the students.
- Question and Answer (Q&A): Individual participants may ask questions. Instructors may provide public or private answers.
- White Board: enable instructor to draw or display whatever compatible components.
- Group Browser: Participants can type the URLs in the address box, and sites are displayed to the entire group.
- Break Out Sessions: allows a subset of learners to enter a private chat area and use the virtual classroom tools.

4.2.3 Digital Library

Digital libraries are libraries that contain digital materials [17]. Digital Libraries' implementations might include digital data from academic institutions, public libraries, government agencies, and museums [53]. Digital libraries play an important role in the learning process due to the tremendous amount of different digital data available to be accessed by any of the LMS components anytime, and anywhere. My faculty is working currently on a project to digitize the "Graduation Projects" as main source of information to fresh students and as a mean to communicate back and forth between instructors and students. This Digital Library will be available on-line so readers can review books authored by faculty instructors; in case they approve that of course, and review graduation projects ideas, concepts, and documentations. Hopefully this project will enhance students graduation projects by providing students with a digital library of their colleges work, and enhancing the faculty knowledge sharing and collaboration.

5. UMIS or LMS

Universities require both UMIS and LMS for efficiency and effectiveness [19]. Neither UMIS nor LMS can replace the other. Figure 6 clarifies this distinction by assuring that University managerial requirements are addressed by UMIS, and Learning Process requirements are addressed by LMS, so University needs to implement both systems.

6. Current LMSs

List of current LMSs include: .LRN [55], BlackBoard [56], Centra [57], COSE [58], LON-CAPA [59], Moodle [60], The Learning Manager [61], Angel [62], ATutor [63], Claroline [64], Desire2Learn [65], Eledge [66], IntaLearn [67], KEWL [68], WebMentor [69], Janison Toolbox [70], KnowEdge eLearning Suite [71], Unicon Academus [72], BSCW [73], Colloquia [74], eCollege AU+ [75], ILIAS [76], Internet Campus Solution [77], MimerDesk [78], SAKAI [79], and IBM Lotus [80]. Figure 7 categorizes presented LMSs as Open Source, Free, or Commercial. Open source LMSs are LMSs that binary download for source code is available. Free LMSs are LMSs that installer download and usage in free and unlimited, with no source code available. Commercial LMSs are neither open source nor free. Users pay for purchasing and running commercial LMSs. By surveying LMSs, it is clear to find that most LMSs implement same features as depicted in prototypical LMSs as the one depicted in [18].

6.1 A Closer Look on IBM Lotus LMS

IBM Lotus is one of the leading LMSs that implements too many complicated features at a high level [81,82]. IBM Lotus is one of LMS dominants [83]. Figure 1.8 presents a detailed Lotus architecture and list of functions that are performed by Lotus components.

IBM Lotus is AICC certified since 1997 [82]. By studying Lotus preview [84] and architecture [85], it becomes clear that it is not applicable to satisfy all the educational institutions requirements within one LMS no matter what efforts are attempted by companies. Concerning Lotus as one of LMS leaders, neither the presence of 11 servers nor letting down some of the functionalities is acceptable. Issues like scalability, interoperability, and integration have been mainly serious issues for current available commercial LMSs that forced many educational institutions towards in-house LMS development and implementation to satisfy educational institutions special requirements.

The main reason of taking a closer look on IBM Lotus is that it has a real strong software architecture that supports many functions. I will not go in software architecture specifications and discussions in details here; because this is not the point right now, however IBM Lotus as one

respectable E-Learning solution approves what we have been talking about since the beginning; that is: separating responsibilities.

7. Conclusion

E-Learning is the "Learning" process revolution enabled by the new technologies that; hopefully, will present an effective and efficient learning process that doesn't exist today. Learning Management Systems (LMSs) are responsible for "Learning" activities, while University Management Information Systems (UMISs) are responsible for handling University managerial activities. Sociotechnical systems recognized many years ago that organizations functioned most effectively when their social and technological networks were compatible [54]. This is the case exactly with E-Learning systems. Neither LMS will cover and provide the managerial functionalities required to supporting universities, nor University Management Information Systems will support the "Learning" process as it shall be supported. Both systems shall integrate and interoperate together to support educational institutions and the e-Learning.

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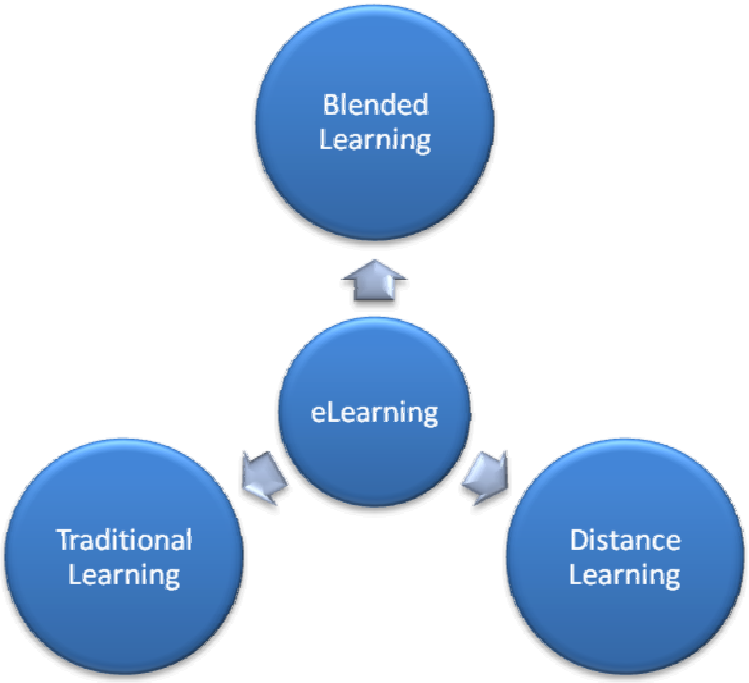

Figure 1: Learning models

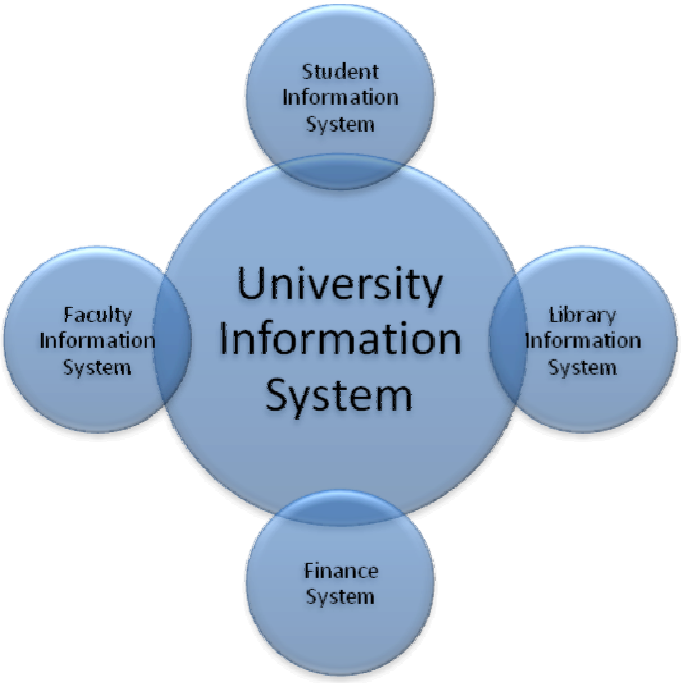

Figure 2: A Prototypical University Management Information System

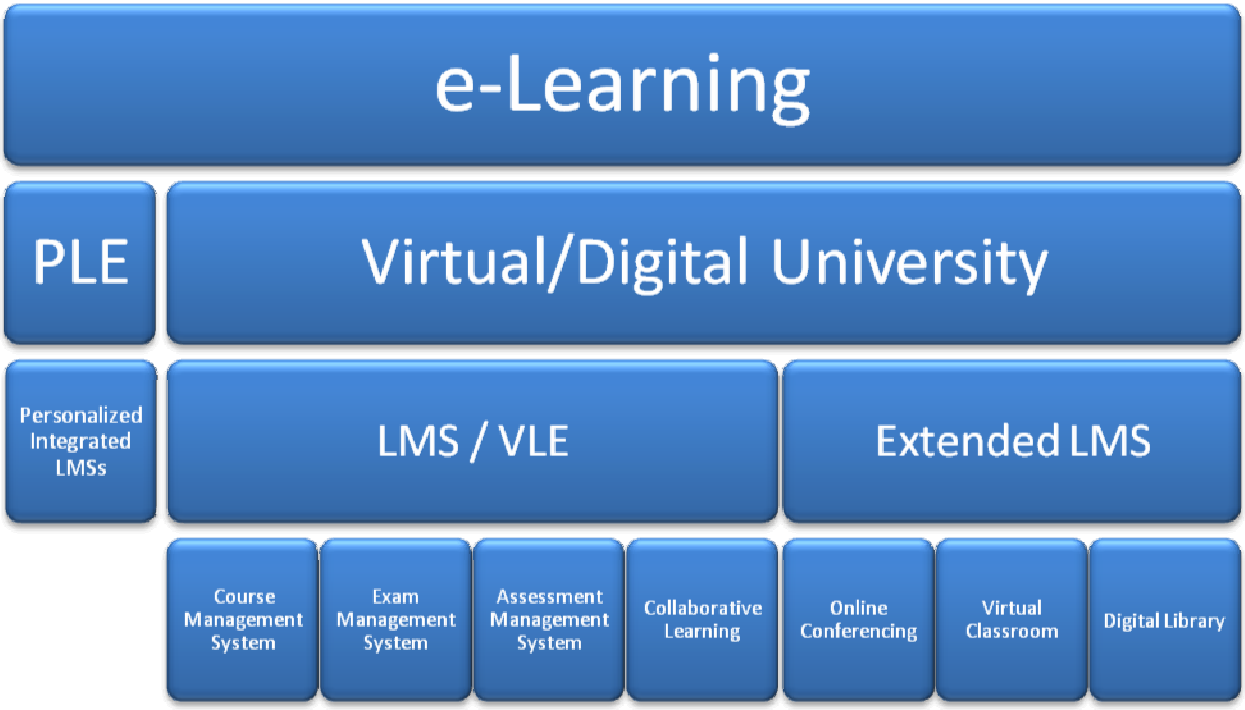

Figure 3: E-Learning umbrella covers many features

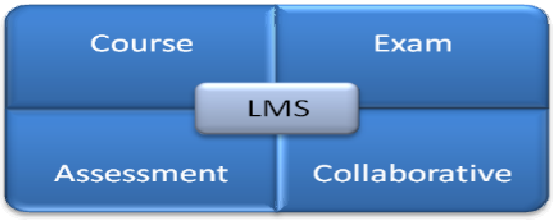

Figure 4: Main functionalities served by LMS

Figure 5: LMS components' functionalities

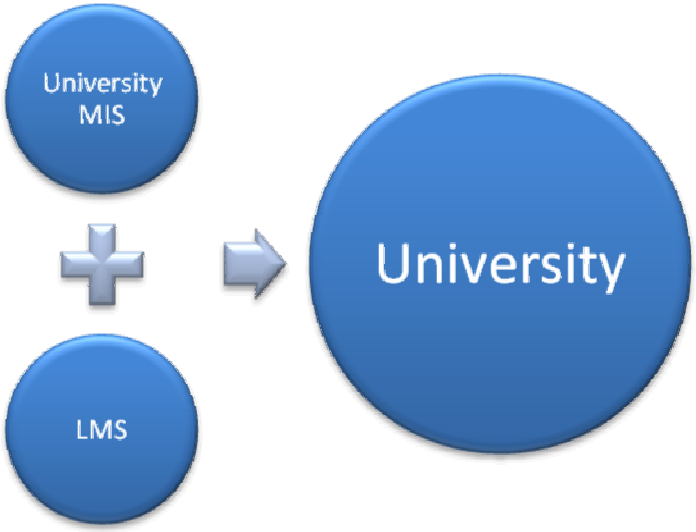

Figure 6: University Consumes Both Systems

Figure 7: LMSs License Categories

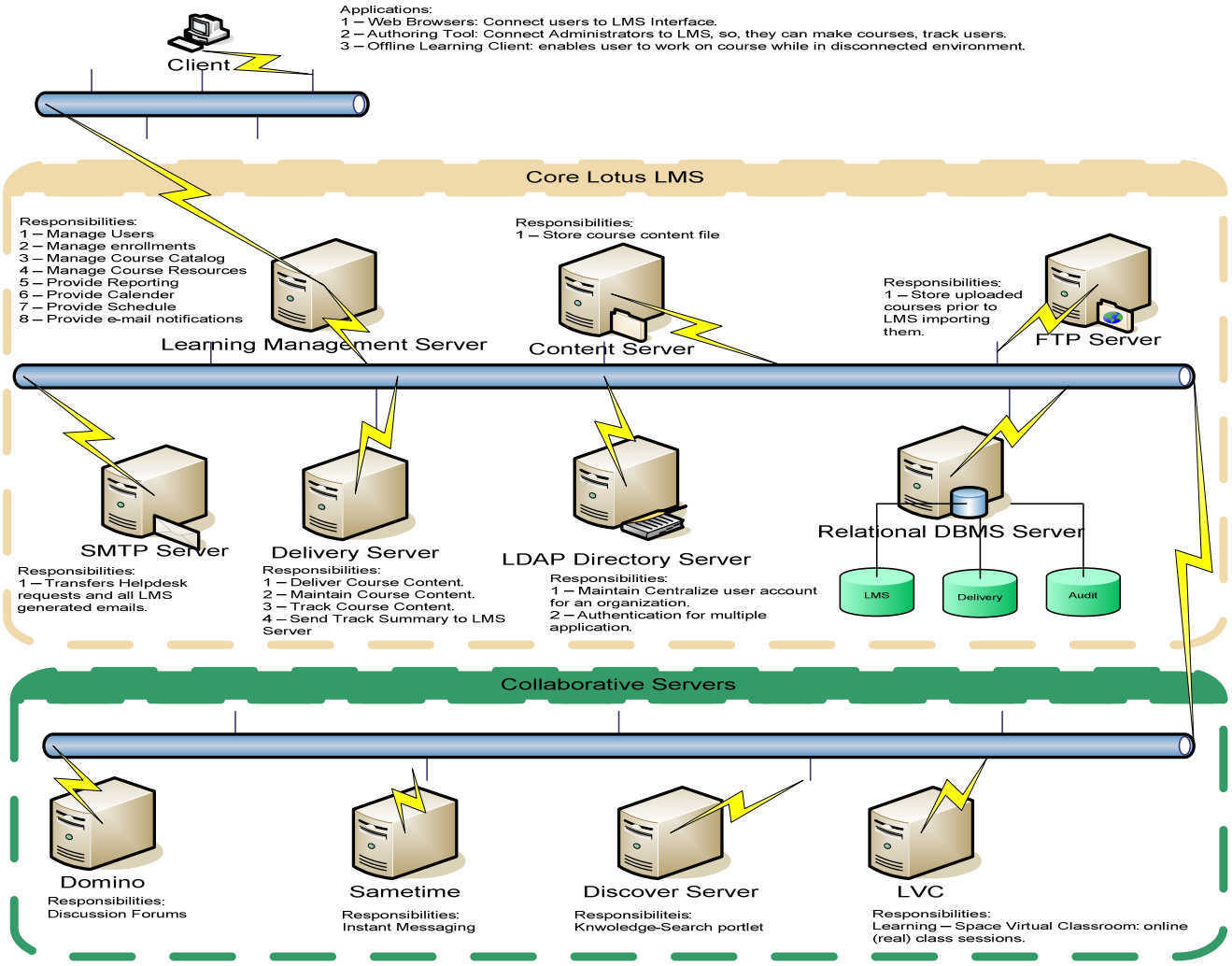

Figure 8: Detailed IBM Lotus Architecture