

## Design and Implementation of Web-Based E-learning Management System

Sarmad F. Yaseen\* & Dr. Muna M. Al-Nayar\*

Received on: 27/10 /2008

Accepted on: 7/1/2010

### Abstract

With the popularization of the internet and the growth of the communication technology, E-learning is increasingly utilized by both the academic and industrial communities.

Management is a critical aspect in E-learning system because it provides a way to create and deliver learning content, monitor student participation, and evaluate student performance. Also learning management system automates the administration of training events, handling course schedules and registrations; delivering learning content; facilitating communication among learners and between learners and instructors.

This paper introduces a distributed E-learning management system using client/server model. On the server side of the system, an administrator involving managing and controlling all the students and tutors activities; making all administrator's subsystems work properly and transparently without bothering or interrupting system's users (clients side).

**Keywords:** E-learning, Web-Based, Learning Management System.

### تصميم وبناء نظام إدارة التعليم الإلكتروني المدعوم بالـ ويب

#### الخلاصة

إن التقدم السريع في تكنولوجيا الاتصالات والمعلومات وبخاصة الانترنت قد اتاح فرصاً جديدةً لخلق وتخزين ومعالجة وتوزيع المعلومات، الأمر الذي وفر بيئات و قنوات تعليمية جديدة. تشكل الادارة جانباً بالغ الأهمية في نظام التعلم الإلكتروني لأنها توفر وسيلة لايجاد وايصال المضمون التعليمي، ورصد مشاركة الطلاب، وتقييم أدائهم، كما انها تعمل على اتمتة عملية ادارة التعلم الإلكتروني، والتعامل مع المواد التعليمية وجدولتها وكذلك عملية التسجيل للطلبة في نظام التعلم الإلكتروني، كما انها مسؤولة عن إيصال المحتوى التعليمي وتيسير الاتصال بين المتعلمين وبين المدرسين.

إن هذا البحث يقدم نظام إدارة التعلم الإلكتروني الموزع باستخدام طراز العميل/الخادم النموذجي. يمثل المدير (Administrator) جانب الخادم (Server) في هذا النظام والذي يكون مسؤولاً عن إدارة ومراقبة جميع الأنشطة الخاصة بالطلاب والمدرسين على حدٍ سواء كما انه يضمن عمل جميع النظم الفرعية بالشكل الصحيح وبشفافية تامة ودون التسبب بأي إزعاج أو مقاطعة لعمل مستخدمي النظام (الذين يمثلون جانب العملاء في النظام).

## 1. Introduction

The rapid advances in communication and information technology not only accelerate the trend of human's life but also change people's way of learning. [1].

E-learning is a training operation that delivered by a computer (including CD-ROM, Internet, or intranet) that is designed to support individual learning or organizational performance goals [2].

Technology, especially the Internet, offers new opportunities to create, store, manipulate, access, distribute information, and provides new learning environments and channels. By taking advantage of these new communication and information technologies, education institutions are now better placed to deliver courses at a distance, reach students in many places and foster international collaboration [1].

Thus new trends in E-learning and the ways to support them can be obtained by using information technology [3].

Learning Management System (LMS) is a powerful integrated system that supports a number of activities, like course preparation, content presentation, course management, user management, communication among e-learning communities, maintaining learners tracking data, etc, performed by teachers and students during the E-learning process [4].

Web based learning management systems or Course Management Systems (CMS) are important tools for e-learning management as the functionalities like educational resource content management, discussion forums, chat, quiz and assignment management, etc. are

effective in promoting interactions between teachers and learners [5].

The primary objective of the LMS is to manage learners, keeping track of their progress and performance across all types of training activities. The LMS manages and allocates learning resources such as registration, classroom and instructor availability, instructional material fulfillment, and online learning delivery [6].

According to Pedro J. Merino [7] and Matjaz Kljun [8], the most common properties and functions involved in the majority of E-Learning systems can be summarized in Table 1 and Table 2. Generally these properties and functions are not involved completely in the same E-Learning system.

This paper introduces a Web-Based E-Learning Management System that tries to collect most of these properties and functions so that it will completely serve the education activities under web design.

In the sections below we will introduce the design and implementation of the proposed WBELMS and discuss its properties and functionalities according to tables (1 and 2).

## 2. Designing of Web-Based E-learning Management System

Management is one of the most important activities in the E-learning system. The proposed system is a Web-Based E-Learning Management System (WBELMS) based on some principles that most e-learning systems depend on, such as:

- .. Distributed data processing (client/server) system.
- .. Hierarchally design.

- .. User friendly and readable system design due to use of menus.
- .. Centralized tracking and administration.
- .. Mutual interaction between different users.
- .. Broad and easy access to information.
- .. The link between WBELMS and any other LMS's platform or environment (standardization).

The system can be described as a three-tiered client/server one; it consists of system server (as an administrator server), SQL server and Database. The technical architecture of the system is realized on Windows Server 2003 as a platform based on ASP.NET

The system main page and other sub-pages are a set of pre-made HTML pages that are dynamically created and displayed by the server. These pages are designed with the standard HTML and some client-side Java Script statements.

On the client side, a usual Web browser (such as Internet explorer or Netscape) is required in order to have an accessing and browsing the system's pages.

The proposed system is composed of three major subsystems, these are Student, Tutor and Administrator as shown in Figure (1), such that the student and the tutors are the clients that have access and communicate with the server, while the Administrator will ensure to control and manages all client's activities and authorities, clients access to the data on the server through a web browser such as Internet Explorer. The communication within the system environment passing through the

server is illustrated in Figure (2), while the architecture of client/server model is proposed in Figure (3).

### 2.1 Student Subsystem

This subsystem deals with all student's activities in (WBELMS), and with how to log-in system as a student, also it includes browsing the system as a tourist. These activities include access procedure to system's courses materials covering the access level authorities and making courses and their chapters available to users in a user friendly manner.

### 2.2 Tutor Subsystem

This subsystem is concerned with the activities and authorities access level of tutor in WBELMS. Unlike student's signing-in process, tutor can not register himself because tutor registration is restricted by administrator only (as it will be seen later).

### 2.3 Administrator Subsystem

This subsystem is the most important part in the proposed WBELMS. The administrator is responsible for all management and control events in the system, some of these events are concerned with students, while the others are concerned with tutors. In addition, there are many features and services that the administrator serves, such as providing detailed information about the system's users (students and tutors), governing and managing subsystem activities, controlling all communications between each subsystem and database, managing quizzes and providing statistics related to both students and tutors.

## 3. Implementation of Web-Based E-Learning Management System (WBELMS)

The proposed system is designed and achieved to be a user friendly system in order to make users access

it in a very easy manner. These requirements are ensured by means of using easy, readable and predesigned menus as it will be shown later. Figure (4) shows the system main page and all links and functions allowed inside it after valid log-in; at first all links will be inactive till user log-in or registrate himself as a new user (student or tutor), then all links will be activated and ready to be used including downloads demonstration files and full text lectures (In PDF format). Figure (5) illustrates the flowchart of validation and process of system's users.

While students can access files for read-only activities, tutors have the rights to access their lectures and modify it (read/write access) or make an update on their profiles.

The administrator is the core object in this proposed system, thus it enriched with many functions that guarantee achieving highly management aspects for learning materials. It also controls all users' activities such as managing students and tutors access rights in addition to managing all learning materials such as courses and lectures creating and updating process. There is also another function deals with creating and demonstrating statistics about the whole E-learning system. Figure (6) shows the main page of an administrator and its functions, also figures (7) and (8) show an example of the kind of statistics that the administrator can offer for the system administration requirements.

#### 4. Discussions and Conclusions

After studying several papers that deal with observing and recording many learning management systems functions and properties offered, we try to involve many of these functions

and properties in the proposed WBELMS in order to ensure variety of functions and properties offered. Table 3 shows these functions and properties.

From the practical implementation of the WBELMS, the following conclusions are obtained:

1. The E-learning management system is important in future learning system; the proposed system can be easily adopted by universities and institutions. It can be used as a separate E-learning system due to use of user friendly menus and easy to access functions and features.
2. The administration's functions are clearly identified to be able to manipulate users' information such as create, update, suspend, and delete students and tutors accounts and managing the learning materials and contents, thus the proposed system is easy and flexible for future maintenance and developments because each subsystem can be handled separately without the influence of one on other.
3. The system offers good and easy way to track student's learning behaviors by using time stamp technique which is very important to improve both the learning and management systems and offers well defined bases for new E-learning approaches that focus on self regulated learning by the student himself.
4. Finally the statistics system offers the ability to archive students' activities, tutors chapters usability and learning materials which can be used in order to improve the E-learning system in the future and help in other researches.

**5. References**

- [1] Y. H. Lui “**E-Learning and Digital Publishing**”, Edited by Hsianghoo S. Ching , Paul W. T. Poon & Carmel McNaught, Springer , 2006.
- [2] Ruth C. Clark; Richard E. Mayer “**E-learning and the science of instruction**”, Second Edition, John Wiley & Sons, Inc., 2008.
- [3] Igor, T. Hawryszkiewicz “**Towards active learning management systems**”, 21st ASCILITE Conference, 5-8 December, 2004, Page(s):348 - 356.
- [4] Aasim Zafar; Nesar Ahmad “**Towards Adaptive e-learning: Technological challenges and Enabling technologies**”, Annual India Conference, page(s): 1-6, 2006.
- [5] Yuuichi Sugi; Toshihiro Kita; Seisuke Yasunami; Hiroshi Nakano “**Web-based Rapid Authoring Tool for LMS Quiz Creation**”, 7th International Conference on Information Technology Based Higher Education and Training, July 2006, Page(s):617 – 620, IEEE 2006.
- [6] Sergio Rapuano; Francesco Zoino “**A Learning Management System Including Laboratory Experiments on Measurement Instrumentation**”, IEEE Transactions on Instrumentation and Measurement, VOL. 55, NO. 5, October 2006, Page(s):1757 – 1766.
- [7] Pedro J. Merino, Carlos D. Kloos, Ralf Seepold, Raquel M. García “**Rating the Importance of Different LMS Functionalities**”, 36th ASEE/IEEE Frontiers in Education Conference, October 28 – 31, 2006, Page(s):T1c-13 – T1c-18.
- [8] Matjaz Kljun, Jernej Vicic, Branko Kavsek, “**Evaluating Comparisons and Evaluations of Learning Management Systems**”, Proceedings of the ITI 2007 29th Int. Conf. on Information Technology Interfaces, June 25-28, 2007, Cavtat, Croatia, Page(s):363 – 368.

**Table (1) Common Functions Available in Major E-Learning Systems**

<b>Common Functions Available in Major E-Learning Systems</b>
Authorization (levels)
Calendar
Course information
Course management
Course syllabus
E-mail
E-mail notifications
FAQ
File download
Forum
Help about using the tool
Lists of students (for all courses in which is enrolled)
Monitoring usage, tracking
News about the course
Offline work, Synchronization
Optimization of features
Scoring system, grading
SCORM (IMS) import
SCORM activities
SCORM collaboration
SCORM export
Student management
Study tools (Test, query, survey)
Submission management system
Support (students, tutors, and administrator)

**Table (2) Properties Functions Available in Major E-Learning Systems**

<b>Common Properties Available in Major E-Learning Systems</b>
Adaptability
Content reusability
File sharing
Foreign sources upload
Group work, communities
Guided learning
Information about the teaching staff (other courses, location, tutoring...)
Modularity, extensibility
Multilingual support
Offline work, Synch
On line publishing
Personalization
Portability

Security
Self-assessment Evaluation
Simulations
Student management
Templates availability
Usage restriction
Visualization of academics record
Visualization of qualifications

**Table ( 3) Functions and Properties Available in the Proposed WBELMS**

<b>Functions and Properties Available in the Proposed WBELMS</b>
Adaptability
Authorization (levels)
Calendar
Content reusability
Course information
Course management
Course syllabus
E-mail
E-mail notifications
FAQ
File download
File sharing
Foreign sources upload
Forum
Group work, communities
Guided learning
Help about using the tool
Information about the teaching staff (other courses, location, tutoring...)
Lists of students (for all courses in which is enrolled)
Modularity, extensibility
Monitoring usage, tracking
Multilingual support
News about the course
Offline work, Synch

---

On line publishing
Optimization of features
Personalization
Portability
Scoring system, grading
SCORM (IMS) import
SCORM activities
SCORM collaboration
SCORM export
Security
Self-assessment Evaluation
Simulations
Student management
Study tools (Test, query, survey)
Submission management system
Support (students, tutors, and administrator)
Templates availability
Usage restriction
Visualization of academics record
Visualization of qualifications

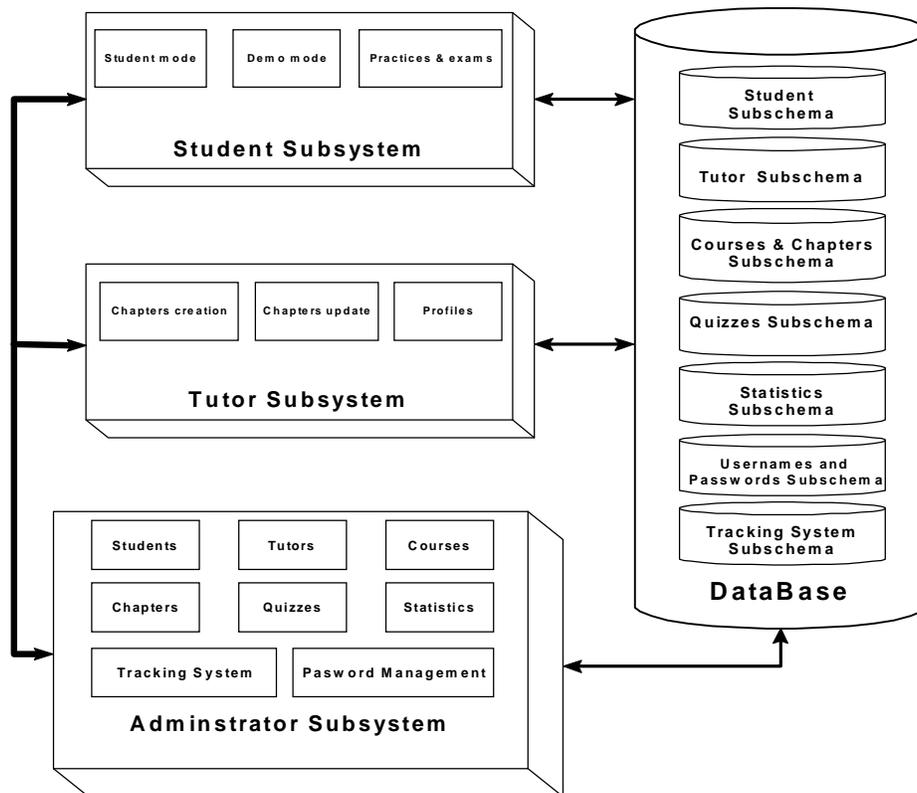


Figure (1) Block diagram of WBELMS

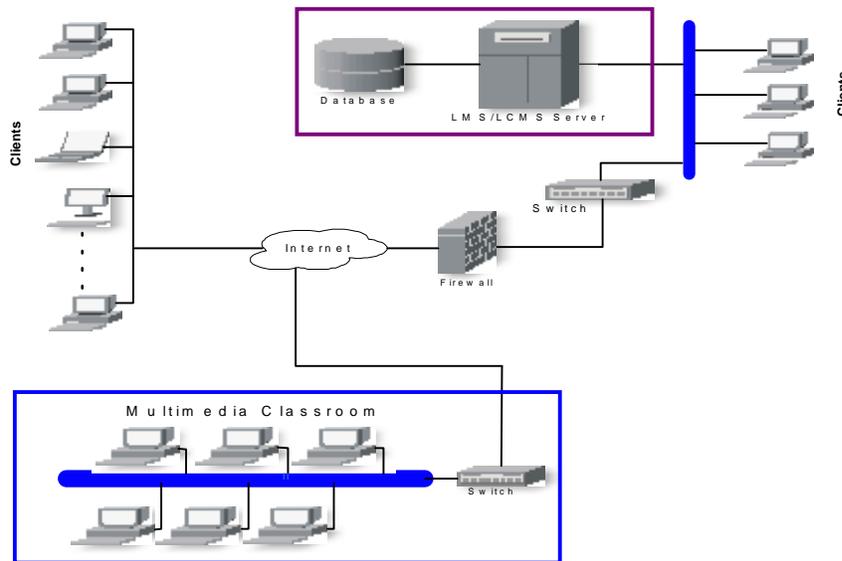


Figure (2) The communication within the system environment

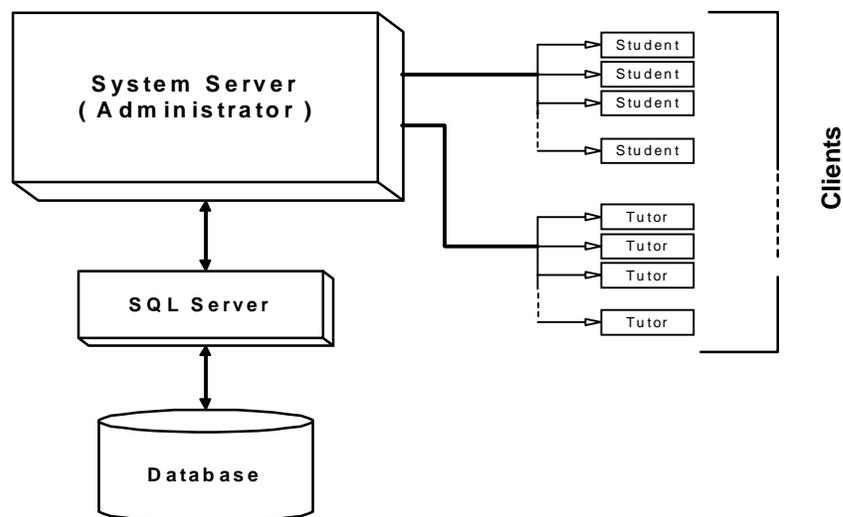


Figure (3) System architecture as a client/server model

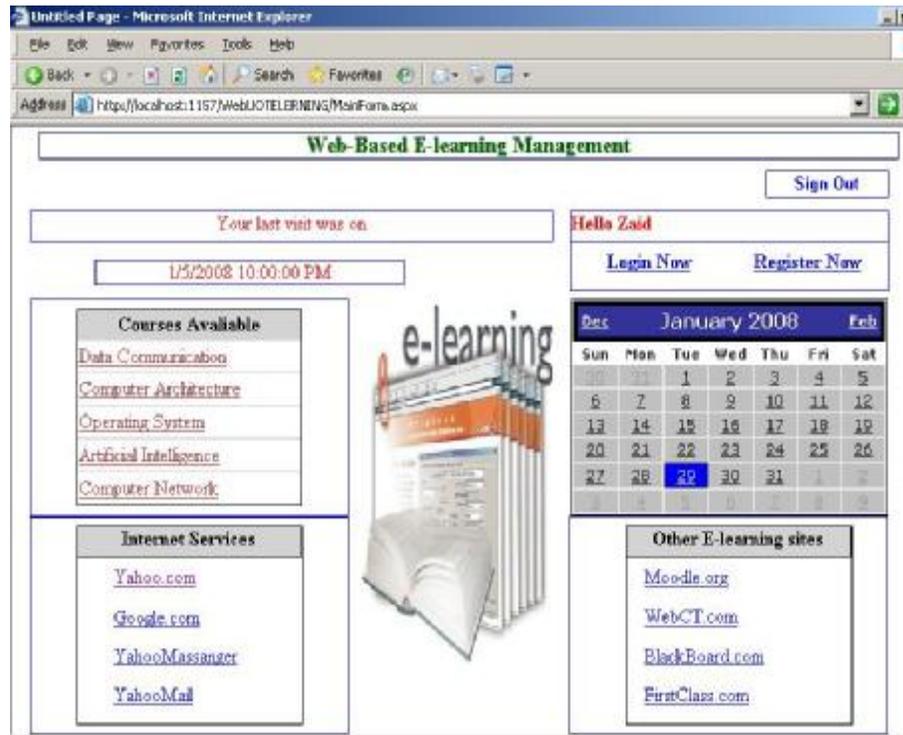


Figure (4) System's main page after valid log-in

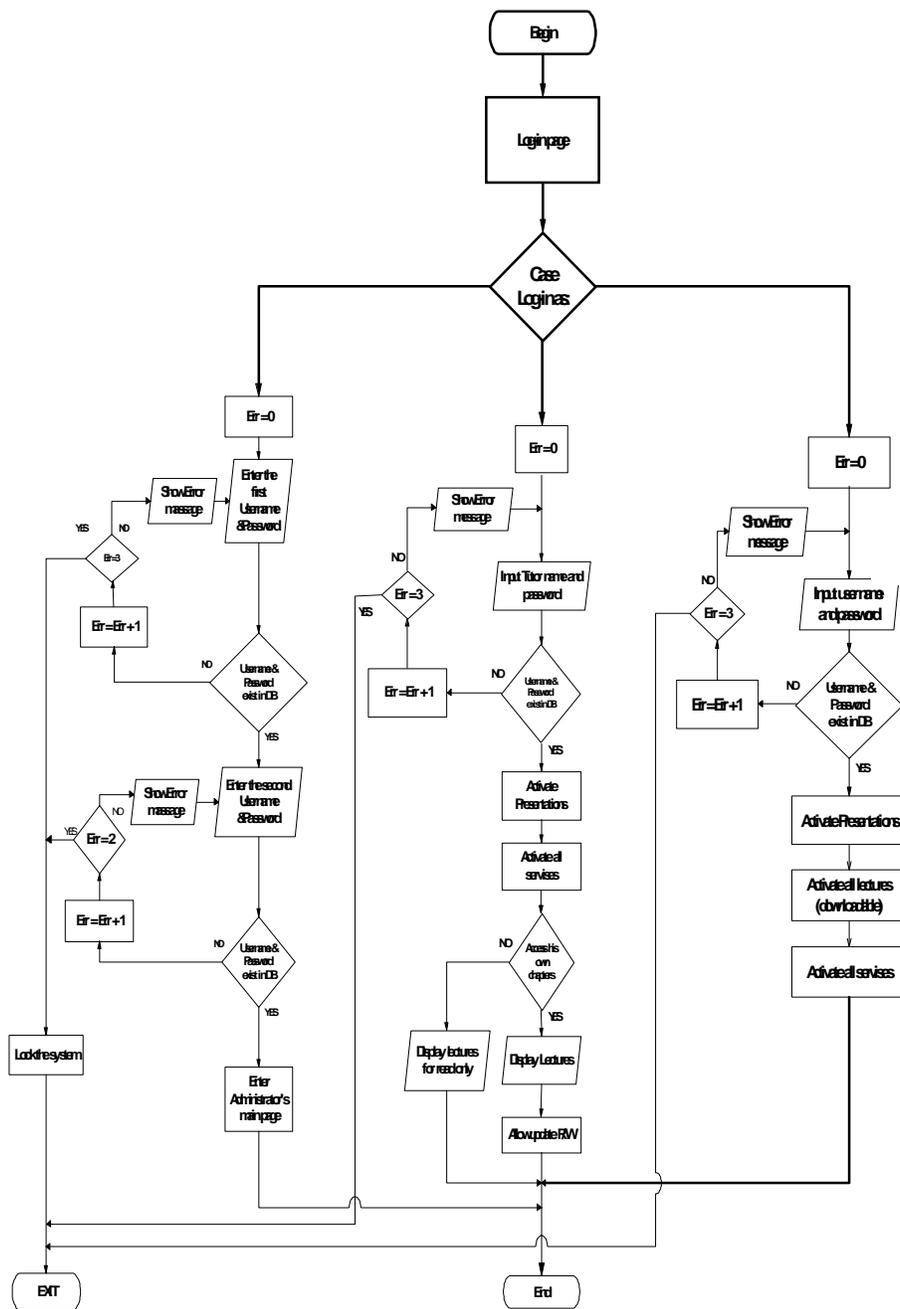


Figure (5) Flowchart of validation and process of system's users.



Figure (6) Administrator main page

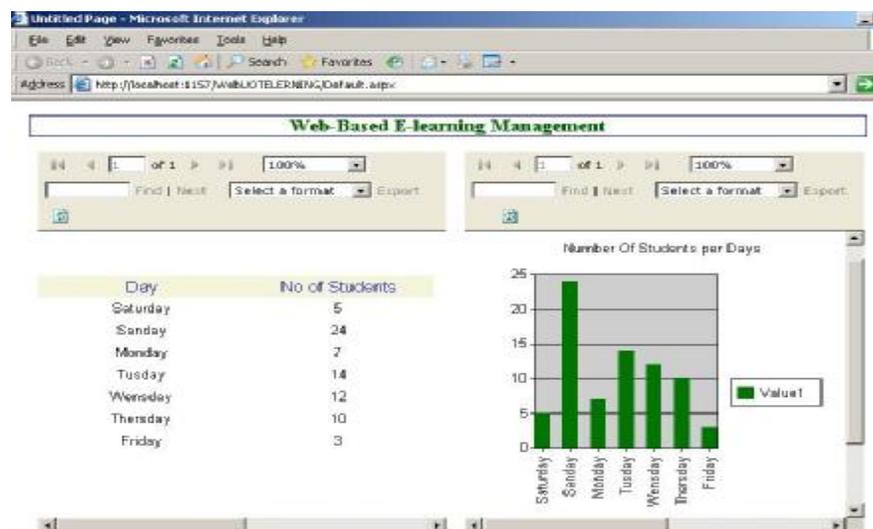


Figure (7) Traffic indication per one week

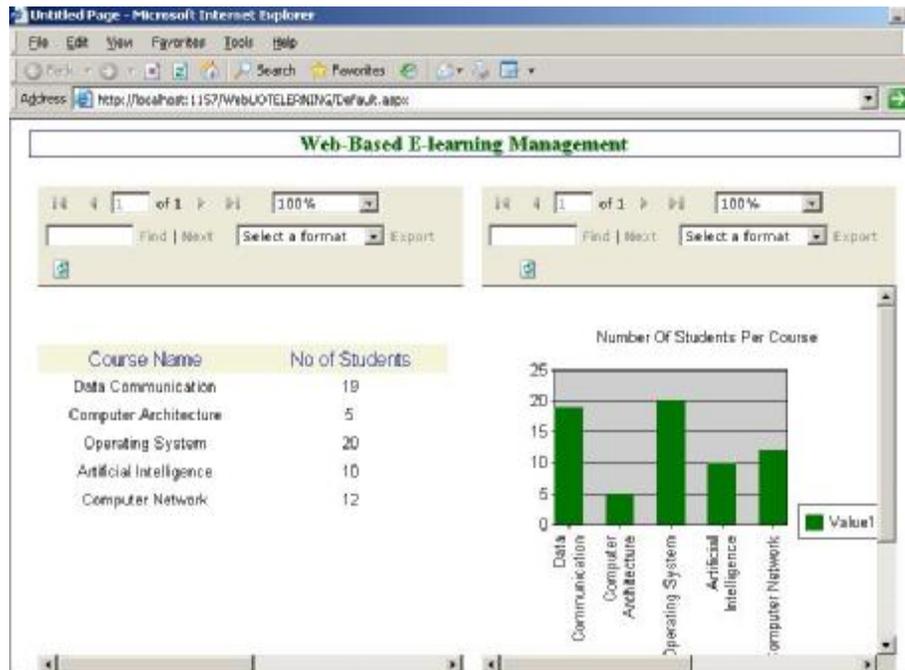


Figure (8) Courses usability