

Instructors' Opinions about New Learning Management System

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ABSTRACT

Learning management system (LMS) is highly discussable subject in educational field. Such systems need to always be updated and upgraded with new features, tools and design to keep up with technology development from day to day. A standard framework for developing LMS was provided with focusing on the design and interface. This research focused in implementing new LMS and implements it in new way by using up to date technologies to achieve user friendly and ease to use. In this research EMU was taken as a case study to get opinions on new LMS of students and instructors and compares it to an existing one in Eastern Mediterranean University. Data is collected by using Interview questions with 10 instructors from School of Computing and Technology. User friendly interface and ease to use design can empower the LMS.

Keywords: learning management system, LMS, interface design, LMS Development Framework, LMS comparison.

ÖZ

Öğrenme Yönetim Sistemi (ÖYS), son zamanlarda eğitim alanında çok konuşulan bir konudur. Bu tür sistemler, her geçen gün gelişen teknolojiye ayak uydurabilmeleri için geliştirilmeli; yeni özellikler, araçlar ve tasarımı ile düzenli olarak güncellenmeleri gerekmektedir. ÖYS geliştirilirken, standart bir çerçeve oluşturabilmek için tasarım ve arayüze odaklanmak gerekmektedir. Bu araştırmada, güncel teknolojiler kullanılarak, kullanıcı dostu ve kullanım kolaylığı sağlayacak olan yeni bir yöntem kullanılarak ÖYS oluşturması sağlanmıştır. Öğrenci ve öğretim elemanlarının, yeni ÖYS hakkındaki görüşlerini almak ve var olan ÖYS ile karşılaştırmak için Doğu Akdeniz Üniversitesi, bir vaka çalışması olarak ele alınmıştır. Öğrenci görüşlerini toplamak için anket kullanılmıştır ve anket sonuçlarına göre de öğrencilerin yeni sistemle daha çok ilgilendikleri gözlemlenmiştir. Veriler ayrıca Bilgisayar ve Teknoloji Yüksek Okulu'ndaki 10 öğretim elemanı ile röportaj yapılarak da toplanmıştır. Sonuç olarak bu araştırmada, özellikleri tamamlanmadığı halde, kullanıcı dostu arayüz ve kullanımı kolay tasarlanması ile ÖYS'nin daha güçlü olabileceği gösterilmiştir.

Anahtar Kelimeler: öğrenme yönetim sistemi, ÖYS, arayüz tasarımı, LMS Geliştirme Çerçeve, LMS karşılaştırılması.

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Chapter 1

INTRODUCTION

E-learning is one of the most important issues in most of universities. Many educational institutions are widely using e-learning. For online learning, universities mostly use blended learning style which is combination between traditional and online modern learning. E-learning courses need to be organized and managed within online environment. Nowadays, most learning management systems (LMSs) use automation processes to help learners and instructors achieving educational goal. Today, learning management systems (LMSs) are hosted in the cloud releasing the companies from the restriction and complexity in installing and maintaining eLearning system (Masud & Huang., 2012). It also helps companies in reducing cost by providing storage, integrity and security features with reasonable prices without requiring any device or application. In 1983 MIT announces the project called Athena to explore creative use of computers and technologies in education and after that 60 similar projects were announced (Hodges & Sasnett, 1993).

Starting from 1990, LMS start to get different path of learning by introduce application based learning. Moving on many LMSs were introduced and some of them be so popular like ePath in 1999, Moodle in 2002, Blackboard in 2003, SCROM in 2004, OLAT in 2006, Eucalyptus in 2008, Canvas in 2010... etc. Bates (2005) gave good description for distance education “Distance education on the other hand is less a philosophy and more a method of education. Students can study in

their own time, at the place of their choice (home, work or learning center), and without face-to-face contact with a teacher.” (Bates, 2005). From other hand Greenberg (1998) defines distance learning as “a planned teaching/learning experience that uses a wide spectrum of technologies to reach learners at a distance and is designed to encourage learner interaction and certification of learning” (Greenberg, 1998). Honeyman & Miller (1993) noted that students can access the course materials and information without need to be physically present as well students can be separated by distance and time or both (Honeyman & Miller, 1993). The history of distance learning has started two centuries ago (Spector, Merrill, Merrienboer, & Driscoll, 2008). The instructional radio and television broadcast were the mean of distance learning until the middle of 19th century (Imel, 1996).

After this period of time and when technology started to involve in human world, distance learning starts to represent noticeable changes in education. After the internet spread, many types of tools are available among the internet for distance learning. E-learning is the term used to call online learning in 1980’s (Harasim, 2000). Phipps & Merisotis (1999) find that when the terminology used simply makes it difficult to implement and design learning environment for this terminology unless more important and specific characteristics are clear up (Phipps & Merisotis, 1999). Nowadays designing and implementing learning environment depend on many things like subject, object, location, audience, type of access, etc... Alias & Zainuddin (2005) define LMS as “software application or Web-based technology used to plan, implement, and assess a specific learning process. Typically, a LMS provides an instructor with a way to create and deliver content, monitor student participation, and assess student performance” (Alias & Zainuddin, 2005).

LMS allows administrator and instructors to control, organize and manage courses and learning process with many features integrated with it. There are two types of LMS that are commercial and open-source.

Open-source LMSs are free and it is completely customizable with its code and design. However most of open-source LMSs are complicated and missy from coding, interface design and database design perspectives. Most of open-source LMSs need to be supported from developer to be modified due to its complexity. Canvas, Sakai, ILIAS, Atutor and Moodle can be good examples of open-source learning management system.

Commercial LMSs offer continues support to the organization as well as it is much easier to deploy, maintain, organize and deal with. However it is very costly. Blackboard, Litmos, TrainCaster and Expertus are examples of commercial learning management system. Different features introduced from different vendors of LMS, however most of these vendors don't consider individual differences between learners from characteristics, abilities, experience and knowledge perspectives. Always learners play the main role in educational institutions to enhance learning process whether in traditional learning style or online one. Kumar, Gankotiya & Dutta (2011) made a comparison between different types of LMSs from 3 different aspects described by Al-Ajlan & Zedan (2008) which are learner tools, support tools and technical specifications.

Table 1: LMSs Comparison

Properties	Number of Technical Features	Number of Learner Tools	Number of Support Features
Product			
D2L	6	15	16

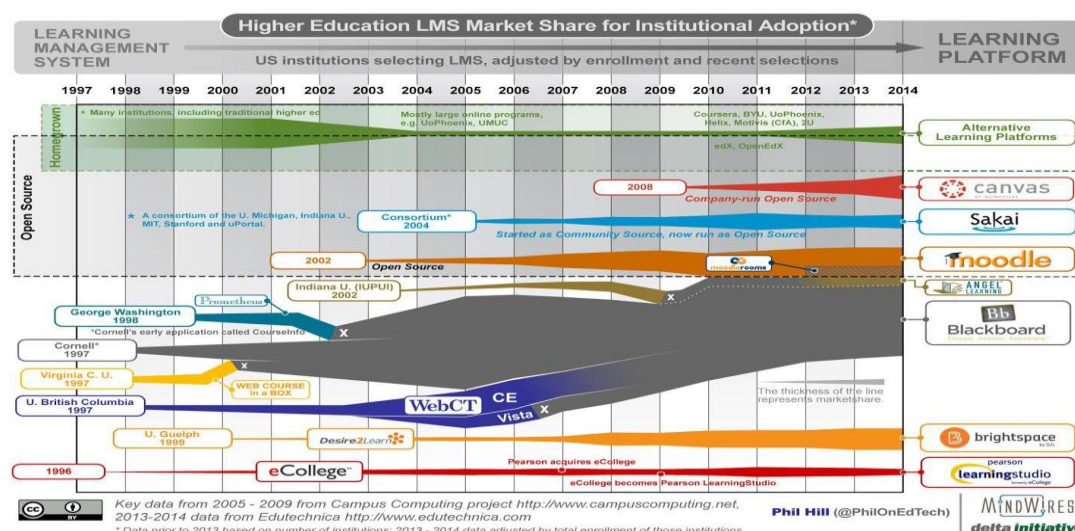
KEWL	5	14	16
ANGEL	5	15	16
eCollege	4	14	15
Blackboard	6	14	15
Moodle	7	15	16
Claroli	5	11	16
OLAT	7	13	16
Sakai	7	15	16

Table 1 shows the number technical features, learner tools and support features provided in each system. According to Kumar, Gankotiya & Dutta (2011) comparison, Moodle and Sakai are the best learning management systems because they provide the highest number of features among other LMSs specially that both of systems are open source LMS.

Some learners find LMS from any vendor is easy to deal with, on the other hand some other learners see it difficult (Jonassen and Grabowski, 2012). Many papers discussed learner experience and knowledge in order to deal with online courses. Jonassen and Grabowski (2012) noted that the learner's prior knowledge and experience is the strongest factor that can help us in prediction the learner's achievement. Felder (2005) noted that learners with strong background and experience in specific learning style may have difficulties in adopting new style of learning (Felder and Silverman, 1988; Felder and Soloman, 2005).

Observatory Borderless Higher Education (OBHE) research study the spread of course tools of blackboard and blackboard LMS. These two products dominate the market until 2006 when SCROM (Shareable Content Object Reference Model) and Moodle start to dominate international market. OBHE reported that over 70% of institutions in Australia, Canada and UK had licenses for at least one of Blackboard

products while around 55% of institutions USA, Finland, South Africa and Netherlands use one of these products. Delta Initiative firm is consulting firm to study the LMS market annually. Delta Initiative reports reflect competition between LMSs in USA Market (Delta Initiative, 2014) (Figure1).



According to the last research of Research and Market (2015), Adobe Systems, Blackboard, Cornerstone OnDemand, Oracle and Skillsoft are dominating USA market in 2015 (Research and Market, 2015). All of these LMSs are complex to deal with and doesn't provide easy customizable code, simplicity or clear friendly interface.

1.1 Problem Statement

The research will move on from the existent LMS in Eastern Mediterranean University (EMU). Many portals, websites and LMSs are functioning within the university subdomains. Any educational institution needs to customize the system to fulfill the requirements of educational process within the institution. Developing trustable LMS with base features and ability to customize can help EMU to

centralize the LMS. Instructors in EMU are also facing with problems while dealing with different systems in different departments.

Developing friendly LMS can help students at EMU to discuss and collaborate to achieve course objectives.

Content management is another problem that will be solved with new system whatever the media type is (video, audio, PDF File, word file...etc).

Quizzing system, fast grading system as well as attendance system will help students and instructors saving more time and achieving assessments fast and easy.

1.2 Purpose

This research has two purposes, the first purpose of this research is to design and implement new learning management system to enhance performance, simplicity and user friendly GUI (Graphic User Interface). Second purpose is to study the view and opinions of instructors of School of Computing and Technology about new LMS.

1.2.1 Research Questions

The aim of this research is to implement the advantages of most powerful and famous LMSs with user friendly and easy to use interface that can provide adaptively for users. To achieve this goal, the researcher investigates the following questions

- 1) How to implement learning management system?
- 2) What is the instructors' opinion about new LMS?

1.3 Importance

This study will help centralized eLearning system within any educational organization and make feature enhancement much easier. Finding and deploying

LMS from open-source can be complex because it was written without documentation. On other hand customizing the source code without developer support needs highly expert developer especially most of open-sources written without taking modifying code by third party into consideration. This LMS will provide easy coding structure, high performance and friendly interface. In addition, the implemented system will provide standard LMS features with ability to extend and deploy new features.

For those reasons, this LMS can be powerful system with its design, features and performance.

1.4 Limitation

Few limitations are noticeable in this research. The participants will test the system within short time without dealing with it for long period of time. The data is collected just from one School in EMU.

1.5 Definition of Key Terms

LMS: Learning Management System is a software application for the administration, documentation, tracking, reporting and delivery of electronic educational technology (also called e-learning) education courses or training programs.

DC: Distance learning is a method of studying in which lectures are broadcast or lessons are conducted by correspondence, without the student needing to attend a school or college.

ELearning: Electronic learning conducted via electronic media, typically on the Internet.

SCROM: Shareable Content Object Reference Model (SCORM) is an XML-based framework used to define and access information about learning objects so that they can be easily shared among different learning management systems (LMSs).

Web 2.0: the second stage of development of the Internet, characterized especially by the change from static web pages to dynamic or user-generated content and the growth of social media.

IMS: IBM Information Management System is a joint hierarchical database and information management system with extensive transaction processing capabilities.

QTI: The IMS Question and Test Interoperability specification (**QTI**) defines a standard format for the representation of assessment content and results, supporting the exchange of this material between authoring and delivery systems, repositories and other learning management systems.

SOA: A service-oriented architecture is an architectural pattern in computer software design in which application components provide services to other components via a communications protocol, typically over a network. The principles of service-orientation are independent of any vendor, product or technology.

MsSQL: Microsoft SQL Server is a relational database management system (RDBMS) from Microsoft that's designed for the enterprise environment.

MVC: Model–view–controller is a software architectural pattern for implementing user interfaces. It divides a given software application into three interconnected parts, so as to separate internal representations of information from the ways that information is presented to or accepted from the user.

DBMS: A database management system is system software for creating and managing databases. The DBMS provides users and programmers with a systematic way to create, retrieve, update and manage data.

HTML5: Hyper Text Markup Language version 5 is a core technology markup language of the Internet used for structuring and presenting content for the World Wide Web.

CSS: A cascading style sheet is a Web page derived from multiple sources with a defined order of precedence where the definitions of any style element conflict.

JS: JavaScript is an object-oriented computer programming language commonly used to create interactive effects within web browsers.

ASP.Net: is an open-source server-side Web application framework designed for Web development to produce dynamic Web pages. It was developed by Microsoft to allow programmers to build dynamic web sites, web applications and web services.

C#: pronounced "C-sharp" is an object-oriented programming language from Microsoft that aims to combine the computing power of C++ with the programming

ease of Visual Basic. C# is based on C++ and contains features similar to those of Java.

VB: Visual Basic is a programming environment from Microsoft in which a programmer uses a graphical user interface (GUI) to choose and modify preselected sections of code written in the BASIC programming language

WebCT: Blackboard Learning System, now owned by Blackboard, is an online proprietary virtual learning environment system that is licensed to colleges and other institutions and used in many campuses for e-learning.

Chapter 2

LITERATURE REVIEW

2.1 Distance Learning and Distance Education

Usually distance education described as providing access and learning services for people who are not physically presented in university or educational institute or in other words who geographically distant (Honeyman & Miller, 1993). Computer now is primary method to deliver education and print instructional materials as well as electronic media (Moore, 1990) which means, instructors can deliver instructional materials from any location at any time. Dede (1996) compared different pedagogical methods which instructors use in traditional learning environments to give details to it and call it “teaching by telling”. The definition also stated that distance education uses emerging media and associated experiences to produce distributed learning opportunities. The changes in the field are obvious after putting these two definitions together and attributed these definitions to the new technologies that were being available. Keegan (1996) use the term “umbrella” to describe distance education. King, Young, Drivere-Richmond, and Schrader (2001) believe that distance learning and distance education are not the same where distance learning is more like ability and distance education is activity within the distance learning (King, Young, Drivere-Richmond, and Schrader, 2001). Volery and Lord (2000) noted that definitions of distance learning and distance education can be different depend on time and place it used in. Learning in new century starts to focus of instruction and media, and again distance learning term was used to focus on time limitation and

geographical limitation (Guilar & Loring, 2008; Newby, Stepich, Lehman, & Russell, 2000). The term distance learning later on used to describe special type of learning like online learning, online collaborative learning, web learning...etc. (Conrad, 2006).

2.2 E-Learning / LMS Definition

The e-learning stands for electronic learning which the term is used to refer to computer enhanced learning. It is difficult to specify standard and general definition for e-learning because a lot of terminologies and definitions used until today. E-learning has different names and sometimes different style of learning like web based learning, distance learning, computer-assisted learning etc. Nowadays the user can use different devices to access learning materials using the system provided by his/her educational institution to interact with other students and the teacher (Salem & Salem, 2015).

The e-Learning definition changes when the technology associated with learning change. Carliner defines it as “educational material that is presented on a computer” (Carliner, 2004). A detailed definition introduced by Khan “an innovative approach for delivering instruction to a remote audience, using the Web as the medium” (Khan, 1997). Although the definition is clear, some disagreeing points may be put forward to Khan’s definition especially in those days when e-learning is not just for delivering the instruction, but also is for using to deliver and share experience, knowledge, practices etc. As a conclusion, eLearning is the representation and delivering learning materials as well as interaction between class participants in online environment.

LMS is commonly referred to as e-learning platform. LMS is a term used to describe web-based technology. LMS refers to a system that can create, plan, support, manage and organize learning process in an online environment. Simply, LMS allows teacher to create, plan, deliver and organize learning material as well as provides event and log to monitor student participation and performance. Hall (2001) defines LMS as “software that automates the administration of training events. All LMSs manage the log-in of registers users, manage course catalogs, record data from learners, and provide reports to management”.

2.3 Advantages and Disadvantages of E-learning

E-learning has its advantages and disadvantages, however with widely spread of technology the advantages are more than disadvantages (Cook, 2007). One of the most important advantages of e-learning is providing location flexibility (Valentine, 2002). Teacher can upload learning materials from any place to be viewed by his/her students. On the other hand, students will be able to access these materials online (Dougiamas, 1999). Also, there is time flexibility because the learner can adjust the time that s/he wants to participate. In such systems learners save time and cost because they don't need to travel to the campus (Distance Learning). In most LMSs nowadays learner can interact with other learners and instructors online (Al-Ajlan & Zedan, 2008). They can share, discuss, meet and do same activity that they do in traditional learning style but in online environment. Another advantage of LMS is that the student can repeat the lesson and review the materials as much as he needs to understand it (Welsh, Wanberg, Brown & Simmering, 2008). For example, video can be played many times. For instructor also eLearning made the life easier, and the instructor can create media and materials for the course one time and share with 10th or hundreds of the classes online to reach students anywhere anytime. For

educational institutions, eLearning can reduce the cost of training and tutoring and it will solve a lot of problems related to lack of resources (O'Lawrence, 2007).

Also eLearning has some disadvantages. One disadvantage is the lack of face-to-face interaction among faculty members and students. Some students feel isolated in online environment. The video conferencing and collaborative tools minimize this effect but it still exists. Motivation of the learner is also an issue in eLearning because learner has no restriction for place and time so no progress will be done if he/she is not motivated (Kantor, 1998).

2.4 Web 2.0 and eLearning 2.0

Some services and communication applications started to service market at early 90's to work in online environment. This was the web 1.0 and it is also called 'Dot Com Boom'. At the end of 90's, web 2.0 was presented as a new web based communication and services which brought as well social network as most powerful part in internet communication in this decade. A lot of businesses see the light in internet using web 2.0 communication technologies like YouTube, Skype, yahoo messenger etc. Web 2.0 provided stable and supportive environment helping business to grow from ideas, Tim O'Reilly produced a nice explanation of web 2.0 as; "business revolution in the computer industry caused by the move to the internet as platform, and an attempt to understand the rules for success on that new platform. Chief among those rules is this: Build applications that harness network effects to get better the more people use them." (O'reilly, 2006). O'Reilly noted the relevant aspects in web 2.0 for eLearning start with the easy engagements when the user needs only browser without downloading and configuring anything (O'Reilly, 2007).

Everyone can be publisher and the data presented can be in different type whether it's audio, video or text (O'Reilly, 2007).

Downes see eLearning is part of World Wide Web and all of its functionality done online and he called it E-learning 2.0 (Downes, 2005). E-Learning has been represented in better and more stable form after the failure of web 1.0. E-Learning 2.0 uses the technologies presented and developed for web 2.0. The students were waiting stable technology to be implemented in educational field. Downes also noted that students responded widely to the thread of testing version of a blogging tool from all over the world. E-learning 2.0 with use of web 2.0 tools allows groups and communities to grow and share materials, knowledge and experience. Wenger noted this point in his article: "a shared domain of interest where members interact and learn together and develop a shared repertoire of resources." (Wenger, 2011).

2.5 LMS Requirements

Many researchers study the requirements and each of them claims standard according to product his/her research dealing with. In this study, many papers in the literature were examined and combined the review of features that make powerful system. Content management is the main feature supposed to be provided by any LMS. Content management helps in organizing and managing the content of the course. This content can be media, assignment, quizzes etc. Yasar and Adiguzel (2010) believed that any implemented LMS should support uploaded files, assignments and objects to the course page. Successful LMS will allow students to evaluate the courses (Hrastinski, 2008) and the administrator should view organized results of this evaluation (Guo & Schwaninger & Gall, 2008). LMS should support at least one type of web 2.0 communication tool like text chat, forums, wikis, video

conferencing... etc. (Kljun & Vicic & Kavsek & Kavcic, 2007). Student learning progress should be recorded and tracked (Crocetti, 2001) to be viewed by teacher or related student (Greenberg, 2002). LMS should have different accounts with different roles and allow just eligible users for using course material that are assigned for them (Daniel, 2006).

LMS should be compatible with popular third party tools, applications and content supporting standard and framework like Aviation Industry CBT Committee (AICC), Information Management System (IMS) and Sharable Content Object Reference Model (SCORM) (E. Sancristobal & S. Martin & R. Gil. G. Díaz & A. Colmenar & M. Castro & J. Peire, J.M. & Gómez, E. López & P. López, 2008). LMS should handle different content's format like (flash, wave, mp3 ...etc.) as well as supporting popular platforms such as Open Office Standards, Photoshop ...etc. (Hall, 2003). The usability is one of the most important features in LMS and that's why LMS should be easy to use by both instructor and student with fully access using web browser (A. Lewis & M. MacEntee & DeLaCruz & Englander & Jeffrey & Takach, Wilson & Woodall, 2005). In the same article authors noted that any LMS is supposed to allow modification to its source code. Reliability should be provided and tested in LMS in order to handle heavy workload and be scalable to number of users (Greenberg, 2002).

Corporate LMS should protect against unauthorized use of content and high level of account security with different roles implemented (Ellis, 2009). Corporate LMS should be able with any system used in educational institution (Crocetti, 2001). In order to corporate LMS to success it should be adopted to the users need (Reyes & Candeas & Galán & R. Viciania & F. Cañadas & P.J. Reche, 2009).

2.6 Comparison of LMSs

Educational organization expected many features from LMS like forums, content management and quizzes with abilities to create different type of questions (Zenha-Rela & Carvalho, 2006). In Tables 2, 3 and 4 comparisons of learner tools are given. In those tables Y denotes the feature provided with LMS and N denotes there is no such feature. Al-Ajlan & Zedan (2006) divide LMS for comparison purpose to learner tools, technical specification and support specification.

According to Dougiamas (1999), learner's tools have three different kinds which are productivity tools, communication tools and student involvement tools. Learner tools has different features and each LMS has some of them (Table 2).

Table 2: Learner Tools Comparison (Kumar, Gankotiya & Dutta, 2011)

Product Name/Tools	D2L	KEWL	ANGEL	eCollege	BB	Moodle	Claroli	OLAT	Sakai
Discussion Forums	Y	Y	Y	Y	Y	Y	Y	Y	Y
Discussion Management	Y	Y	Y	Y	Y	Y	Y	Y	Y
File Exchange	Y	Y	Y	Y	Y	Y	Y	Y	Y
Internal Email	Y	Y	Y	Y	Y	Y	Y	Y	Y
On-line Journal	Y	Y	Y	N	Y	Y	N	Y	Y
Real-time Chat	Y	Y	Y	Y	Y	Y	Y	Y	Y
Video Services	N	N	N	N	N	Y	N	N	N
Whiteboard	Y	N	Y	Y	Y	Y	Y	N	Y
Bookmarks	N	N	N	N	N	Y	N	N	N
Calendar	Y	N	Y	Y	Y	Y	N	Y	Y
Orientation	Y	Y	Y	Y	N	N	Y	N	Y
Searching Course	Y	Y	Y	Y	Y	Y	Y	Y	Y
Work Offline	Y	Y	Y	Y	Y	Y	N	Y	Y
Group Work	Y	Y	Y	Y	Y	Y	Y	Y	Y
Community	Y	Y	Y	Y	Y	Y	N	Y	Y
Student Portfolios	Y	Y	Y	Y	Y	Y	Y	Y	Y
Total Features	16	16	16	16	16	16	16	16	16
Total Available	15	14	15	14	14	15	11	13	15
Total Missing	1	2	1	2	2	1	5	3	1

Table 2 compares 9 different learning management systems based on learner tools. According to Kumar, Gankotiya and Dutta (2011) moodle and sakai are the LMSs providing highest number of learner tools (Kumar, Gankotiya & Dutta, 2011) (Al-Ajlan & Zedan,2008).

The second aspect is support tools. These tools are also divided into three different types which are Administration Tools, Course Delivery Tools, and Content Development Tools and all of these tools have features and capabilities (Al-Ajlan & Zedan,2008) (Table 3).

Table 3: Support Tools Comparison (Kumar, Gankotiya & Dutta, 2011)

Product Name/Tools	D2L	KEWL	ANGEL	eCollege	BB	Moodle	Claroli	OLAT	Sakai
Authentication	Y	Y	Y	Y	Y	Y	Y	Y	Y
Authorization	Y	Y	Y	Y	Y	Y	Y	Y	Y
File Exchange	Y	Y	Y	Y	Y	Y	Y	Y	Y
Registration Integration	Y	Y	Y	Y	Y	Y	Y	Y	Y
Test Types	Y	Y	Y	Y	Y	Y	Y	Y	Y
Automated Management	Y	Y	Y	Y	Y	Y	Y	Y	Y
Automated Support	Y	Y	Y	Y	Y	Y	Y	Y	Y
Course Management	Y	Y	Y	Y	Y	Y	Y	Y	Y
On-line Grading	Y	Y	Y	Y	Y	Y	Y	Y	Y
Student Tracking	Y	Y	Y	Y	Y	Y	Y	Y	Y
Accessibility	Y	Y	Y	N	Y	Y	Y	Y	Y
Content Sharing	Y	Y	Y	Y	N	Y	Y	Y	Y
Course Templates	Y	Y	Y	Y	Y	Y	Y	Y	Y
Look and Feel	Y	Y	Y	Y	Y	Y	Y	Y	Y
Design	Y	Y	Y	Y	Y	Y	Y	Y	Y
Instructional standards	Y	Y	Y	Y	Y	Y	Y	Y	Y
Total Features	16	16	16	16	16	16	16	16	16
Total Available	16	16	16	15	15	16	16	16	16
Total Missing	0	0	0	1	1	0	0	0	0

According to Table 3 support tools comparison, all LMSs have same level of support tools features except Blackboard which missed accessibility feature and eCollege which missed content sharing feature (Kumar, Gankotiya & Dutta, 2011).

The third aspect is technical tools which have two types of tools, hardware /software tools and pricing/licensing (EduTools, 2015). All support tools have features and capabilities.

Table 4: Technical Tools Comparison (Kumar, Gankotiya & Dutta, 2011)

Product Name/Tools	D2L	KEWL	ANGEL	eCollege	BB	Moodle	Claroli	OLAT	Sakai
Client Request	Y	Y	Y	Y	Y	Y	N	N	Y
Database Requirements	Y	Y	Y	Y	Y	Y	Y	Y	Y
Unix Server	N	N	N	N	Y	Y	Y	Y	Y
Windows server	Y	Y	Y	N	Y	Y	Y	Y	Y
Company Profile	Y	Y	Y	Y	Y	N	N	Y	Y
Costs	N	N	N	N	N	Y	Y	Y	Y
Open Source	N	N	N	N	N	Y	Y	Y	Y
Optional extra	Y	Y	Y	Y	Y	Y	N	Y	Y
Total Features	8	8	8	8	8	8	8	8	8
Total Available	6	5	5	4	6	7	5	7	7
Total Missing	2	3	3	4	2	1	3	1	1

In the Table 4 above, Because of some LMSs are open source (Y) is calculated as cost and versa for commercial once. Table 4 shows the comparison between technical tools show that Moodle, Sakai and OLAT are best learning management system based on technical tools with just one feature missing (Kumar, Gankotiya & Dutta, 2011).

2.7 Distance Education Problems

The advantage of online learning is obvious especially from time and distance perspectives, but still problem exist. These problems include the quality of

instruction, actors' attitude, technology misuse, hidden costs, student concern and instructor concern (Valentine, 2002).

The quality of instruction considers one of the main problems in eLearning because it mostly depends on instructor's attitude (Valentine, 2002). Inman and Kerwin (1999) research shows that instructors have different attitudes about online teaching especially if it is distance education. Inman and Kerwin (1999) also show in their report that majority of the instructors' rated online courses equal or lower than traditional face-to-face courses. Palloff and Pratt (2000) believe that effective learning come from effective instructor not from technology.

The true cost of distance learning program is also a problem. Phelps et al. (1991) noted that "the potential cost-effectiveness of using online technologies in distance education is still uncertain". NG (2000) noted that "it is possible for a program to be efficient but not cost effective if the outputs which are actually produced do not contribute to the program objectives: that is it may be efficient at doing the wrong things". According to NG (2000) the way of implementing online courses can affect the cost of eLearning.

Not utilizing the technologies can be one of eLearning problem. Lack of training and skills can lead to misuse of technologies (Palloff & Pratt, 2000). Palloff and Pratt (2000) mention that instructors should be trained to use new technologies and they noted "not only to use technology, but also to shift the way in which they organize and deliver material".

Beside the misuse of technology, actors' attitude can be problem in distance learning. Instructor should have technology skills and confidence in using e-Learning system in order to achieve effective teaching (Weber, 1996). Walcott (1994) noted that "to effectively bridge the gaps between classroom and distance teaching, faculty need to look at the distance teaching from the students' point of view". In distance education, instructor loss the eye contacts which according to McKnight (2000) it is very important factor in education.

The main problem in e-Learning that not all students are familiar with it, beside some subjects is difficult to teach online (Hardy & Boaz, 1997). Autonomy and flexibility, tolerance and ambiguity needed from students to be successful in this type of learning (Threkeld & Brzoska, 1994). Hardy and Boaz (1997) noted that "compared to most face-to-face learning environments, distance learning requires students to be more focused, better time managers, and to be able to work independently and with group members".

2.8 Related Research

Del Cid, de la Fuente, Gutiérrez, Pardo & Kloos (2007) study IMS learning design (Information Management System) which Develop by IBM to capture the learning flow of courses with not restricted pedagogical model. The flow should work and produced in any systems using run-time environment. The most important part of this study is studying the integration of other services Like QTI (Question and Test Interoperability) and SCROM.

Moura, Brandão and Brandão (2007) study free web-based LMS called SAW that integrate learning modules for special learning content like geometry and

programming. Automatic assessments resources provided in this LMS were welcomed by students.

Cavus, Uzunboylu & Ibrahim (2009) implement and study the Moodle LMS with GREWPtool collaborative editor. They test the system among 36 students enrolling in two programming courses which are Java and Pascal. The authors find out that using collaborative tools with moodle LMS can make the education process more efficient.

Lonn, S., & Teasley (2009) study the perception of participants in LMS at a large American Midwestern university. They report the finding as “Findings suggest that instructors and students value tools and activities for efficient communication more than interactive tools for innovating existing practices. However, survey item analysis reveals that instructors and students also highly value the teaching and learning tools within the LMS.”

Laisheng, X., & Zhengxia (2011) describes the amount of infrastructure and huge investment needed by organization to adopt on-site LMS. They provide structure and paradigm to e-Learning system build on the cloud. They find that learning management system is feasible and efficient in cloud computing with the existence of management power to the system.

Jabr and Al-Omari (2010) develop learning management system based on Service Oriented Architecture (SOA). Because this system uses SOA, it is fully integrated with different databases like oracle and MsSQL. The authors believe that the

eLearning architecture they presented will be the future of eLearning because it provides compatibility, manageability and accessibility in simple manner.

Shulamit and Yossi (2011) used Moodle platform to implement creative eLearning environment as they call it. Authors of this research introduce the environments as enhancement of face-to-face style; however it gives the advantage to the teacher to add, edit or use existent curriculum.

Chen, Hwang & Wang (2012) developed Web 2.0 tool for annotation system called MyNote and collect participants perception about the new tool. The evaluation it receives for integrating this tool with learning management system was positive. The Authors noted that “It was found that the factors of interactivity and helpfulness were statistically significant to predict the future use of MyNote.”

Awang & Darus (2012) evaluate Claroline Open-Source learning management system which is compatible with many operating because it written using PHP and MySql database. The authors of this research believe that Claroline open-source learning management system can save high cost without losing quality.

Lange, Suwardy and Wells (2012) study perceptions of 846 undergraduate accounting students of the design features of LMS. Authors found that the student positively associate and use most of LMS tools like discussion forums, bulletin boards...etc. student in this study find the materials provided by LMS doesn't enhance student engagements and participation in the class. The authors noted as value of the new research that “the motivation to use and engage with LMSs by accounting students is not well understood.”

Masud and Huang (2012) believe that information and communication technologies (ICT) is transforming whole system of education. After introducing the cloud computing, Masud and Huang (2012) design new education system to meet institute needs. Combining eLearning and cloud computing together can solve complicated education problem fast with lower cost.

Hovat, Dobrota, Krsmanovic and Cudanov (2013) study the students' perception in Moodle learning management system as well as the perceptions based on characteristics. This research is study satisfaction of the students based on their age and year of study. And find both gender equally satisfied in Moodle. One more important point they noted in their research "there is a substantial statistical difference in the significance students gave to quality characteristics and in student satisfaction itself, according to how much time they spent using the Moodle application, which is also noted as one of the most important aspects of the research conducted"

In a formative assessment of the homegrown TeLeTOP LMS at the University of Twente (Maslowski, Visscher, & Collis, 2000), researchers collected data from 25 courses and found that the most popular functions of the TeLeTOP system included managing files, particularly PowerPoint slide handouts. Similar results were found in an online survey of 57 faculty members using WebCT at several universities in Switzerland (Holm, Röllinghoff, & Ninck, 2003). In an examination of perceived usefulness, instructors reported that they valued the content module (file management) and threaded discussion tool the most and the chat tool the least.

Hanson and Robson (2004) studied the use of WebCT and Blackboard at three US colleges (Williams, Brandeis, and Wesleyan) to determine: 1) if instructors and students perceived a learning value from using LMS, 2) what web-based processes provided the most learning benefit, and 3) if views differed between instructors and students. When asked to select the benefits of LMS, both instructors and students chose "saves time" more often than "improves learning." Features that supported making class information and readings available online were most highly valued. With respect to learning benefits, instructors highly valued online discussions while students responded favorably about LMS features that allowed online access to grades, sample quizzes, and audiovisual review materials, all of which were seen as having strong learning benefits by students.

In a 2003 survey of 172 faculty members at Colorado State University, Yohon, Zimmerman, and Keeler (2004) found that significantly more WebCT adopters than non-adopters reported that technology, in general, saved them time on their daily tasks and enabled them to improve their teaching. Of these adopters, instructors were found to use content publishing tools the most, while interactive tools such as chat and threaded discussion were seldom used.

West et al. (2007) conducted interviews and surveys about how instructors at Brigham Young University implemented Blackboard into their instruction. Using Rogers' (2003) model for understanding the adoption decision process; they found that instructors grapple with several small decisions as they weigh the advantages and disadvantages in each stage of their adoption. Although West and his colleagues found that most instructors used Blackboard for the distribution, management and retrieval of course materials, the authors note that LMS are increasingly

incorporating functionality (e.g., discussion boards, synchronous chat, etc.) that supports communication between students and instructors and among students. Both the West et al. (2007) and G. Morgan (2003) studies illustrate that while instructors initially prefer management aspects of LMS, they begin to use more of the interactive features for their teaching as they gain familiarity with the technology.

Chapter 3

METHODOLOGY

The purpose of this research is to implement a LMS and analyze the opinions of instructors regarding to this system. Students and instructors in this system are the main actors. The methodology design to clear the answer of research questions.

3.1 Research Design

To generate solution to the existent problem, building new knowledge about the problem and solution method should be used (Lekvall, Wahlbin & Frankelius, 2001). According to Marshall & Rossman (2014) there are different type of strategies can be used to deal with data. These strategies can be experiment, survey, archival analysis, history or case studies. To choose methodology, research, type, questions, focus on contemporary events should be taken into consideration (Marshall & Rossman, 2014). In this research qualitative research method is used to collect data from participants.

For collecting qualitative data, interview is the most common tool for this type of data collection (Denzin & Lincoln, 1998). According to Shah (2002), using interview as method help interviewer to understand and investigate the problem deeply and give interviewer advantage of understanding participant point of view (Shah, 2002). Rubin and Rubin (2004) Noted that “any verbal confirmation or dis-confirmation of observation or any formal, informal or casual answers to a question constitutes an

interview”. Figure 2 describes the research design and at what stage of the research data collection instrument used to collect data.

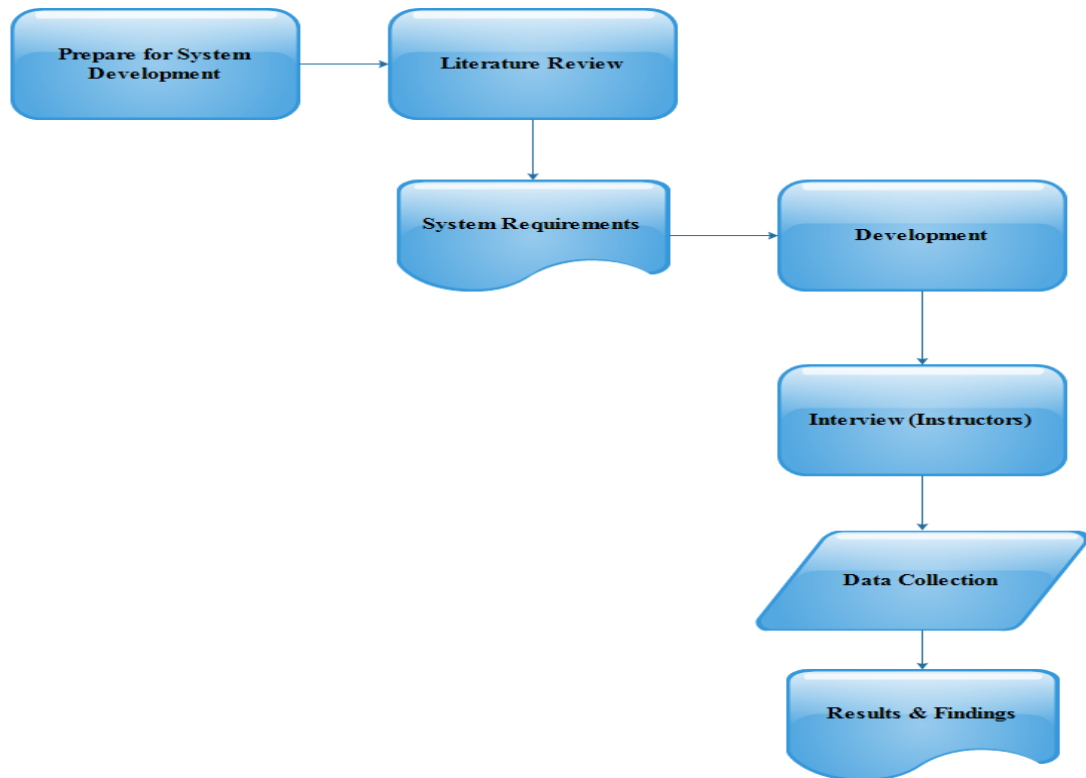


Figure 2: Steps of Research

10 instructors from school of computing and technology were interviewed. Interviews are used to collect information from instructors in this research. The first issue is to understand if the management system and online management system integration will help in reducing the complexity. Interviewees will be asked about the current system especially in students’, teachers’ and courses’ registration process and the complexity that teacher faced during registration process. The second research question that is answered by this method is the teacher perspectives of implemented LMS. Interviewees will be asked for advantages and disadvantages of current system and compares it to the implemented LMS. The main focuses in interview is on easy to use and user friendly features and sees if it can help teacher’s experience in LMS

and reduce the complexity. Finally teacher's considerations for future enhancement will be noted.

3.2 Participants

The interviewee will be made with 10 instructors in Eastern Mediterranean University from school of information technology. The minimum academic level for an instructor is PHD.

3.3 Data Collection Instrument

Semi-structured questions are more flexible than the structure once. Furthermore it gives the interviewer space to predefine questions during the session. Kvale & Brinkmann (2009) don't agree with this structure, noted that this flexibility can be predesigned for the whole interview session (Kvale & Brinkmann, 2009). Semi-structure questions can give more freedom for both interviewer and interviewee and give interviewee a space to express her/him opinion without limitations. For the aim of this research, researcher develops seven questions and will be collected by face-to-face meeting with interviewees. Interview questions develop in order to answer the research question, evaluate the system and tools needed for future enhancements. The interview data was documented and saved as paper hardcopy.

3.4 Data Analysis

Jorgensen (1989) noted that "Analysis is a breaking up, separating, or disassembling of research materials into pieces, parts, elements, or units. With facts broken down into manageable pieces, the researcher sorts and sifts them, searching for types, classes, sequences, processes, patterns or wholes. The aim of this process is to assemble or reconstruct the data in a meaningful or comprehensible fashion."

To accomplish this study, data was derived from different type of resources whether it is online or offline. Interview method is analyzed using the content analysis method provided by Krippendorff (2004). However the most important points collect it by interview from each interviewee will be noted and discussed.

Chapter 4

SYSTEM DESIGN & DEVELOPMENT

4.1 System Design

In this sub chapter, system designs will be explained. Three different designs implemented which are: function design, database design and interface design

4.1.1 Functional Requirements Diagram

Different users in the system have different requirements and functionality. In this subchapter, function diagram will be designed for both student and teacher.

4.1.1.1 Student

Figure 3 shows the cycle of the student or learner and what is the logical process that student should proceed. The function will expand at same level when more features added.

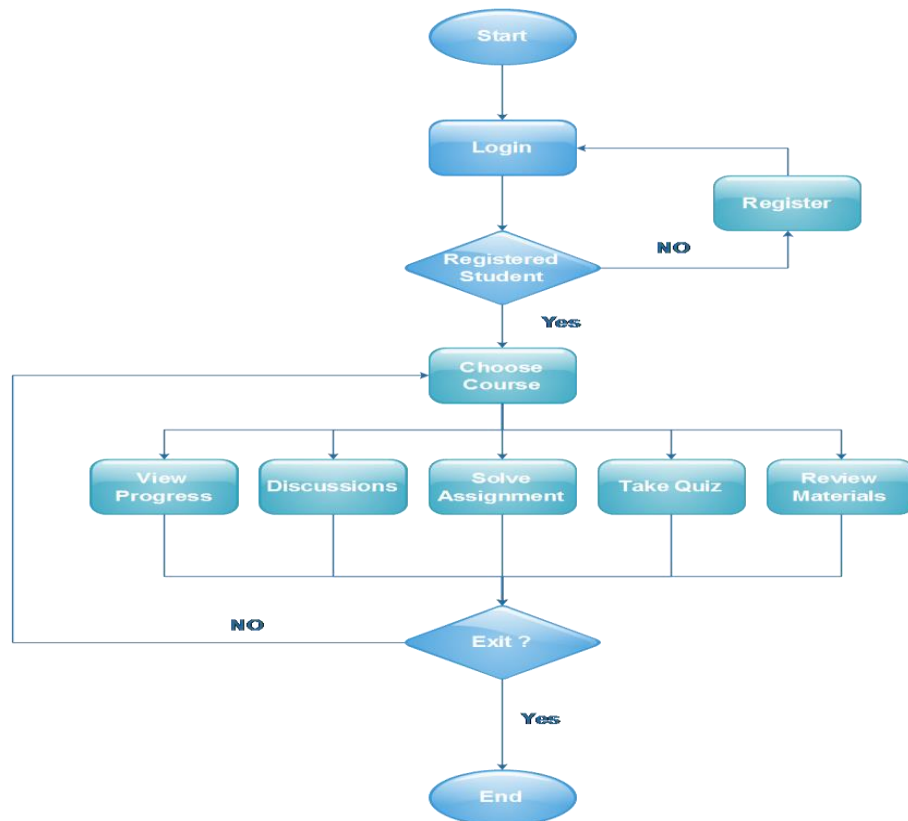


Figure 3: Learner's Process Cycle

Once the student is logged in, student sees the list of all the courses that he/she enrolled without need to register. The system will fetch all the courses registered by student from the registration database and list it to student. Student can choose one of the courses to be directed to the course page. The student will be able to overview the course, read objectives and see all the important details related to course (time, date, teacher...etc.). Also student will be able to change his/her profile picture and some personal details.

Once the student redirected to course page, student will have a lot of options related to the course s/he chooses. Student can view and download lecture notes that uploaded by instructor of this course. Also the student can take quiz or assignment and submit it online. Students will be able to add discussion topic to be discussed with other students and instructor or can join open discussion. More features in

course page made the process long to go through each one of them. When the student chooses logout functionality the system will logout and end the cycle of the session.

4.1.1.2 Teacher

Figure 4 shows the teacher's process cycle for this system and its logical flow of it.

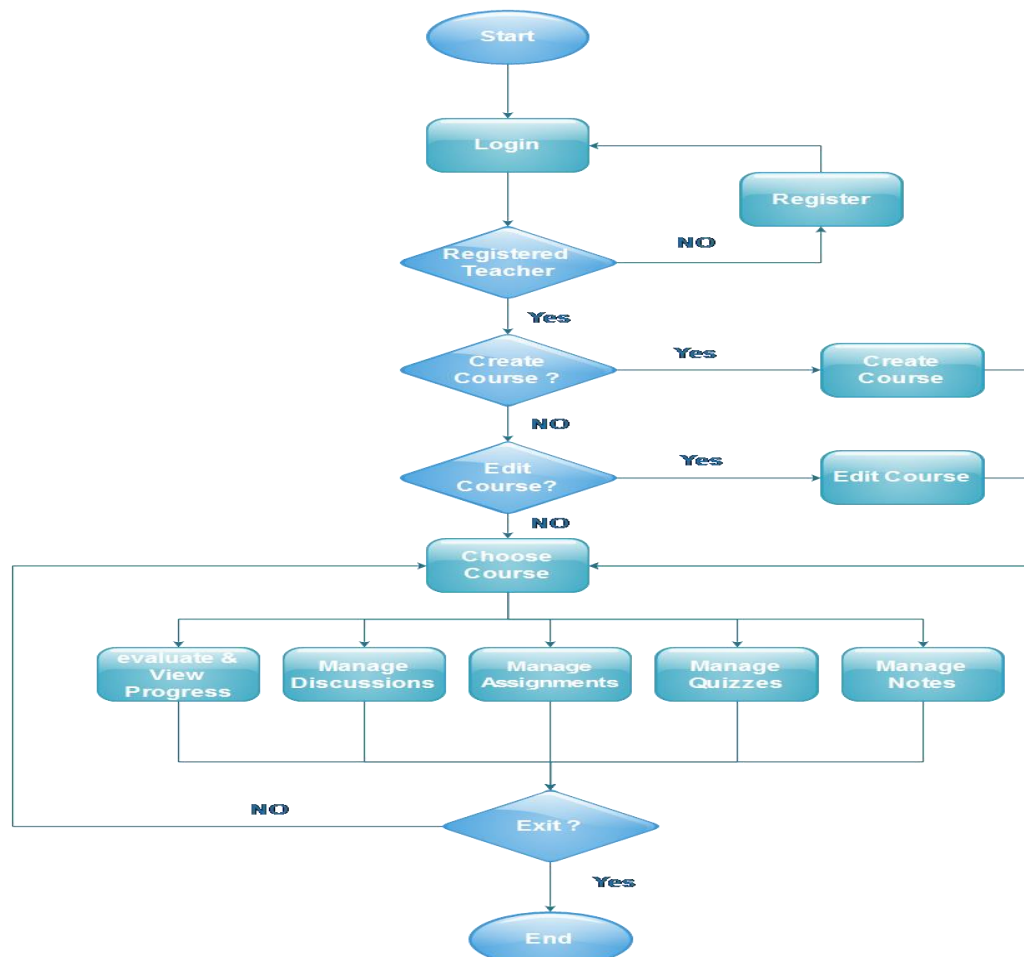


Figure 4: Teacher's Process Cycle

Function diagram for teacher in implemented system will start as student function with login process. The system will prompt teacher for unique username and password that assigned and provided by administrator. The system in this case will not create username and password but it will fetch it from teacher registration table in database, however security mechanism will be implemented. If the teacher is

registered in the database s/he will be able to access the system, otherwise teacher should register into targeted institution.

Once teacher is logged in, teacher will be able to create new course (from the courses belong open for him in specific semester), edit course or choose course to manage its materials. Teacher can simply add course with its objectives and details and after saving the course will be directed again to dashboard. Editing course details is the same process as adding and again when the modification is done the teacher will be directed to dashboard. Choosing course to be directed to course page will allow teacher to deal with chosen course.

Once the teacher chooses the course and redirected to course page, s/he will have the tools and function needed to control the course. Teacher can upload any format of files into materials. S/he has right to add, manage and delete course materials to be delivered to students. Also teacher can create, manage, edit and delete assignment and quizzes as well as activate or deactivate option. Activate/deactivate option makes sure the student will be notified about quiz or assignment when teacher wants.

There are many other options that teacher can do in implemented LMS like discussion and chatting.

4.1.1.3 Administrator

Figure 5 shows the administrator's process cycle for this system and its logical flow of it.

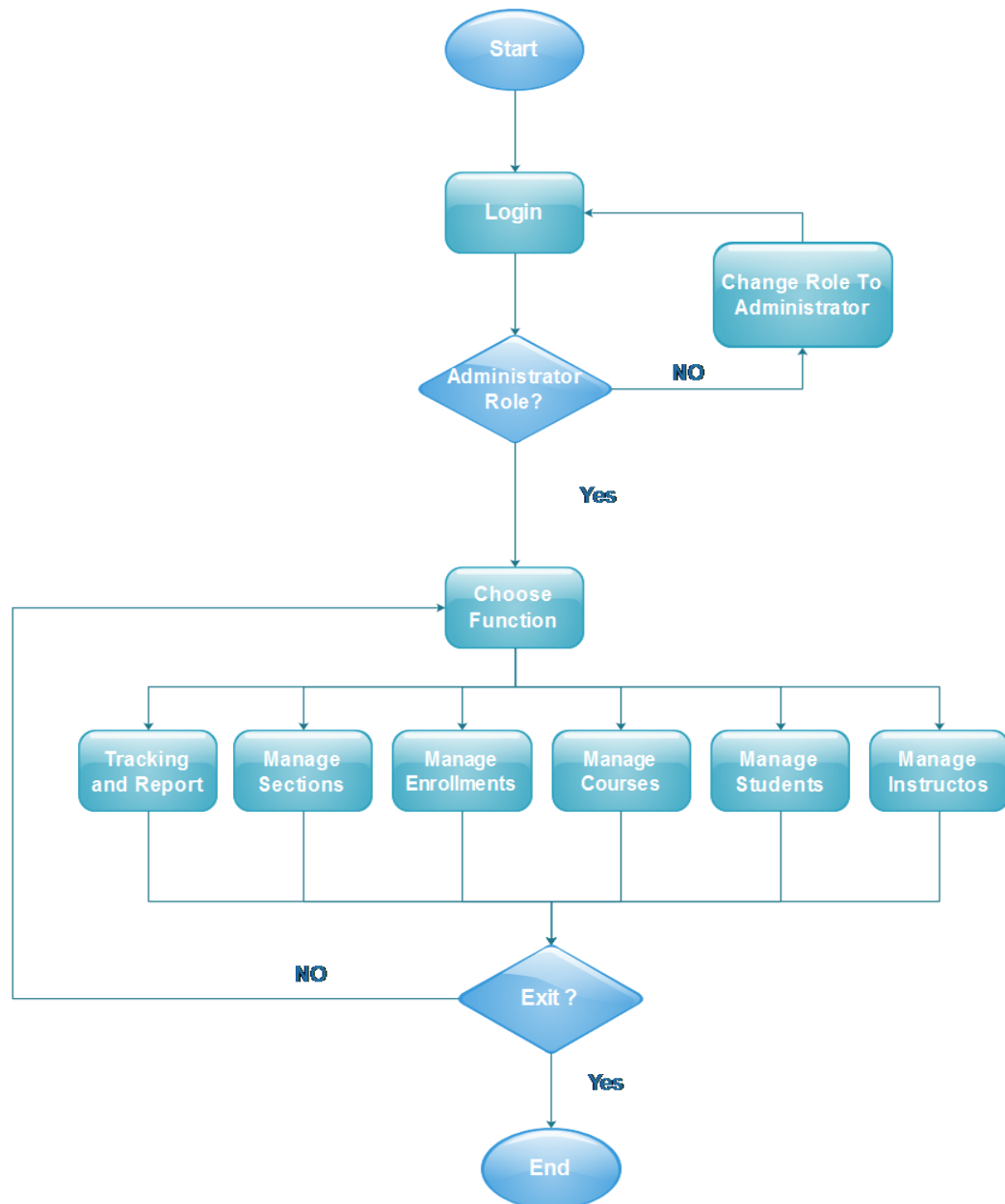


Figure 5: Administrator's Process Cycle

Function diagram for administrator in implemented system will start as other functions with login process. The system will prompt administrator for unique username and password that assigned with administrator role. The system in this case

will not create username and password but it will fetch it from academic table in database, however the role must be administrator role. If the user is assigned as administrator in the database s/he will be able to access the administrator portal.

Once administrator is logged in, administrator will be able to manage students, instructors, courses, enrollments and sections. Administrator will have full control of the system to assign instructors to courses. Administrator can track and report any actor or entity on the system using tracking and reporting functionalities.

There are many other options that administrator can do in implemented system like notification, managing roles of users etc...

4.1.2 Use case Diagram

Figure 6 below shows the main processes in implemented LMS and the main actors dealing with those processes.

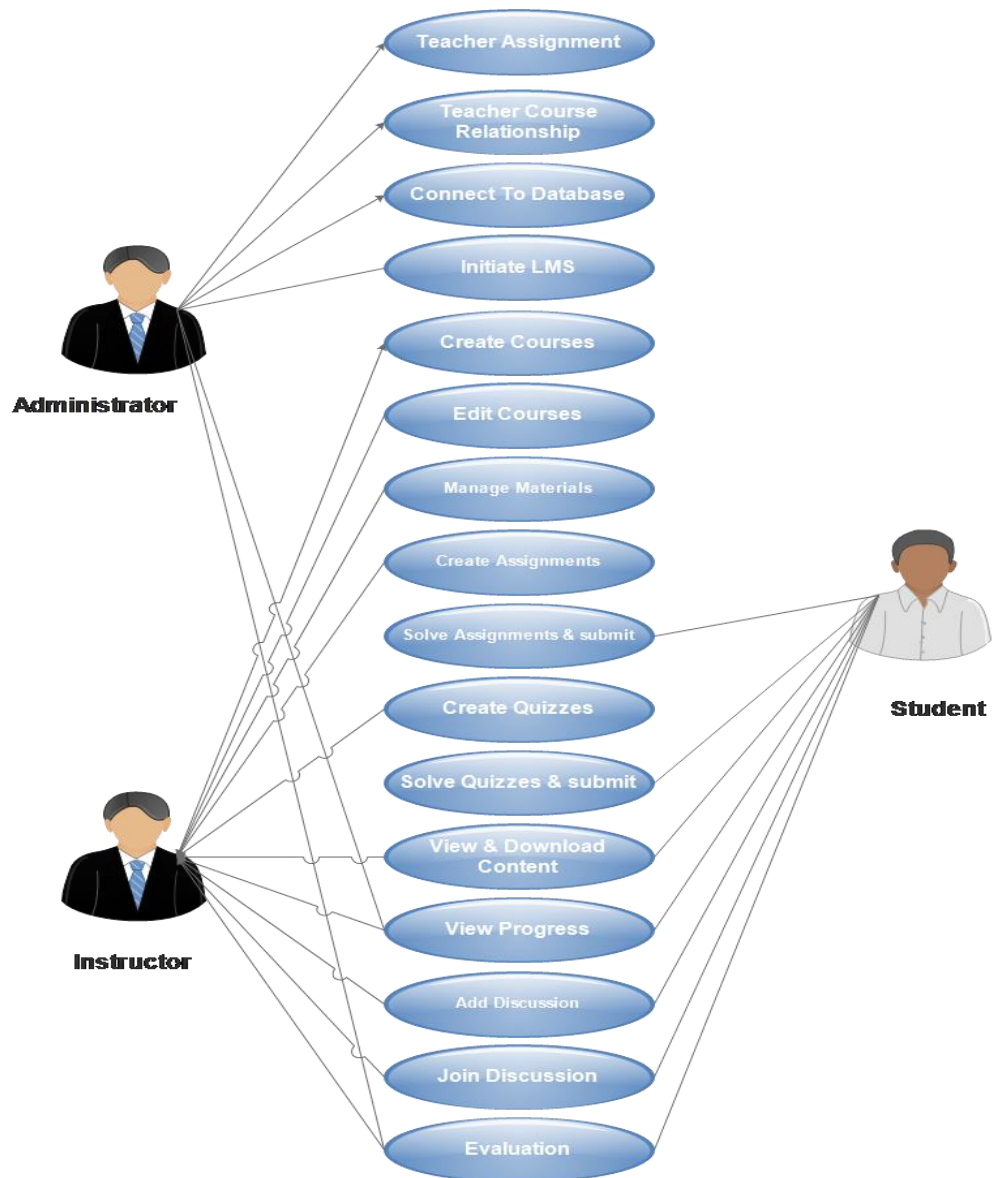


Figure 6: Use Case Diagram

4.1.2.1 Use Case Specification

The administrator in this system will connect the system to database and initiate the system. Initiating the system will be in wizard process. And all other processes used in web application interface. Table 5 shows the use case specification to connect to university database.

Table 5: Connect To Database Specification

Connect To Database	
Brief Description	Before even initiating LMS, it is responsibility of administrator to connect system to registration database.
Actor(s)	Administrator
Preconditions	Database must have the student, staff and section tables
Main Flow	Open wizard Choose the database Click “Make Connection”

Table 6 shows the user case specification of initiating LMS by administrator.

Table 6: Initiate LMS

Initiate LMS	
Brief Description	After connecting to database. Location and time as well as language should be selected before it officially starts.
Actor(s)	Administrator
Preconditions	-
Main Flow	Open wizard Choose Time Zone and language Click “Save”

Table 7 shows the user case specification of creating courses by instructor.

Table 7: Create Courses

Create Courses	
Brief Description	Teacher should create the course details and open the section to be able after that adding resource to the course.
Actor(s)	Instructor
Preconditions	Open section (Course Open for this semester) Teacher assigned to teach this course in main database
Main Flow	Create Course Fill The Form Click “Save”

Table 8 shows the user case specification to Edit created course by instructor.

Table 8: Edit Courses

Edit Courses	
Brief Description	Once the instructor create course, he/she will be able to edit course details if any error occurs.
Actor(s)	Instructor
Preconditions	Course Created
Main Flow	Choose Course Click “Edit Course” Editing Click “Save”

Table 9 shows the user case specification to Manage Course Content or media by instructor.

Table 9: Manage Materials

Manage Materials	
Brief Description	Teacher will be able to upload any type of material whether it is text, graphic, audio or/and video to be viewed by students
Actor(s)	Instructor
Preconditions	Created Course
Main Flow	Choose Course Click “Course Page” Click “Model” Click “Add New Materials” Fill the form / Upload the file then click “Save”

Table 10 shows the user case specification to create course assignment by instructor.

Table 10: Create Assignment

Create Assignment	
Brief Description	Teacher will be able to Create Assignment for assign it to the students. Also he/she has choice to activate or deactivate the assignment.
Actor(s)	Instructor
Preconditions	Created Course

Main Flow	Choose Course Click “Course Page” Click “Assignment” Click “Add New Assignment” Fill the form then click “Save”
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Table 11 shows the user case specification to solve assignment and submit the solution by student.

Table 11: Solve & Submit Assignment

Solve Assignment & submit	
Brief Description	Student will be able to solve the assignment and submit it online without need to upload any file.
Actor(s)	Student
Preconditions	Published Assignment Active Assignment
Main Flow	Choose Course Click “Course Page” Click “Assignment” Click “Submit Solution” - Enter the content then click “Submit”

Table 12 shows the user case specification to view and download course materials. This step can be done by student and instructor.

Table 12: View & Download Content

View & Download Content	
Brief Description	User can view and download resources related to the course
Actor(s)	Instructor, Student
Preconditions	Uploaded Content
Main Flow	Choose Course Click “Course Page” Click “Materials” Click “View” To View Online Click “Download” To Download The File

Table 13 shows the user case specification to create quizzes by instructor.

Table 13: Create Quizzes

Create Quizzes	
Brief Description	Teacher will be able to Create Quiz for assign it to the students. Also he/she has choice to activate or deactivate the Quiz.
Actor(s)	Instructor
Preconditions	Created Course
Main Flow	Click “Course Page” Click “Quizzes” Click “Add New Quiz” Fill the form then click “Save”

Table 14 shows the user case specification to solve quiz and submit solution by student.

Table 14: Solve & Submit Quizzes

Solve & Submit Quizzes	
Brief Description	Students will be able to solve the Quiz and submit it online, after submission the grade will be generated.
Actor(s)	Student
Preconditions	Active Quiz Published Quiz
Main Flow	Click “Course Page” Click “Quizzes” Click “Take Quiz” Solve Quiz then click “Submit”

Table 15 shows the user case specification to view student progress during the course. This can be done by all actors in the system.

Table 15: View Student's Progress

View Student Progress	
Brief Description	Students’ progress can be viewed easily in implemented LMS. It will provide grade, logs and events.
Actor(s)	Student, Instructor, Administrator
Preconditions	Created Course

Main Flow	Click “Course Page” Click “Students” Click “View Progress”
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Table 16 shows the user case specification to add discussion topic which can be done by both instructor and student.

Table 16: Add Discussion Topic

Add Discussion Topic	
Brief Description	User can add a topic to be discussed among the class’s participants as part of online collaborative learning.
Actor(s)	Instructor, Student
Preconditions	Created Course
Main Flow	Choose Course Click “Course Page” Click “Discussions” Click “Add Topic” Fill the form then click “Discuss”

Table 17 shows the user case specification to join and replay a discussion which can be done by student and instructor.

Table 17: Join Discussions

Join Discussions	
Brief Description	User Can Comment and replay any discussion to share knowledge and experience.
Actor(s)	Instructor, Student
Preconditions	Topic Created
Main Flow	Choose Course Click “Course Page” Click “Discussions” Add you replay then click “Replay”

Table 18 shows the user case specification to evaluate the course, system, semester and instructor. Student will evaluate all the aspects mentioned while administrator and instructor will evaluate the system.

Table 18: Evaluation

Evaluation	
Brief Description	Participant in specific course will be able to evaluate the course and the system at the end of the semester.
Actor(s)	Instructor , Administrator, Student
Preconditions	End of the semester
Main Flow	Automatically prompt to user after finishing the section Fill the Survey then click “Submit”

4.1.3 Database diagram

The Design of the data base will be as shown in Figure 7. There will be 14 entities as mentioned: Courses, Section, Course Materials, Enrollment, Student, Staff, Quizzes, Questions, Options, Quiz Response, Assignment, Assignment Response, Discussion, and Discussion Replay. Each of these entities has their own attributes as below.

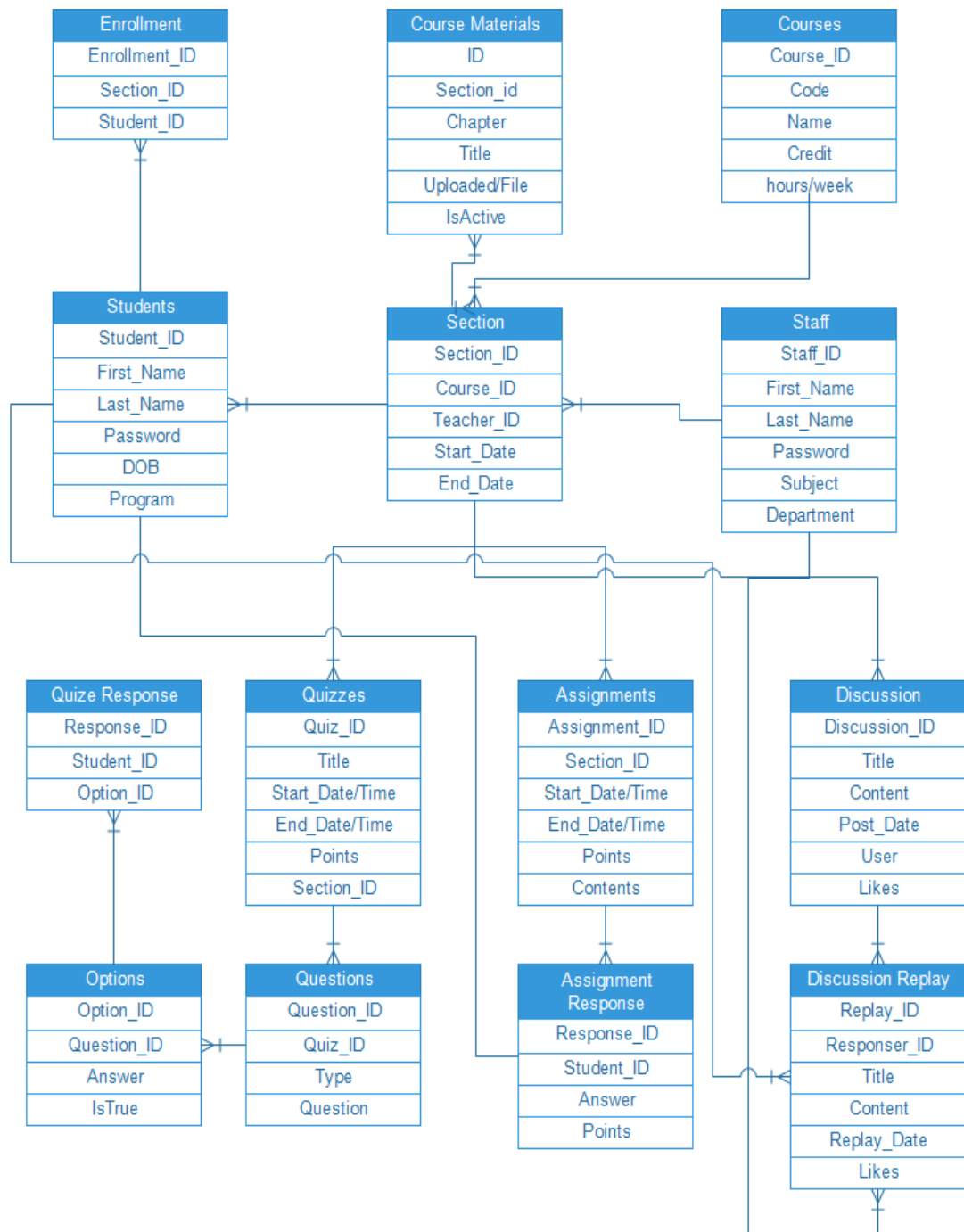


Figure 7: Database Diagram

This database has two entities for system's users. The first entity is staff entity which holds all the data about the instructors and administrators. The second entity is the student entity which holds all the information about students, most important columns in user tables is the user id and password. Other information is not really

important in LMS. Courses entity is provided by the system with the courses available in institute to open sections.

The section entity is the center and the heart of this database. Section has primary key “Section_ID” which will be the main key in this database. Section table created when course open for enrollment, it has two foreign keys “Teacher_ID” and “Course_ID”. Course Materials entity has all the lecture notes and media uploaded by lecturer. To handle assignment, assignment entity for this purpose was created. Teachers will save the assignments in assignment table to be published for students. Students solve and submit the answers of the assignment by submitting the solution to be saved in assignment response entity.

Just like assignment, quizzes entity is used to create quizzes by teacher. Question entity is used to add question to quizzes and finally options entity created to save the options available for each question. Students can take quiz when it published by teacher. The quiz responses from students will be saved in quiz response entity.

Discussion entity holds all the discussions created by students or/and teacher. Also student and/or teacher can replay any discussion and the replay will be saved in discussion replay entity.

4.1.4 Interface Design

Easy to use and user friendly feature powers this LMS which almost not there in other LMSs (Figure 8). Most powerful learning management system provides high functionality with high complexity.

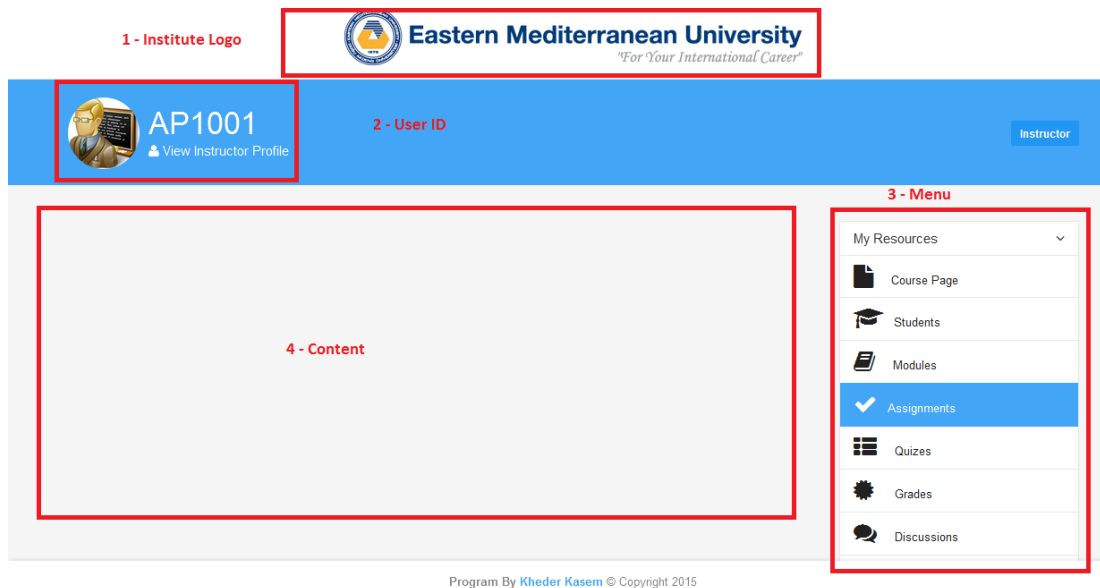


Figure 8: User Interface Design

In Figure 8 above, design made it easy for user to figure out what is going on. This design gives two sections at the header without any functionality which made the system look and function as friendly design. No submenu was implemented to reduce the complexity of the system, instead clear and user friendly menu was presented. Implemented interface powers ease to use in main content as well by reducing functionality in each page. Each content page can have not more than four functions. Finally the layout implemented in the way that helps user to deal with the system using any type of application by applying responsive feature to the design.

4.2 System Development

This study provides framework to develop learning management system. This framework will help any developer committees to have a right track in developing LMS using any software and programming language. Research explains in details the reason for choosing specific development tools. The structure of development is represented in three different stages. The first stage is interface development, second stage is database development and the last stage is coding.

4.2.1 Interface Development

Starting the development with interface gives advantage in controlling the code and knowing what exactly the functions needed to be developed. For example if submit button designed and located in specific place, it easily can be coded later on because the function is obvious. Students' and teachers' interaction and how they think while using web-application need to be understood clearly before design. Students' and teachers' habit in an online environment not different from normal users' habits. Users try to find them interest subject with in the page and they click on the first link that meet or related to them subject. Most of the users they don't even look at the rest of the page. According to Friedman (2008) users don't read the content of the page, instead they scan and analyze the content. Nielsen (1999) noted that web-application should meet user's expectation otherwise application fails and if the user can't get the knowledge with easy navigation he/she will leave the site. Most of online users follow them intuition to build knowledge and experience in online environment. Krug (2014) explain that the users don't read what is in the page but they search for what they need "If we find something that works, we stick on it. It doesn't matter to us if we understand how things work, as long as we can use them. If your audience is going to act like you're designing billboard, then design great billboards."

To design and develop useable web application, Krug (2014) comes out with Krug 3 laws of usability. The 3 laws are "1. Don't make me think. 2. It doesn't matter how many times I have to click, as long as each click is a mindless, unambiguous choice. 3. Get rid of half the words on each page, and then get rid of half of what is left"

According to Friedman (2008), users are more comfortable and attracted to work with modern design with large buttons, images, visual effects etc... The modern web

application with “keep it simple” principle can make great user friendly design. When user at the end of the day is looking for specific information or function in web application, then user interface should help them to find it.

Hyper-text markup language 5(HTML5), cascading style sheet 3(CSS3) and JavaScript (JS) will be used to design and develop the interface. HTML5 and CSS3 codes are easy to read and very simple to write and understand. With using HTML5 with CSS3, the user doesn't need any plug-ins to be installed in order to view the content. Compatibility is one of the most important subjects in web development, HTML5 and CSS help in developing a web page combatable with all browsers' version. Handling media in HTML5 and CSS3 are so efficient providing many choices for developer. Using CSS libraries that available online give an advantage of saving time in writing hundreds of lines of codes. For this purpose Bootstrap Library to develop modern web application is used.

4.2.2 Database Development

Usually database management system chosen depending on the programming language used. However developer can use any database needed to implement the system. Microsoft SQL server 2014(MsSQL 2014) was chosen. Many reasons motivate to use this Database Management system (DBMS). The most important reason is using ASP.Net MVC as programming language. MsSQL works well with Asp.Net with high performance. In MsSQL 2014 there are noticeable improvement on security, backup and performance. United Airlines is one of the most famous users of MsSQL 2014. Eric Craig (Managing Director of Enterprise Architecture at United Airlines) says “We have the most comprehensive network on earth, but that's not enough. We have to earn our customers' business on each and every flight with the great on-time performance, excellent customer service, and innovative features

our customers want...” (Microsoft, 2014). In term of security, MsSQL 2014 allows developer to create security policy and automatically can be applied to all databases.

Performance is important term to make the system success. In MsSQL 2014 unlike other DBMS, developer can modify and update the table instead recreating it. MsSQL 2014 has integrated database engine in-memory data processing in order to do transaction faster.

As framework database develops for LMS, system has static tables which are staff, student, course, enrollment and sections. This tables always exist in any LMS then adding the table needed according to function. For example, if there is requirement to add discussion function, in this case table will be created and connected to involved tables for data. In discussion students, staff will join so the link will be made to students, staff and section (foreign key to link the targeted section). Any function needs table to save data and all of tables created in the same rules (see figure 6).

4.2.3 Coding

Coding is the main stage of development. Choosing the right programming language to develop the system can increase performance and save time. Developer should be comfortable with the programming language he/she choose. In this system ASP.Net MVC with C# was chosen because it is to develop framework based on MVC concept. MVC is one model of ASP.Net programming. It is using (Model View Controller) each one of them responsible of part of the application (Figure 9).

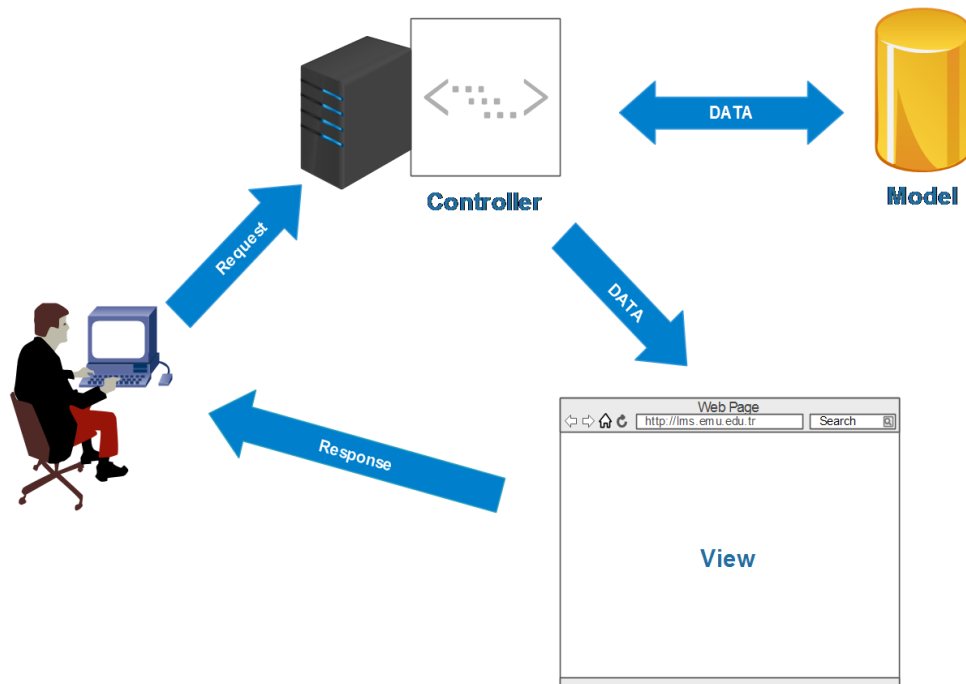


Figure 9: MVC Model

Using MVC model, developer brings database and records to be presented in Model which represents the core of the application. The View part displays the data received from controller (database record). Controller usually handles user interaction and input. Controller has two way connections to the model (read and write). Controller main function is to receive request from user direct it to model then send response to view. MVC model separation helps development group to manage any application with one aspect at the time. Also development group can separate the task without need to interfere each other works. For example, one member can work on view (design) another can work on model (data source) and another work on coding.

Set of stages supposed to be followed as framework to develop LMS using MVC model. First we import the design inside View folder, second we import and connect

the database to system and store it in Model folder. In this stage the developer is ready to work with controller.

The actual coding will be inside the controller. Either VB or C# as programming language should be used to develop the system. In either language, the system has two different functions that can be implemented for each View. One is to read from model (database) and other to post to it.

Chapter 5

FINDINGS

5.1 System Manual

For the purpose of this assignment, short manual for instructor will be described briefly. In the Figure 10 below the main interface for the system presented. User has two choices, one is student portal and the other is instructor portal. For this manual, we assume that user is instructor so instructor portal will be clicked.

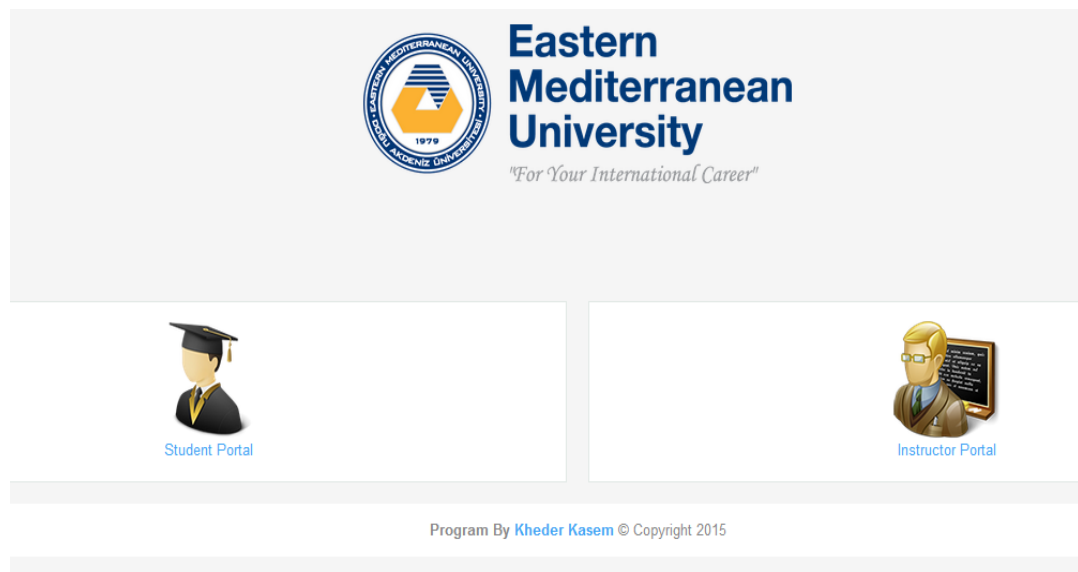


Figure 10: System Main Interface

The user will be directed to log in page then the system prompt instructor for his/her credentials (username and password) see Figure 11.

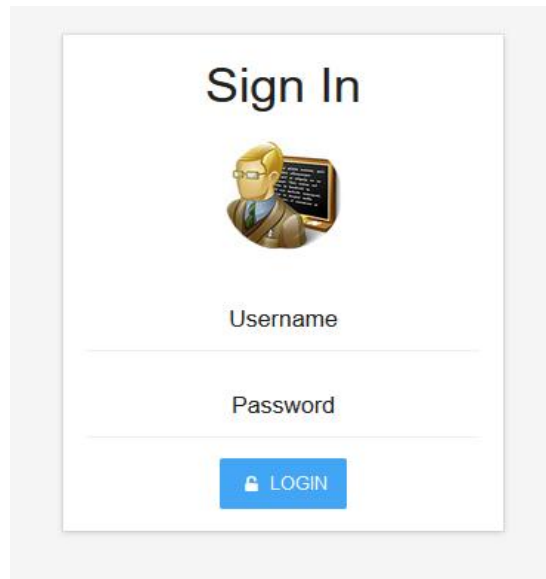


Figure 11: Sign-In Page

After entering correct credentials, instructor will be directed to main page in portal called “Dashboard”. Instructor has many choices in this page implemented simply. In the main page all current semester courses that belong to instructor will be listed. To view all pervious courses, instructor should click on “VIEW ALL” or “My Courses” in the menu (Figure 12).

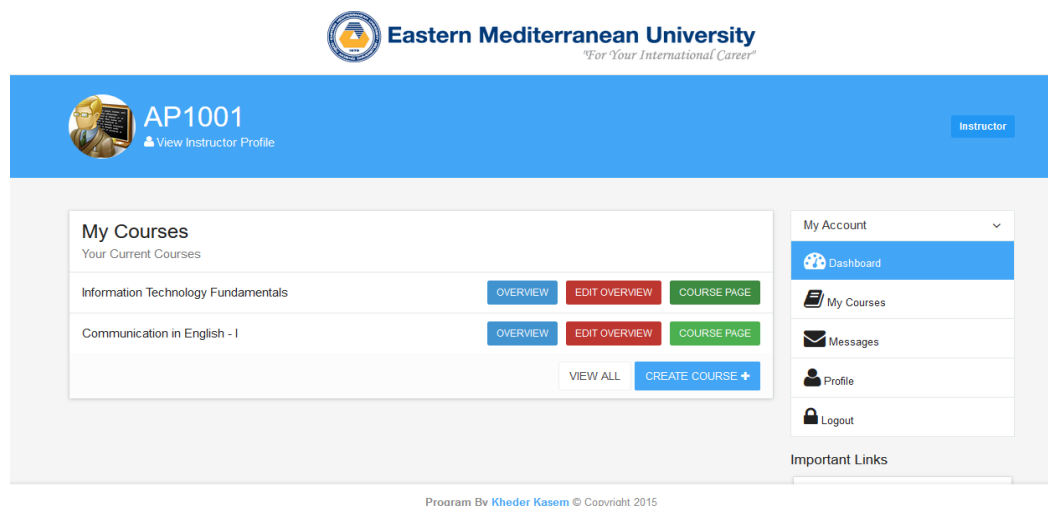


Figure 12: Instructor Dashboard

By clicking on “COURSE PAGE” the system will direct the instructor to all the resources related to chosen course. The first page will appear is “Course Overview” which shows the description of the course, class date, class time, instructor biography, objectives...etc. see Figure 13 and Figure 14.



Eastern Mediterranean University
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AP1001
View Instructor Profile

Information Technology Fundamentals / 2014-2015 FALL

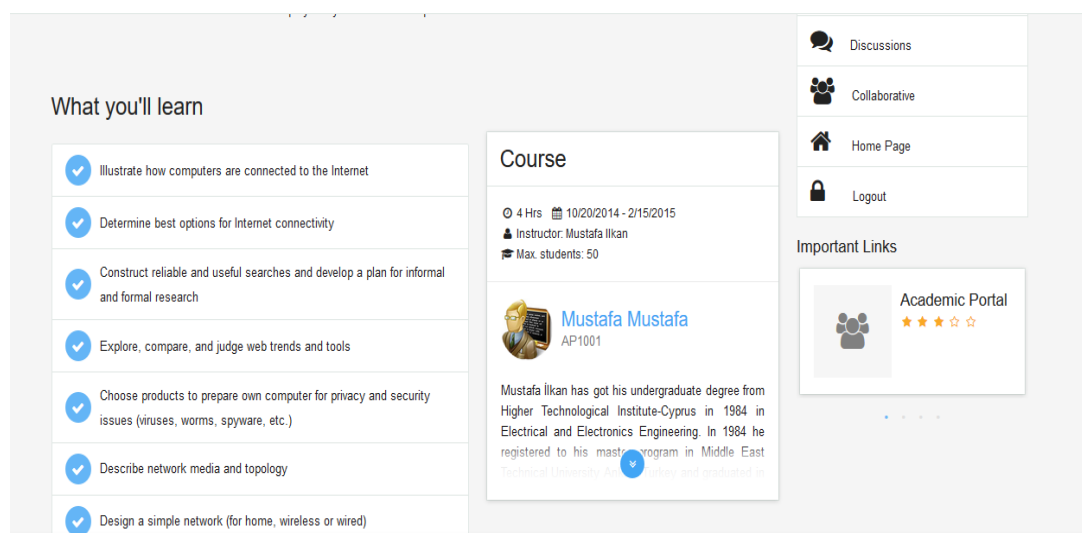
2013 Eastern Mediterranean University Promotional ...

Information Technology (IT) Fundamentals introduces the essential technical and professional skills required for students to pursue programs leading to professional careers and IT certifications. Students investigate career opportunities and technologies in four major IT areas: Information Services and Support, Network Systems, Programming and Software Development, and Interactive Media. Students will evaluate the impact of IT on other career clusters. The focus of the IT Fundamentals course is the introduction of skills related to information technology basics, Internet fundamentals, network systems, computer maintenance/upgrading/troubleshooting, computer applications, programming, graphics, Web page design, and interactive media. Students explore ethical issues related to computers and Internet technology and develop teamwork and communication skills that will enhance their employability. Recommended p

My Resources

- Course Page
- Students
- Modules
- Assignments
- Quizzes
- Grades

Figure 13: Course Page



What you'll learn

- Illustrate how computers are connected to the Internet
- Determine best options for Internet connectivity
- Construct reliable and useful searches and develop a plan for informal and formal research
- Explore, compare, and judge web trends and tools
- Choose products to prepare own computer for privacy and security issues (viruses, worms, spyware, etc.)
- Describe network media and topology
- Design a simple network (for home, wireless or wired)

Course

4 Hrs 10/20/2014 - 2/15/2015
Instructor: Mustafa Ilkan
Max students: 50

Mustafa Mustafa
AP1001

Mustafa Ilkan has got his undergraduate degree from Higher Technological Institute-Cyprus in 1984 in Electrical and Electronics Engineering. In 1984 he registered to his master program in Middle East Technical University Ankara Turkey and graduated in

Discussions

Collaborative

Home Page

Logout

Important Links

Academic Portal

Program By Kheder Kasem © Copyright 2015

Figure 14: Course Page Cont.

In course page menu there are many option related to the course. Most important menu item will be describe briefly starting from “students” item which allow

instructor to view the list of enrolled student in the course with important details like name,id,email and department. Also instructor can view the student’s grades and performance related to the course (Figure 15).

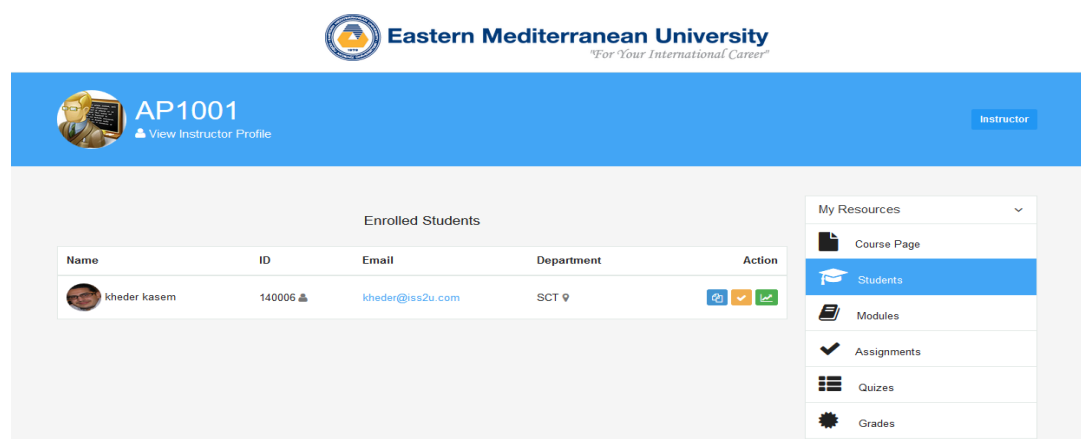


Figure 15: Students Page

Menu item “Modules” allows instructor to view courses materials as well as adding new material. For adding new material, instructor should click on “ADD COURSE MATERIALS” button to be redirected to another page to add materials (Figure 16).



Figure 16: Modules Page

After clicking on “ADD COURSE MATERIALS” button, instructor will be prompt to add the title of the material, chapter number (optional) and file document. Any

type of media can be added (audio, video, word document, excel document...etc.) (Figure 17).

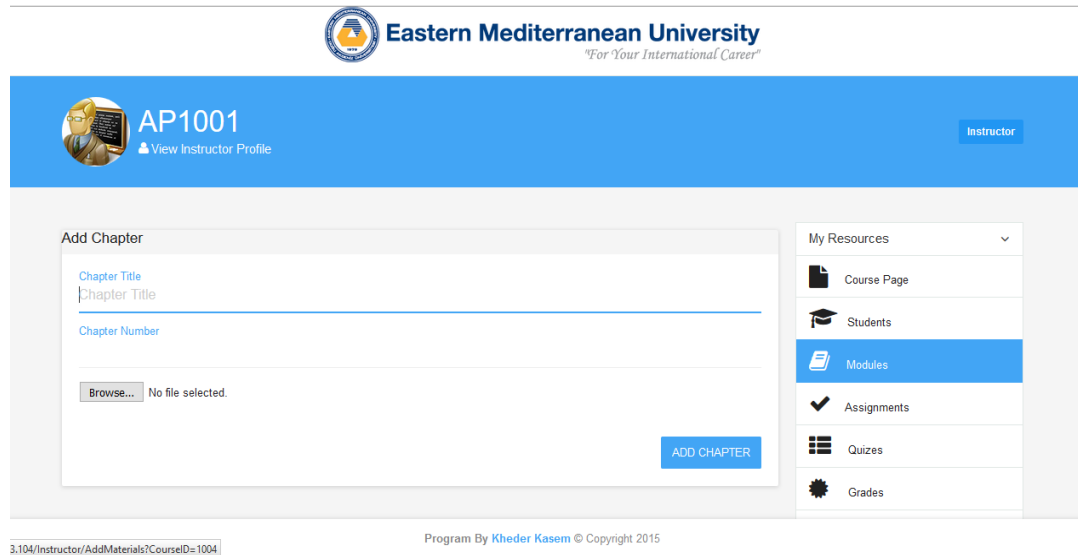


Figure 17: Add Modules Page

After clicking “ADD CHAPTER” button, the material will be shown in “Modules” page. The instructor has the option to view, edit and delete module (Figure 18).

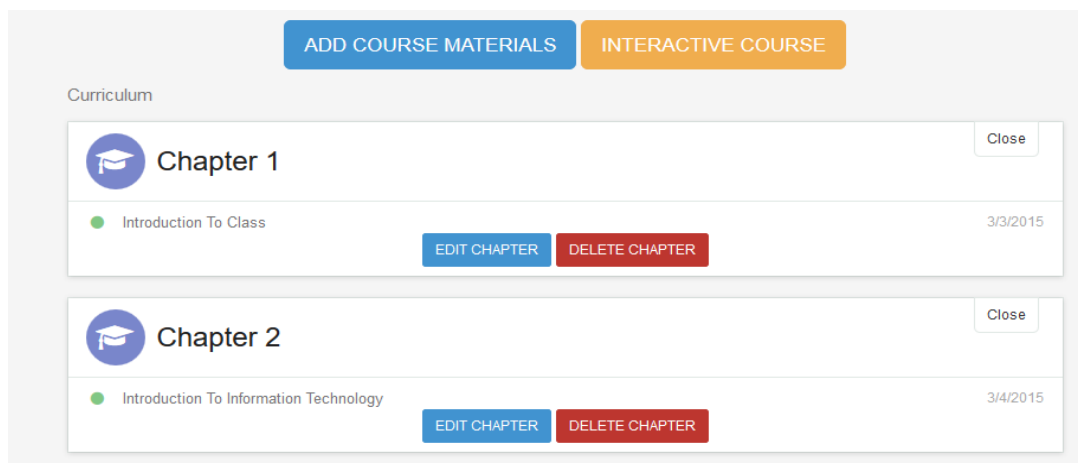


Figure 18: Modules Page - Material View

Moving on to “Assignments” menu item which allows instructor to add assignment and distributed to all students. Figure 19 shows the main view of “Assignments”

page. Instructor can add new assignment by clicking “ADD NEW ASSIGNMENT” button.

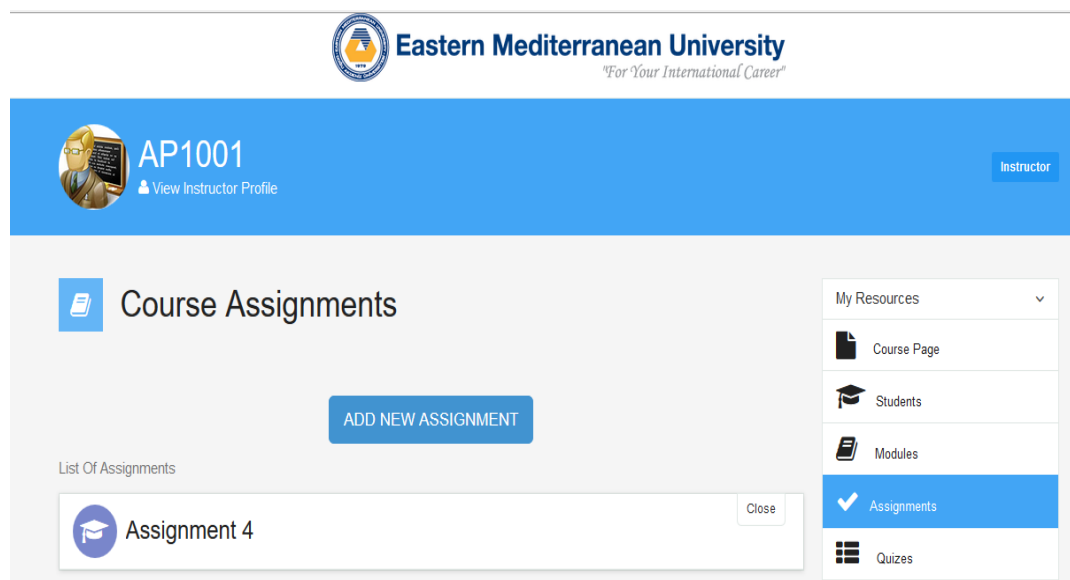


Figure 19: Assignments Page

When instructor click on “ADD NEW ASSIGNMENT” button, system will prompt instructor to insert assignment details and properties to be added (Figure 20).

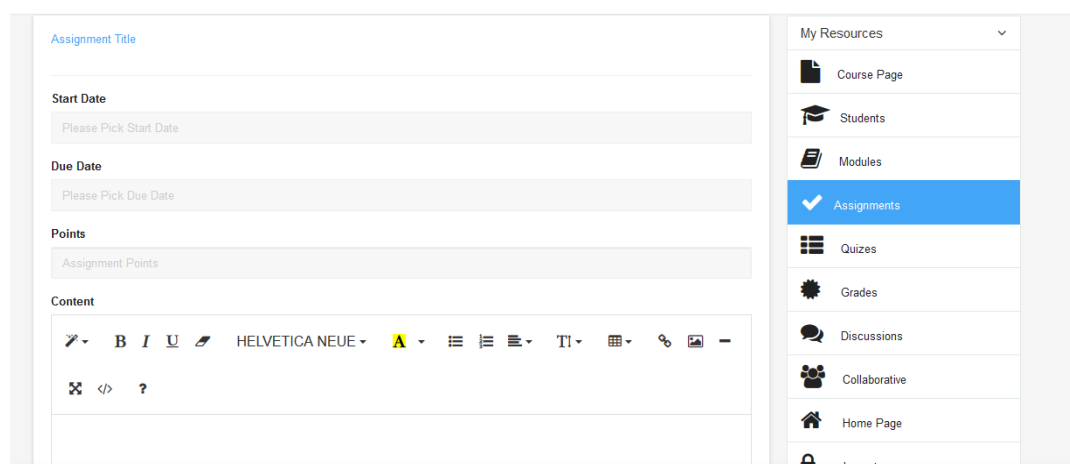


Figure 20: Add Assignment Page

After adding the assignment, assignment will be listed in “Assignments” page. With four different options which are edit assignment, delete assignment, grade

assignment and Active/Deactive. Instructor can change the status of the assignment by clicking on active if the assignment status is deactive so assignment will be distributed among student.



Figure 21: Assignment Page - Assignment View

Moving to the “Quizzes” menu item, instructor can add quiz by clicking on “ADD NEW QUIZ” button (Figure 22).

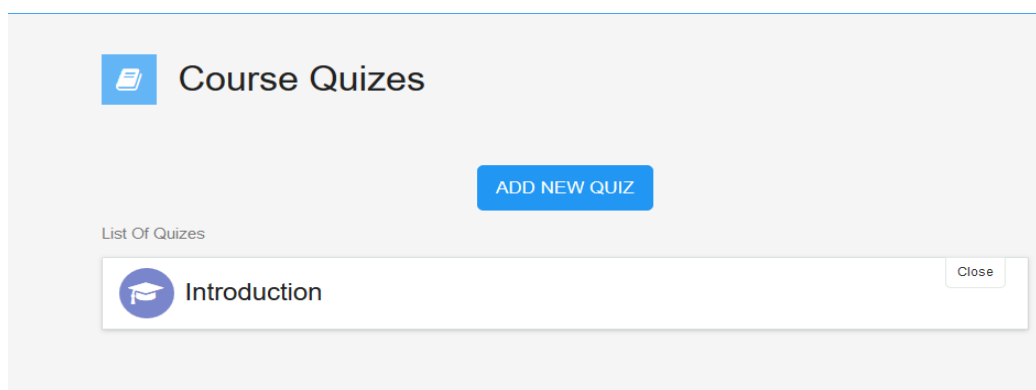


Figure 22: Quizzes Page

After clicking on “ADD NEW QUIZ” button, system will prompt instructor to add quiz properties like title, chapter, start date, due date and points then click on “ADD QUIZ” button (Figure 23).

A form for adding a new quiz. It contains five input fields: 'Quiz Title', 'Chapter Number', 'Start Date' (with a placeholder 'Please Pick Start Date'), 'Due Date' (with a placeholder 'Please Pick Due Date'), and 'Points' (with a placeholder 'Quiz Points'). A blue 'ADD QUIZ' button is located at the bottom right of the form.

Quiz Title

Chapter Number

Start Date

Please Pick Start Date

Due Date

Please Pick Due Date

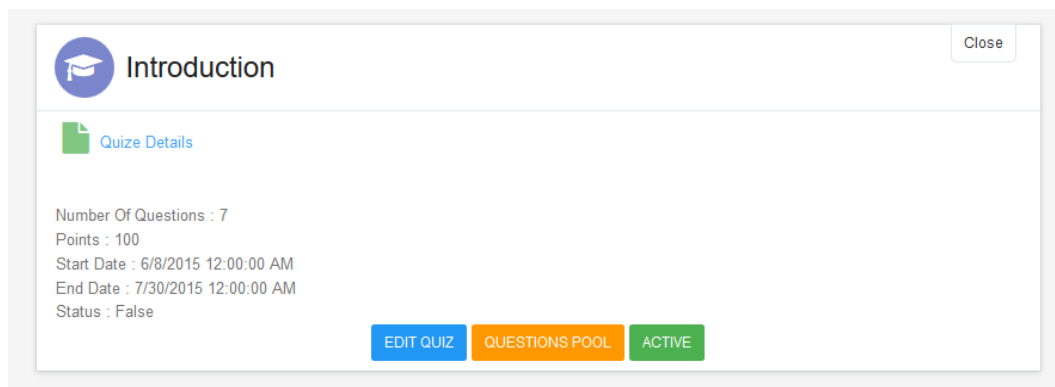
Points

Quiz Points

ADD QUIZ

Figure 23: Add Quiz Page

After adding quiz properties, the quiz will be shown in “Quizzes” page. Instructor can active the quiz to be distributed to all the students by clicking “Active” button. Instructor should add question to the quiz by clicking on “QUESTIONS POOL” button (Figure 24).

A screenshot of the 'Quiz View' page. At the top, there is a header with a graduation cap icon and the word 'Introduction'. A 'Close' button is in the top right corner. Below the header, there is a 'Quiz Details' section with a green document icon. The details listed are: 'Number Of Questions : 7', 'Points : 100', 'Start Date : 6/8/2015 12:00:00 AM', 'End Date : 7/30/2015 12:00:00 AM', and 'Status : False'. At the bottom, there are three buttons: 'EDIT QUIZ' (blue), 'QUESTIONS POOL' (orange), and 'ACTIVE' (green).

Introduction

Close

Quiz Details

Number Of Questions : 7
Points : 100
Start Date : 6/8/2015 12:00:00 AM
End Date : 7/30/2015 12:00:00 AM
Status : False

EDIT QUIZ QUESTIONS POOL ACTIVE

Figure 24: Quizzes Page - Quiz View

After clicking on “QUESTIONS POOL” button, the questions added to the quiz will be listed. To add question to question pool, instructor should click on “ADD NEW QUESTION” button (Figure 25).

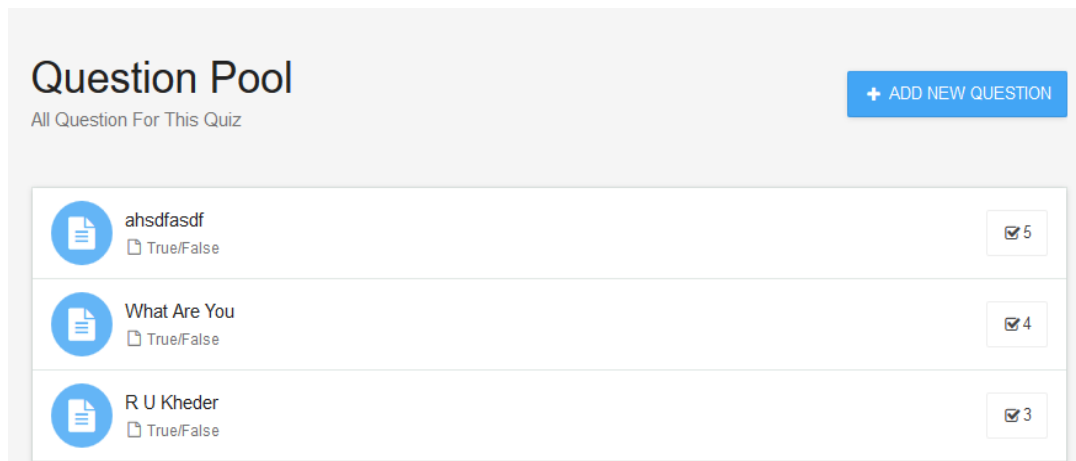


Figure 25: Question Pool Page

After clicking on “ADD NEW QUESTION” button, instructor will prompt to add the question. The question type that can be added in this LMS are true/false and multiple choice questions (Figure 26).

The screenshot shows the 'Add Question' form. It includes a 'Question Type' dropdown menu with options 'True/False' and 'Multiple Choice'. Below this is a 'Question' text field. Under the 'Options' section, there are two checkboxes, each followed by a text input field and a 'Remove' link. At the bottom left is a link 'Add Another Option', and at the bottom right is a blue 'ADD QUESTION' button.

Figure 26: Add Question Page

Discussion is on collaborative learning tool added to this LMS. Both instructor and students can add topic to discuss it with other participants in the class. Instructor can add discussion topic by clicking on “ADD TOPIC” button (Figure 27).

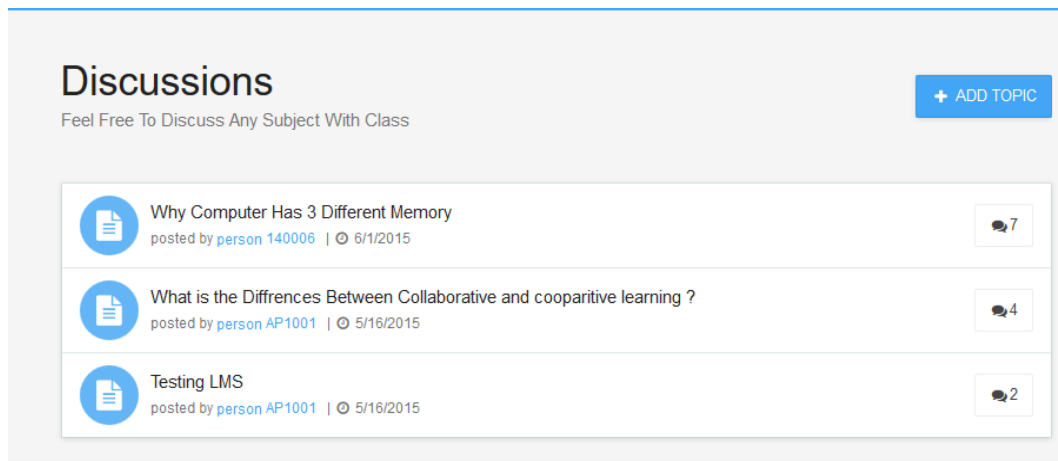


Figure 27: Discussions Page

After clicking on “ADD TOPIC” button, instructor prompt to add the title and content to the topic to be published.

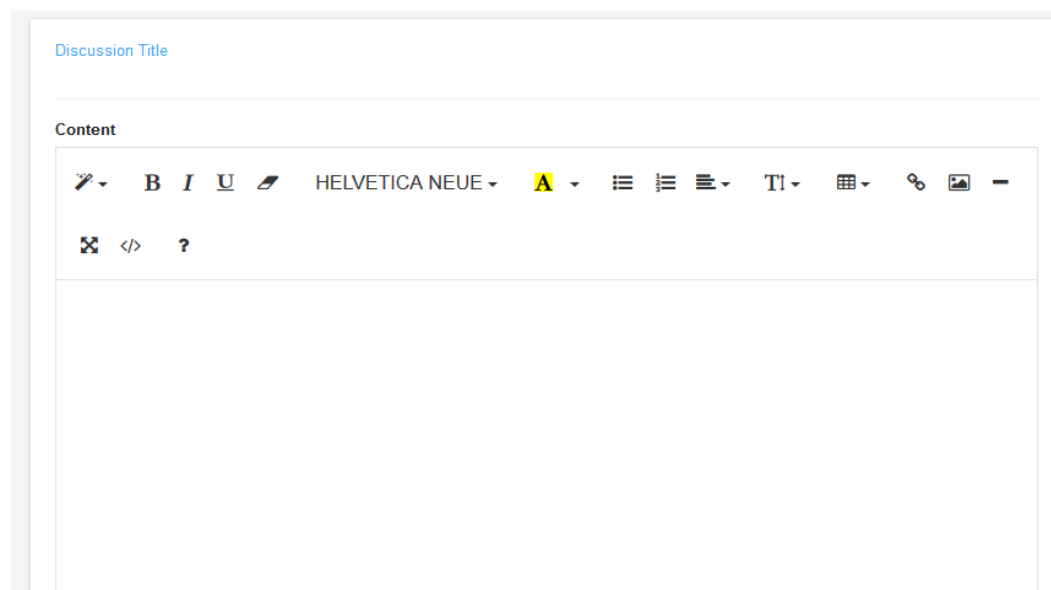


Figure 28: Add Discussion Topic Page

5.2 Instructor’s Opinions about New System

The author interviews 10 academic instructors from school of computing and technology working in eastern Mediterranean university to evaluate the new system and note down the instructors opinion for new system. This interview helps to

answer research question. Main system used in school of computing and technology is PHP manual content management system. The most important points will be noted and list it under each question.

5.2.1 Instructors' Opinion about Current System

According to the interviewees answers, most of instructors describe the current system, not functional, not user-friendly, inefficient and definitely not suitable for big institutions agreeing with Alias & Zainuddin (2005) that the system should support an instructor to organize and manage online learning in the most easy and user friendly way. According to interviewee (1) most of instructors in this university using free web template and upload it by FTP but depending to department or even personal taste of instructor the LMS program can be different. None of the instructors found current system professional and in the level of international university like EMU. Also for student current system is not easy to understand and track, especially because not all of instructors use the same way.

As Interviewee (5) said:

“I use Moodle package which is an easily affordable package. Preparing and uploading materials is bit a challenge but I usually ask one of department assistant or students who's good in this things to organize the materials and send the link to all students”.

Interviewee (3) said:

“we are using content management system through FTP. Still we can deliver the materials, grades, assignments ... but this way is not efficient and user friendly at all. Our system has a lot of weaknesses and need a lot of effort and experience to deal with”.

5.2.2 Instructors' Opinion about Centralized System

According to all instructors having a centralized LMS is better and more efficient and easy way for both instructors and students to deal with. Moreover the training,

performance, and development content are offered at all times from the same source. Because of that multiple users can access the information from anywhere and anytime they want. A 2007 report showed that over 90% of all responding American universities and colleges have established one or more LMS type products for student and faculty use to centralize and customize LMS (Hawkins & Rudy, 2008). Interviewee (8) and (4) also note that, these systems ensure consistency in the evaluation and delivery of the material, meaning every user sees the same content through the same manner. These systems let the user design customized training modules that can be used to introduce new equipment, update equipment, or modify operating procedures.

5.2.3 Instructors' Opinion about New System Design

After instructors get familiar with proposed system, almost all instructors agreed that this system is easier with clear functionality design, professional and efficient which can meet user expectation to be success. The instructors agreed with Nielsen (1999) that web-application should meet user's expectation otherwise application fails and if the user can't get the knowledge with easy navigation he/she will leave the site. As instructor (7) said:

“I truly see a big future in this system. It is fast, it is easy to learn and it is implement everything that students and instructors might need in one centralized system. With a bit more work this system can be use globally”.

Instructors (5) said:

“I find this system much better than what we are using now, with this system all the instructors and students will be forced to use one centralized program for their courses. It is really user friendly, easy to understand and if it can handle the heavy traffic, it will be great subtitle for Moodle”.

5.2.4 Instructors' Opinion about New System Interface Design

All of the instructors were totally agree with the fact that proposed system is much more user-friendly and at the same time professional. In their opinions proposed

system was easy to manage, update, navigate, troubleshoot and it does not need and it does not have to install any third party software agreeing with Krug (2014) when he stated that when user find something that works, they stick on it. It doesn't matter to us if we understand how things work, as long as we can use them and the interface design help with that.

According to interviewee (10)

"I always let the secretary or my assistant deal with online materials. It is difficult for me to learn how to upload the link and materials to Moodle but this system is really easy to follow. By few clicks you can have a new course, exam and assignment page. I really find it efficient".

Instructor (2) said:

"It's nice; I don't have any background in LMS system. I never had used Moodle or webpages. I prefer old ways, books and papers, but this system is easy to learn. I think with a little practice I can start to manage my courses online".

5.2.5 Instructors' Opinion about New System's Usability and Ease to Use

Majority of instructors strongly agreed with the fact that new system can be much easier and more efficient to use. The old system made instructors forced to learn html coding or let one of their students make the page for them. Proposed system from other hand does not need any background in coding and web design. Instructors can easily have their own course page with few clicks. Instructors find the Krug three laws of usability are applying which are 1. Don't make me think. 2. It doesn't matter how many times I have to click, as long as each click is a mindless, unambiguous choice. 3. Get rid of half the words on each page, and then get rid of half of what is left.

According to interviewee (3)

“I find it so much easier than dealing with website templates and ftp server. In this system I can go to my account and make as much course materials and exam that I want. It is really easy”.

5.2.6 Instructors’ Opinion about New System Advantages

According to the instructors the biggest advantage of new system is the fact that it is centralized. All instructors, for all the courses have the same system, same way. Moreover this system is much more professional. When asked to select the benefits of LMS All the instructors focused on the "saves time" more often than "improves learning" features which match the results conducted by Hanson and Robson (2004) and disagreeing with the finding of Holm, Röllinghoff, & Ninck (2003) which find the learning environment is the most advantage in blackboard system.

According to Interviewee (7)

“I don’t know how to make web page so I really like the idea of not being force to deal with that. I can make and grade the assignment and exams online. All of my courses materials are online and accessible for students. It is great way of education really”.

Interviewee (4) said:

“it is really good that all of the university can use the same way. I always hear students complain about losing the website address or not being able to interact with me online. New system has a discussion ability which let student and instructor discuss about a subject online. I like the fact that there is an online interaction between students and me”.

Interviewee (8) said:

“I liked the interactive course idea, new generations of students are interested to technology and we have to be flexible according to their needs. Online interactive courses can help them to make a better connection with their course and the instructor”.

5.2.7 Instructors’ Opinion about New System Mistakes and Problems

According to majority of instructors the new system was a great substitute of current ways, what make them concern was the ability of proposed system in performing fast

in heavy traffic. They believed that this system will be perfect in time and with making all of features that might be needed for instructors or students available and functional. Also as much the system being user-friendly and easy some instructors are more traditional and not willing to move online ways. Instructor agrees with Bower and Wittmann (2009) that may be disadvantage depending on the aims of the learning design.

As Interviewee (3) said:

“This system is great, what make me worried is that can it work fast in exam and assignment due nights? ... These night a lot of students want to connect to the system at the same time, your system should be able to handle this traffic”.

Interviewee (8) said:

“I think you need to work a little more in some functions. It needs debugging and fixing for some feature ... I think you have to test it in small population first, maybe in one department and then after understanding and fixing all the errors and possible weakness make it for all the university”.

5.2.8 Instructors' Opinion about New System Enhancements Needed

Oliver (2001) was already advocating that LMS "should be evaluated on the basis of their ability to support planned learning goals and teaching strategies. Oliver described two main categories of web-based tools: development tools for faculty to create and deliver content online and active learning tools for students to engage in higher-order information processing. Most of the instructors suggest web-based tools agreeing with Oliver that it is the most efficient way to control learning.

According to Interviewees (5) and (3) adding notification feature will make a great advantage for instructors and students. Moreover instructor did like to have more

collaboration and streaming feature in their page for the times that they are not in Cyprus and need to teach their students.

Instructor (2) said:

“sometimes students forgot they have exam or assignment due date, if this system could remind them online or even send for them sms it will be great”.

Instructor (1) mentioned:

“if you can add some calendar system to your system and add it to the university calendar I think it will be more professional” while instructor (7) said: “you can add video conferencing and online examination system”.

5.2.9 Instructors Comparison between Current System and New System

According to the most instructors current system is not really a LMS. It is just a website that is added to the ftp servers. Some instructors use Moodle or Microsoft LMS but it depend on the instructors. There is no clear rule or regulation about current system. Students are confused about how they can access their learning materials, since depend on the instructor it can be so different ways. Moreover instructors believed that in current way there is no interaction between students and instructors, there is just inefficient, unprofessional and complicated way to share courses materials online. Foremother hand proposed way is user-friendly, easy and centralized way to connect all the university academic members and student together.

According to Interviewee (5)

“There is no right LMS now. As I know there should be interaction between student and instructors to call it LMS. Right now I just upload the materials to my page and use gmail as way to communicate with my students and receive their message and assignment. Your new system can make the whole system easier to manage. I can make the course online, communicate online and manage the assignment and exams”.

Interviewee (8) said:

“In fact the comparison is between traditional and new learning systems. Old system is just a lame way to put everything online. It is not professional, not user-friendly and not helping students really. Proposed system from other can help the learning and teaching process. Interaction in online environment is important, proposed system can provide that”.

5.3 Discussion

Always in education field, researcher should adopt and implement new technologies that can have positive effects on learners and instructors. This type of technologies can help students and instructors to achieve better outcome of learning process. In this research, author follows three different research methods in order to have clear vision about eLearning, the way it supposed to be implemented and its features. The methods that author used in this research are questionnaires and interview.

The research done using literature review method shows that there are some different between academic learning management system and corporate training learning management system. In literature review, author talks about main features of learning management system which are content management and communication. Content management is the main feature should be provided in any learning management system and it consider as core feature. Content management should have the ability to handle any course materials and its media. Also communication system is very important in any learning management system to help student and instructor communicate with each other in effective online method in order to make student feel involve in learning process. The requirements for learning management system are depending on which market is developed for. The requirements established for the academic environment are not exclusive to the academic systems but serve as the basic functions (Saul Carliner, 2005) for a learning management system. Literature review shows also the many advantages of learning management system which

providing location and time flexibility. Including web 2.0 tools to learning management system can help and enhance the learning process.

Author issues standard design for three users (actors) of learning management system which are student, instructor and administrator as main actors in this system. Using the same design, developer can add as many actors as the system requires. Database diagram designed to be the core of any learning management system. Developer can add as many functions as they want in learning management system by adding new entity and connect it to core entities. Finally, the user interface design which is flexible to developer choice.

Development as mentioned in the research divided into three main parts which are interface, database and coding. Author focus in interface design and follow the rules introduced by Krug (2014) to develop useable web application which prove that developer need to be more focus in interface design in same as coding because interface plays important factors in student and instructors acceptance of the system in these days.

Basic system was developed based on criteria and framework presented earlier in this research.

The second research method used in this research is interview. 10 instructors interviewed from School of Computing and Technology. Instructors from School of Computing and Technology are facing problem in dealing with the system. In interviewee opinions, School of Computing and Technology system needs to be automated. All the interviewee instructors from Eastern Mediterranean University

see it important to implement centralized system to manage learning/teaching process within the university. EMU doesn't support instructors in proper system to deliver studying materials to students which cause a lot of pressure on instructors to distribute those materials in face-to-face manner. All instructors that author interviewee have good points about Moodle management system but some instructors noted that when Moodle implemented badly will not be so useful and they refer to system implemented in education department. The author receives a positive response about the new system after the instructors test it. Instructors saw that new learning management system has user friendly interface and easy to use the system can make it preferable from both students and instructors. Instructors not looking for complicated system, they prefer easy to use system over fully featured system. But still there are packages and steps can be implemented to achieve both.

Instructors are looking to deal with simple system without any initiation and training to be taken. The new system provides that and it provides the basic features of any learning management system with ability to develop any tools and features in the future.

Working with web application give the power to user and developer to integrate any content management to the system (for example: SCROM) just it needs from user to upload by one click. The overall satisfaction of the system was good and not just because of its functionality but because of those function introduced to the user in modern and friendly manner that can digest it fast.

Chapter 6

CONCLUSION

This chapter views and summarizes the conducted work in this research. The contribution of the work will be highlighted with summary and performed work.

The objective of this research was to implement new learning management system (LMS) with simple and easy to use features and interface. New learning management system focus in supporting the most important features used by instructors to help create, administrate and manage online courses. On the other hand, the system supports learners by providing simple interface and clear navigation among the features of the system. The aim of this thesis is to design, develop and implement learning management system and clear framework for any features development in the future. The LMS developed by the functionality of providing adaptively based on learning styles referring to the Felder-Silverman learning style model (FSLSM) (Felder and Silverman, 1988). LMS developed to be simple for both instructors and learners. Providing clear and simple design for learning management system will allows designer to customize the design to suit the requirements of organization. Three different designs were proposed for this system which are functional, database and interface. Developer can start with interface then database and finally add the coding according to interface and database designs. Developer following framework presented by this research can customize and add any new feature to learning management system easily. Responses received from instructors after testing the new system which shows high level of flexibility using the new system.

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APPENDICES

Appendix A: Interview Questions

- 1) Describe current LMS and Management system in the department
- 2) Describe Centralizing LMS for the department
- 3) What is your opinion about the system design?
- 4) What is your opinion about the interface design?
- 5) What is your opinion about usability and ease to use?
- 6) What are the advantages you see it of new LMS?
- 7) What are the problems and mistakes you find in new LMS?
- 8) What features you think are needed to be added as core features?
- 9) Can you shortly compare between current and new LMS

Appendix B: System Installation

To install implemented learning management system, Developer needs Microsoft Windows server 2008 or later and Microsoft SQL 2014 or later version. Starting with database installation, administrator should follow the following steps:

1. Open SQL Management Studio

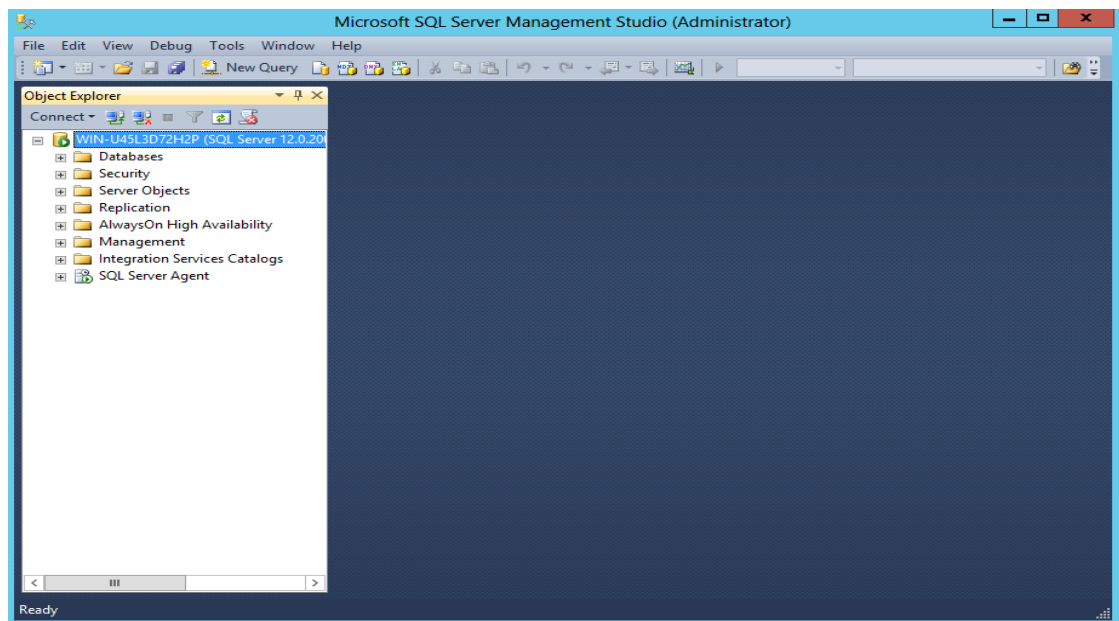


Figure 29: SQL Management Studio interface

2. Write click on “Databases” and click “Restore Database”

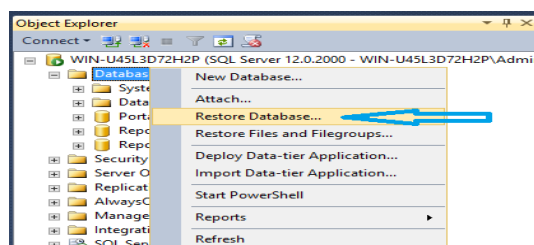


Figure 30: Restore Database Option

3. Click on “Device” and then Browse “...”

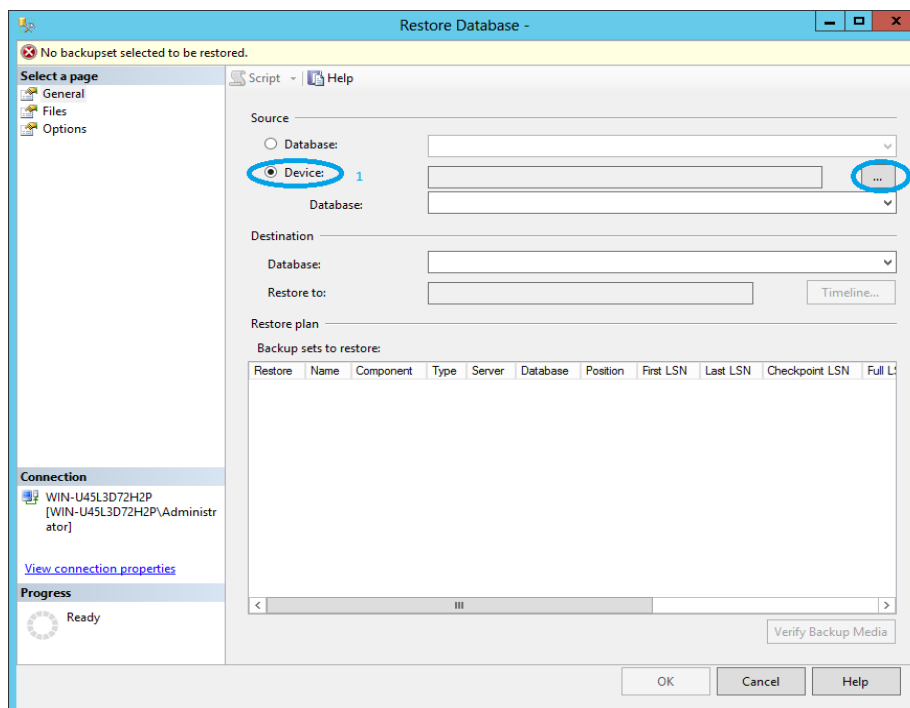


Figure 31: Restore Database Settings

4. Click “Add” and Navigate to database then click “OK”

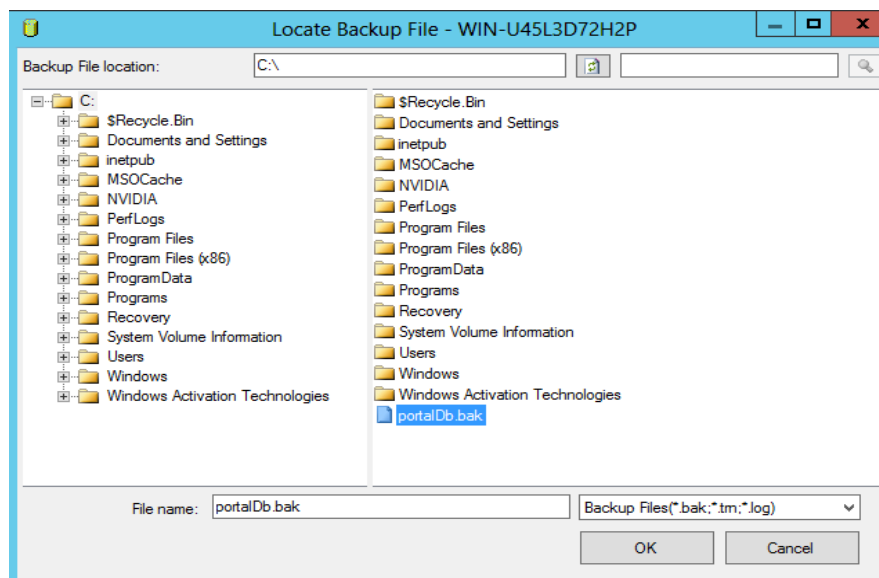


Figure 32: Restore Database - Locate Database File

Now for adding the web application, Administrator should follow the following steps:

5. Navigate to Internet Information Services Manager (IIS)

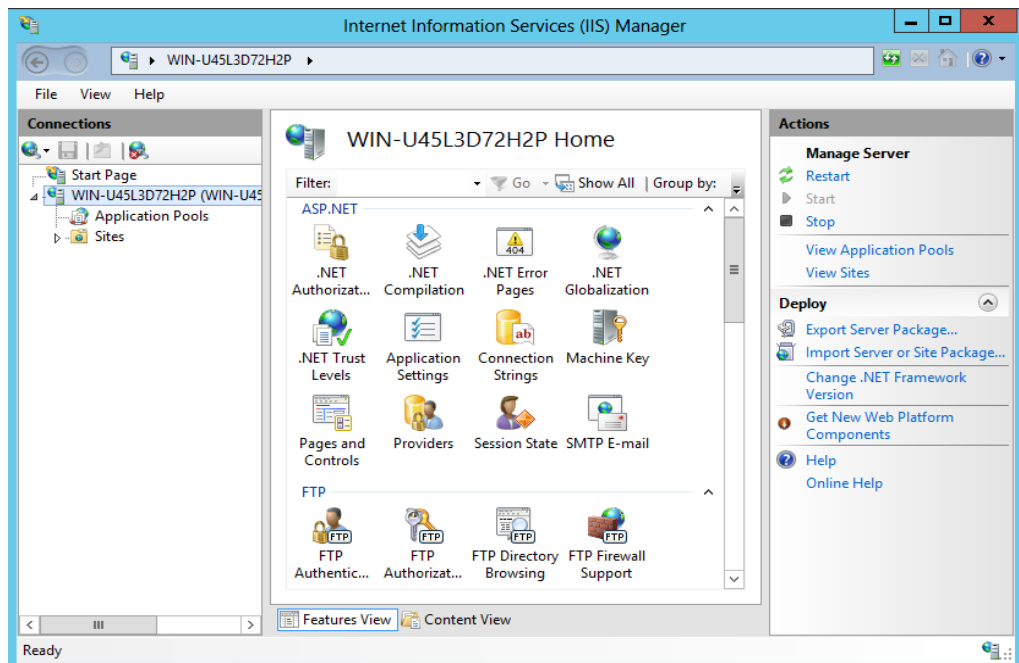


Figure 33: Internet Information Services Manager Interface

6. Click On “Site” then “Add Website”.

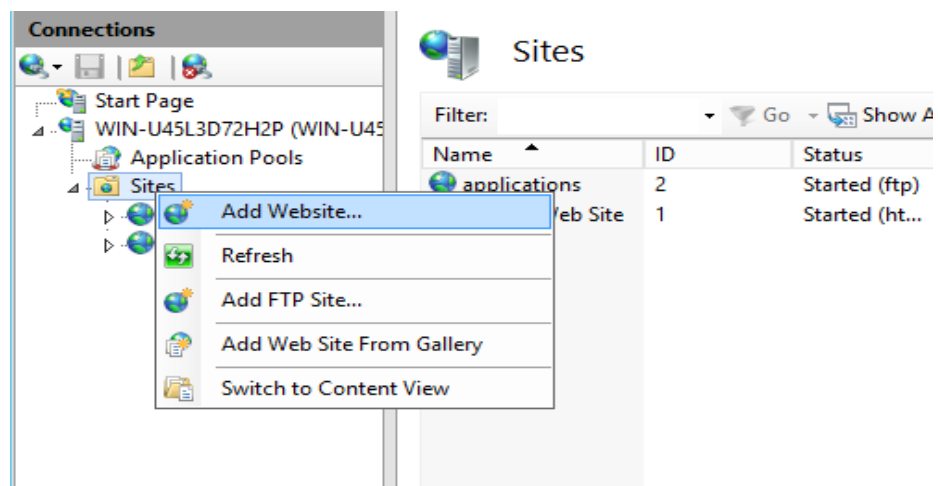


Figure 34: IIS - Site Menu

7. Choose the site name, physical path and binding setting then click “Ok:

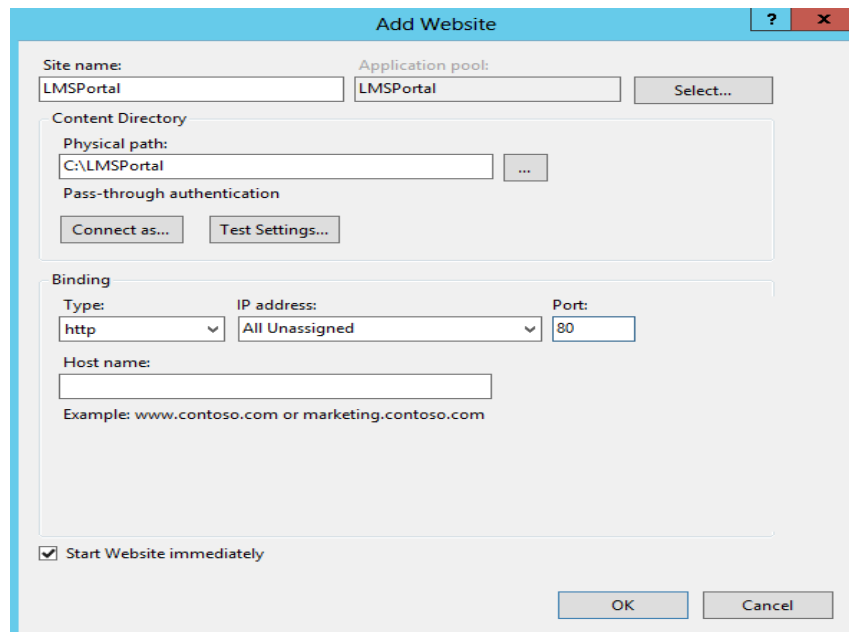


Figure 35: Add Website Settings

8. Right click on the website we just create it and choose “deploy” then “Import Application”.

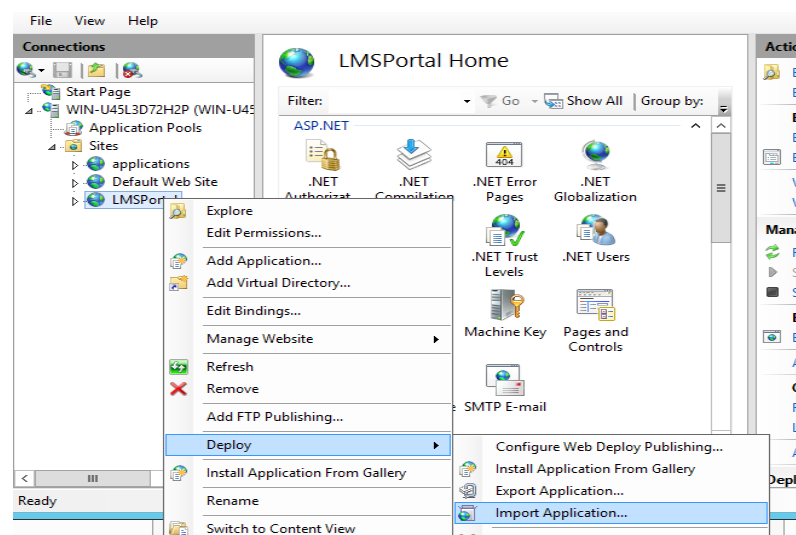


Figure 36: Navigation for Deploy Application

9. Choose the location of the package (submitted with the thesis’s soft copy) then click next

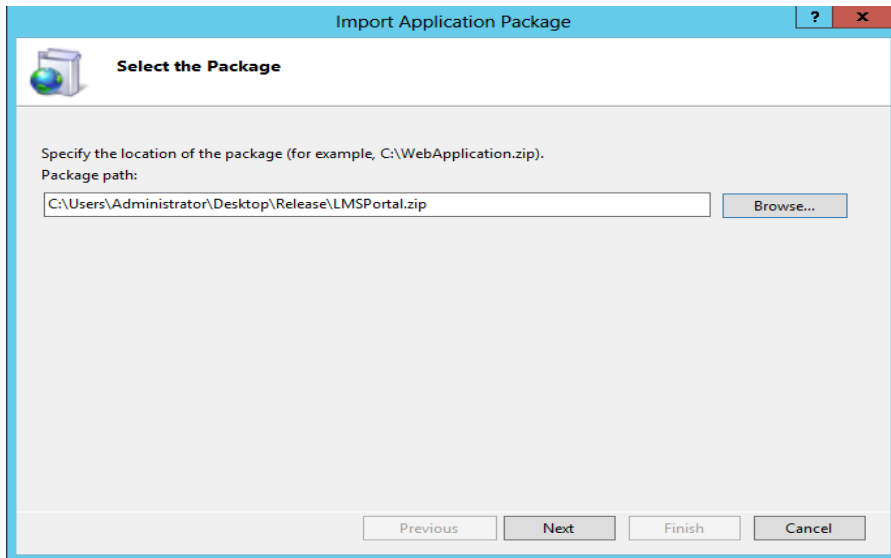


Figure 37: Import Application - Package Location

10. Verify the content of the package then click “Next”

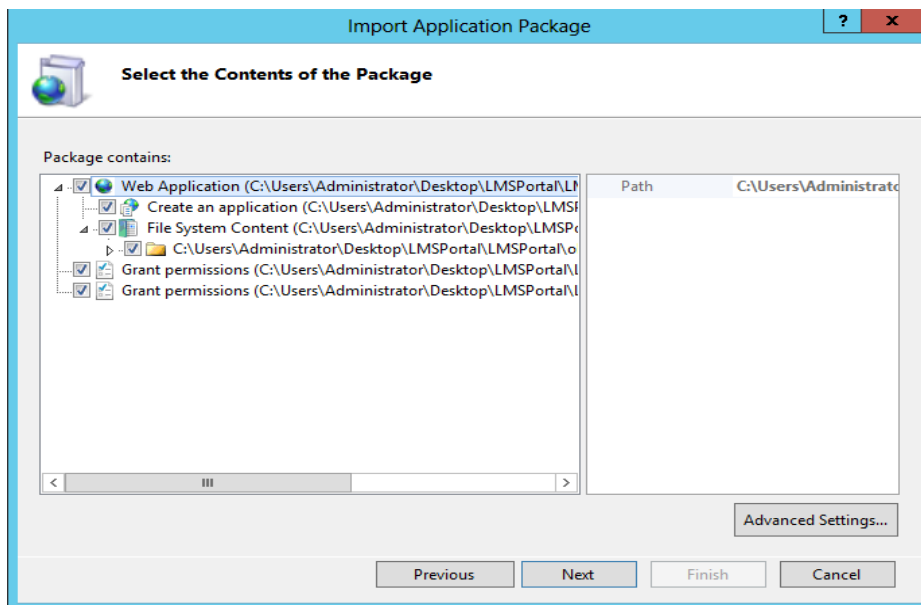


Figure 38: Import Application - Package Contents

11. Define The Database Connection (change the server name) then click “Next”

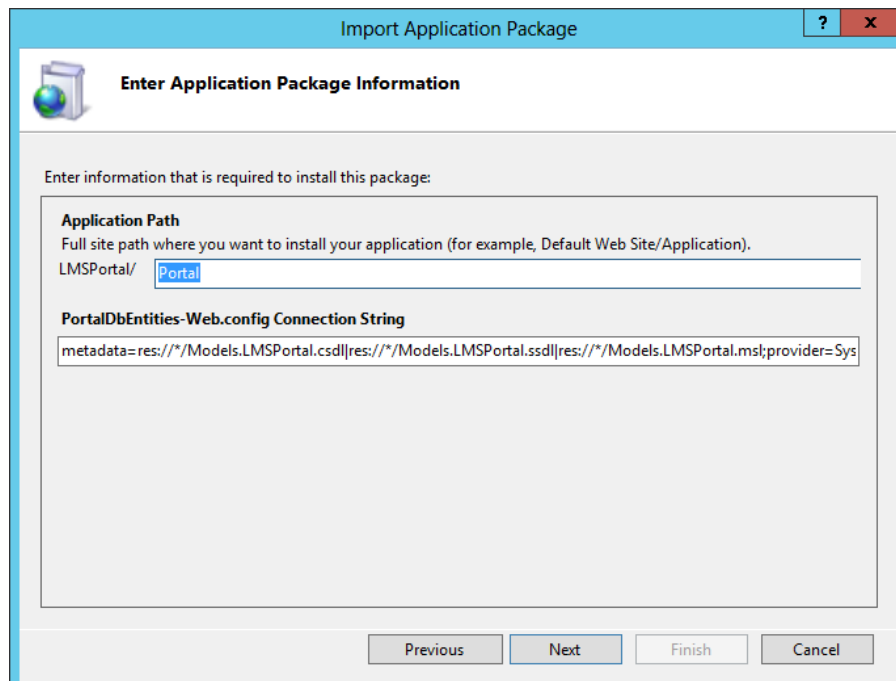


Figure 39: Import Application - Path and Database

12. Installation will start. Wait until it done then click “Finish”.

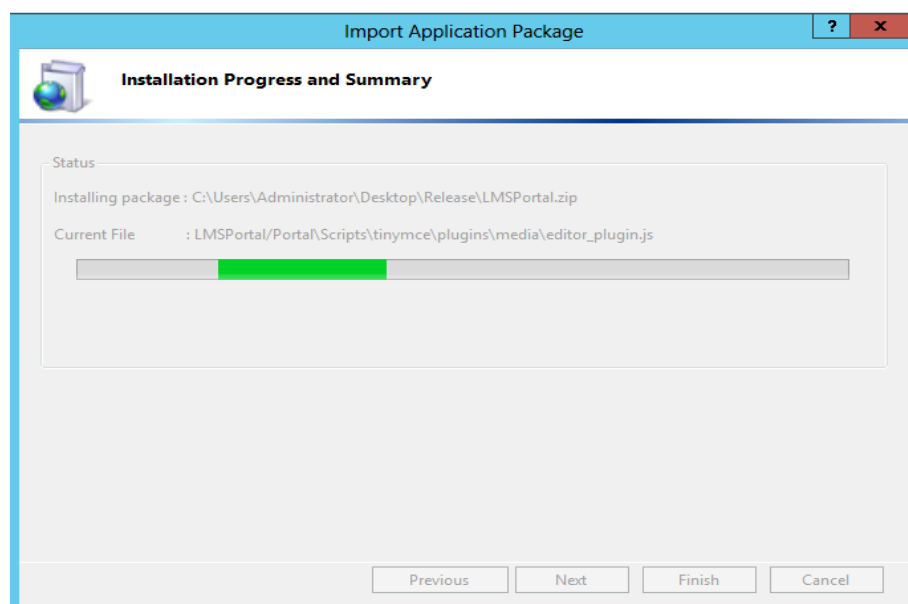


Figure 40: Import Application -Installation Progress

Now the user can navigate to the site using the server IP address or server URL if it assign.

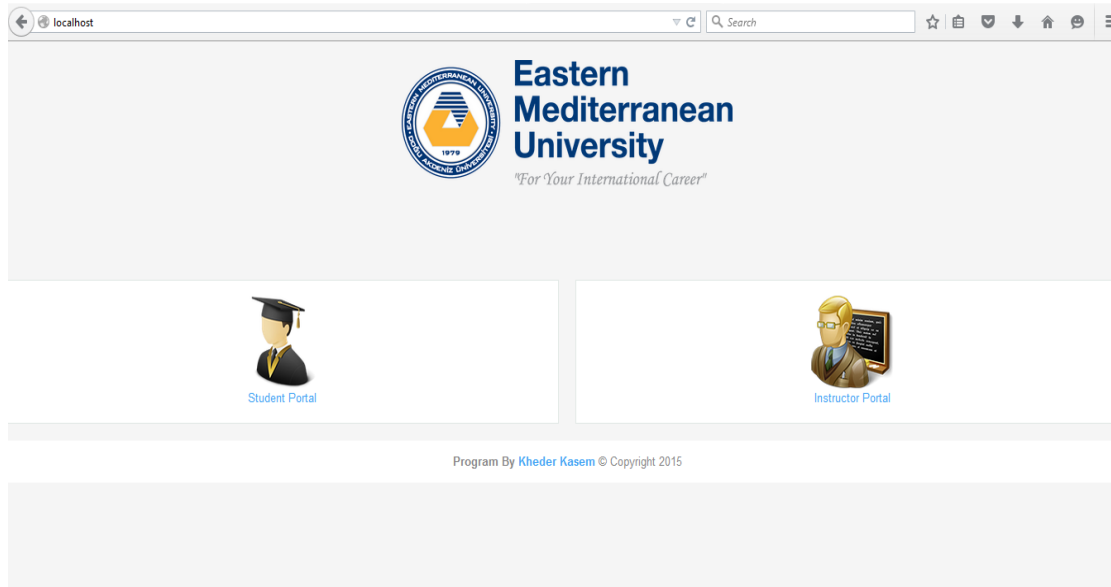


Figure 41: Application's User Interface