Journal of Multidisciplinary Engineering Science Studies (JMESS)
ISSN: 2458-925X
Vol. 2 Issue 5, May - 2016

# Design and Development of ELearning University System

**Assist. Prof. Ahmed Y. Mahmoud**
Faculty of Engineering & Information Technology,
Information Technology Department,
Al-Azhar University, Gaza, Palestine,
ahmed@alazhar.edu.ps

**Mohammed S. Barakat**
Faculty of Engineering & Information Technology,
Al-Azhar University, Gaza, Palestine,

**Mahmoud J. Ajjour**
Faculty of Engineering & Information Technology,
Al-Azhar University, Gaza, Palestine,

***Abstract*—The significant advancements of ICT, particularly the Internet, opens up the opportunity for a new teaching and learning model. The E-learning methodology has worldwide been considered compulsory to enable twenty-first century learners to adjust to worldwide changes. In this paper we consider the E-learning system and staff websites. A new system moodel is proposed to be used at Alazhar university. The main aim of the proposed moodel is to help lecturers to manage online courses. It provides an interaction and collaborative construction of content. The teachers essentially interfere in the development process. The proposed moodel provides the teacher with an interactive GUI that can be used to enhance the teaching– learning process. It enables the lecturers and students to be effective in the learning process. Also it provides the opportunity for teachers to interact electronically with their students. This interaction can be via internal messaging system from teachers to students and vice versa.**

***Keywords—E-learning; moodle; education; classroom***

## I. INTRODUCTION

Today, people need to learn more and learn in a different way. Education system faces significant problems unless we overpasses the breach between how students live and how they gain knowledge. In recent years , E-learning becomes one of the most important tools of higher education institute. The importance of E-learning comes from the revolution in the communication networks , the proliferation of applications which use internet provided us the opportunity to move from the classical education. The E-Learning system can be applied to several levels of users [1]. The use of Internet in past years has proven to be successful in many different contexts and with various target groups [2].

E-Learning management software systems refer to any application that enables delivering courses and instruction electronically either over the Internet or via download of software on individual desktop using CD's or DVD's. Essentially, any learning that is not delivered into the classroom but via electronic media can be categorized as E-Learning software. There are many categories of software available in the market that fell in the category of E-Learning software. These range from course authoring tools that allow instructional designers to create E-learning courses to learning management systems that allow users to access E-learning courses over the internet.

In Palestine, people have several obstacles in movement towards West bank and Gaza Strip, the staff members face difficulties to manage the education process. Furthermore students face difficulties as well. The E-learning is vital alternative to campus-based study.

In this manuscript , we propose a web application for E-learning system, the application contains courses website, staff website, and the moodle software.

The paper is organized as follows. The rest of Section I, we give a description of E-learning importance and the research objectives are introduced. Section II includes the related work and presents an overview of E-learning. In Section III, the proposed system use case diagrams and main user interface are introduced. Section IV presents a description of the development environment. In Section V, we apply several tests to evaluate the proposed E-learning applications. Finally, the conclusion is given in Section VI.

### *A. Importance of E-Learning and Application Development*

The revenue of E-learning is growing up rapidly, it was $32.1 billion dollars in 2010 [3]. By 2015, the revenue of E-learning is expected to reach $107 billion [4]. The revenues of E-learning market with five year compound annual growth rate of approximately 9.2% . This indicates that the estimated revenues of $49.9

billion in 2015 [3]. It is expected to grow more in next a few years.

The recent advances in information and communication technology ICT plays a significant role in all aspects of daily life in general [5]. Accordingly, the main concern was to achieve the greatest benefit of education. The collaboration between multimedia processing tools, the worldwide availability of Internet access and network technologies have shown the need of the presence of reliable E-Learning applications. The number of people worldwide have access to internet is estimated as three billion users [6] and it is expected to grow up. Many educational institutes have adopted the use of E-Learning applications as a new technology in educational process. E-Learning allowed potentially, enormous tools and methods for publishing educational material through the Internet. It is aimed at providing an aid for education mediated by the Internet, e-book, Virtual University, the library electronic and other electronic media that helps the learner to learn at anywhere, home, university, and in the time that he/she fit in and preferences without the obligation to come to the halls teaching at specific times. The learner can read materials online or download them for reading later and regularly updated with latest course material, announcements, tasks, discussions, etc.

### *B. Research Objectives*

The main objective of this work is to introduce a web e-learning application to develop an integrated E-learning system, including procedures for upload course material, perform online quizzes, discussion sessions, etc. The developed system has unified under a common interface. They could be used both for lecturers and students. The developed system can be used smoothly to provide communication between students and faculty members and it enables students to access the courses web sites 24 hours in a day. This makes it possible for learners to learn the topic at their own velocity and in comfortable settings. The course web sites include tabs for announcement, labs, tests models, grades, etc… Finally, the proposed system will enable each faculty member to have a personal website.

## II. OVERVIEW OF E-LEARNING

The term “E-Learning” has only been in reality since 1999, when the word was first utilized at a computer based training (CBT) systems seminar [7]. E-Learning has been intensively developed by several researchers, see for e.g., [8], [9], [10], [11]. E-learning is generally known as a vital means to improve the accessibility and quality of the teaching-learning process [12] , [13]. E-Learning is seen as a teaching technique which enables students are not able to attend classes due to any reason, it enables the student to study and communicate with the instructors without restrictions at anytime and anyplace. It also provide the instructors to spread the course material and keep on touch with the students at any time [14].

Despite E-Learning has many advantages, it also faces many challenges. Several problems are also highlighted by previous literature’s concerning the necessary skills to allow students and instructors to use and access E-learning models [15], [16], [17], [18]; without doubt the extra experience, familiarity, knowledge in using computers and the Internet is required. Nevertheless, many researchers illustrate that, the required specific skills and experience for use of E-learning are wikis, blogs, discussion forums, virtual meetings and videoconferences, which are necessary to the successful and effective implementation of E-learning [19].

## III. PROPOSED SYSTEM

Proposed University E-learning application works on PC, Tablet and Mobile platform compatible with all internet explorer. It has the Web- Responsive design, i.e., the screens are automatically adjusted based on the size of monitor device. It can be used by students, lecturer and visitors. Fig. 1 shows the final use case diagram for academic staff app, fig. 2 shows the final use case for student app and fig. 3 shows use case for visitor app. Fig. 4 shows the user interface for log in page and fig. 5 shows the user Interface of the E-learning application main page.

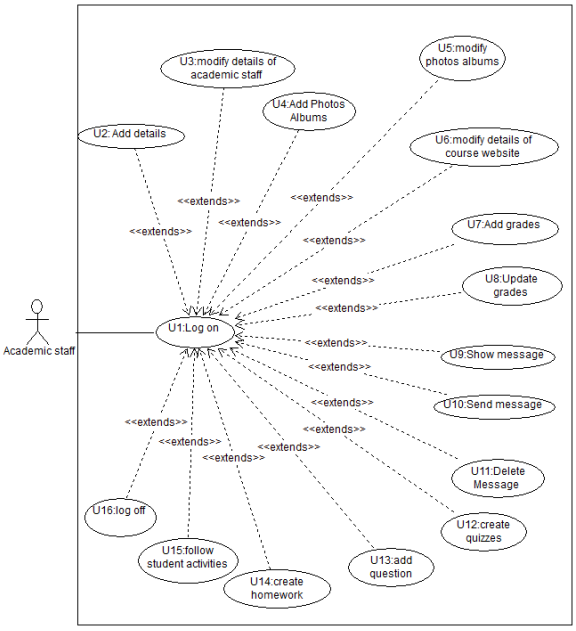


Fig1. *The final use case diagram for academic staff*

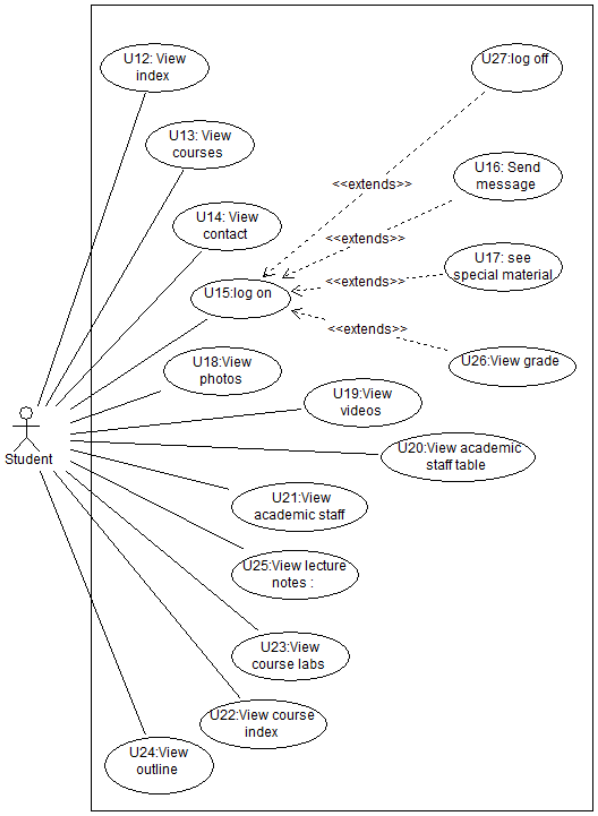


Fig. 2: *The final use case diagram for student*

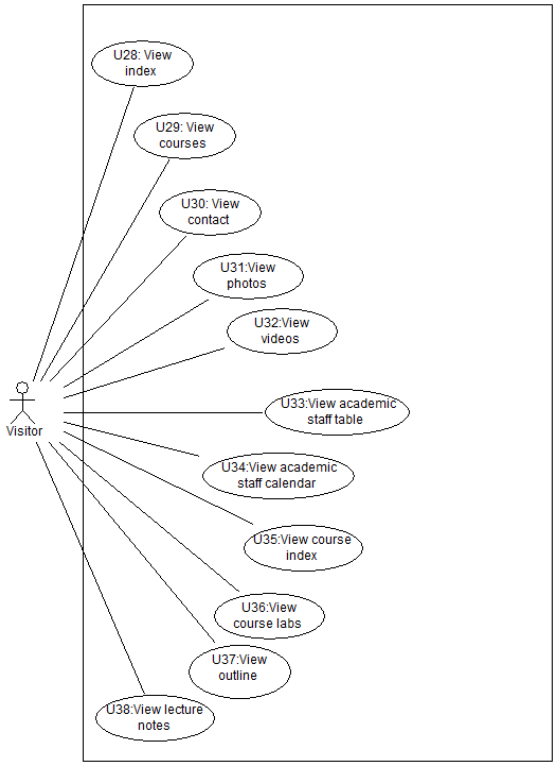


Fig. 3: *The final use case diagram for visitor*


Fig. 4: *User Interface for Login page*


Fig. 5: *User interface of the main page*

## IV. Development Envirnoment

The system is written in asp.net using C# language, the choice is dedicated by the fact that this language offers tools for easy creation of friendly user interfaces. The database is designed by Oracle 11G [20], [21] which makes database infrastructure far more efficient, resilient, and manageable. We used HTML 5 which is modern and support CSS3 for responsive design. The JavaScript is used to enhance the performance of the application since it is executed on users' computers when they access the page, this means that JavaScript will not add processing strain onto your server, hence, it is client-side. This allow sites to be much more responsive for the end user and less expensive in terms of server traffic [22]. Finally, Microsoft Visual Studio and Oracle SQL Developer were used [23].

## V. Testing

A number of different evaluation measures/tests have been used to measure the E-learning applications [24]. The main objective of the used tests is to ensure the proposed application has no erroneous, work correctly, fully integrated based on user requirements, finally, efficiently evaluate

performance and to achieve the best results. The most widely used and popular measures are evaluate business, functional and end user requirements.

*A. Integration Testing*

In this step, we check the performance of the system units when assembled/integrated together. We implement all the parts of the application, and try to detect the errors until they are fixed and make sure all parts are functioning properly and efficiently before implementing the system.

*B. System Testing*

The objective of this step to verify that either the application meets the functional requirements or not. The System Testing, enables you to test, validate and verify both the application architecture and industry requirements. A number of different tests have been used to test the system. The most widely used and popular tests are Usability Testing, Compatibility testing, Load Test, Stress Test, Security Test, Acceptance Test, User Acceptance Testing, Business Acceptance Testing [25], [26], [27]. In this section, we recall the used tests as follows.

1. Usability Testing

The purpose of this test is to measure how easy it is to use the system based on the principles of human-computer interaction (HCI). The test will recognize the ease of user interaction points such as data entry, screens, reports. We examine the usability testing by selecting five different users (two staff members and three students) to evaluate the usability functions in accordance with psychometric practice. Each of the feature questions is answered with Agree (A), Strongly Agree (SA), Undecided (U), and Disagree (D), and Strongly Disagree (SD), and Not Applicable (NA). The obtained results are shown in table I

Table 1: Usability Testing

| Usability Feature | Staff Members | | Students | | |
|---|---|---|---|---|---|
| | User 1 | User 2 | User 3 | User 4 | User 5 |
| In relation to other software I have used, I found the Application prototype to be easy to use | A | SA | A | A | SA |
| In relation to the Viewer, I found the Application easy to use | SA | A | A | A | SA |
| The menu items were well organized and functions were easy to find. | SA | SA | A | A | A |
| I immediately understood the function of each menu item. | A | A | A | A | A |
| All of the functions I expected to find in the menus were present. | A | A | A | A | SA |
| The buttons were well organized and easy to find. | A | A | A | A | SA |
| I immediately understood the function of each button. | SA | A | A | A | SA |
| All of the tasks hope anticipated to find on the button bar were present. | A | A | A | A | SA |
| I found navigating around the E-Learning application screen to be difficult. | U | D | SD | D | D |
| My overall impression of the E-Learning Application prototype is Positive | A | A | A | SA | A |
| Is the cursor placement consistent? | A | A | A | A | A |
| Is the control matched to user skill? | A | A | A | A | A |
| Are the results of control entry compatible with your expectations? | A | A | SA | SA | A |
| Does it provide flexible sequence control? | A | A | SA | SA | A |
| Are the menu options dependent on context? | A | A | A | A | A |
| Does the application provide flexible user guidance? | A | A | A | A | A |

2. Compatibility testing

The compatibility of the application is studied by visual inspection when running on different platforms (browsers and devices) are used. Based on visual inspection, it was obvious that, the application can run in different browsers and different devices with different screens size.

3. Load Testing

The goal of this test to determine how much the system can tolerate/hold out at a certain point of user load requests and find out how effective the application response. We examine the application in one of our courses named “Operating System” at the faculty of engineering and information technology when 10, 50, 100 users were signed in to the system

simultaneously. The system successfully handle all the users requests without any bug, the obtained result was satisfactory.

4. Acceptance testing

The objective of this test to determine whether or not the application has met the requirement specifications. The test to evaluates the system's compliance with the business requirements and verify if the required criteria's delivered to end users are satisfied or not. The acceptance test has been performed based on user acceptance and business acceptance. The application is divided into two versions, Beta and Alpha version. First, the application is examined within the work environment by using Beta version which was implemented for one course at the faculty of engineering and information technology. The obtained feedback is considered in the production of Alpha version to met the user and business acceptance.

5. Execution and Evaluation Test

The test is performed to ensure that the design and development of the application have been performed based on different aspects. Table 2 shows the Execution and Evaluation testing carried out.

Table 2: Execution and Evaluating Testing

| Feature | Result |
|---|---|
| Has the acceptance test been performed according to the test plan? | Yes |
| Have all steps of the test run been documented? | Yes |
| Have the users reviewed the test results? | Yes |
| Are the services provided by the system conform to user requirements stated before? | Yes |
| Have the users judged about acceptability according to the predetermined criteria? | Yes |

4. Security Test

Nowadays, the term security has been commonly used in different fields, the proliferation of digital documents, multimedia processing tools, the worldwide availability of Internet access and network technologies have shown the urgent need of the presence of reliable security in storage, transmission of digital data and data authentication [28], [29], [30]. Security testing is a technique that is conducted with the purpose of examining drawbacks in security mechanisms and finding the vulnerabilities or weaknesses of software applications. A number of different security tests have been conducted on the E-learning application. The main objective of the conducted tests were to ensure that the proposed E-Learning application is secure against several attacks. We use the VEGA tool to conduct the security testing due to difficulty of manual implementation. VEGA examine the system resistance against several attacks (Fig. 7 and Fig. 8) SQL Injections, Cross-Site Scripting (XSS), inadvertently disclosed sensitive information, and other vulnerabilities. The progress of security test is shown in Fig. 6, Fig. 7, Fig. 8, Fig. 9, and Fig. 10. Finally, the obtained result in Fig. 11 shows that the developed E-Learning system is secure against several attacks Fig. 11.

### C. *Environmental Needs*

For the use and test of E-Learning system, the user must have a personal computer or Laptop, Internet Browsers, Internet Connection. Free Testing Tools.

## VI. CONCLUSION

In this paper, we presented the design and implementation of E-learning system and staff websites called E-learning University System. The proposed system helps the lecturers to demonstrate and mange online courses. The proposed system allows an easy and interactive communication between students and lecturers to overcome the obstacles and restrictions in educational process. The proposed system has been tested to satisfy both user requirements and security.

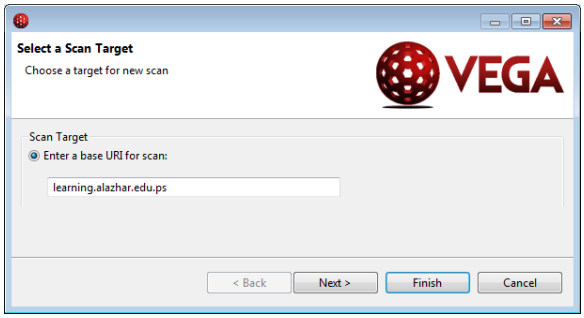


Fig. 6: *The scan target*

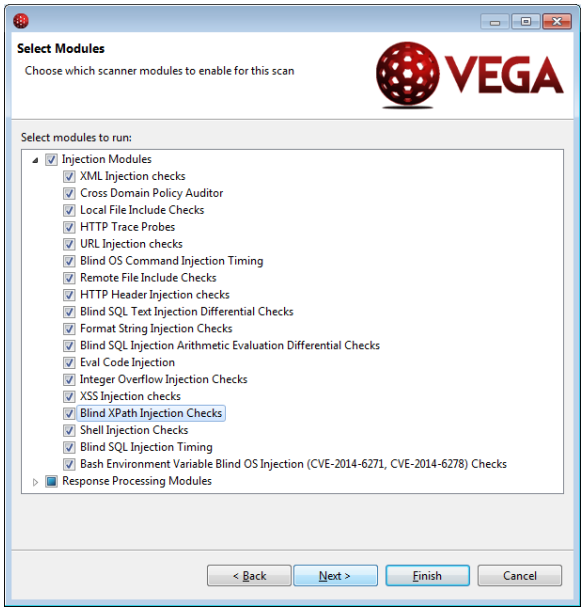


Fig. 7: *Selected Injection Modules*

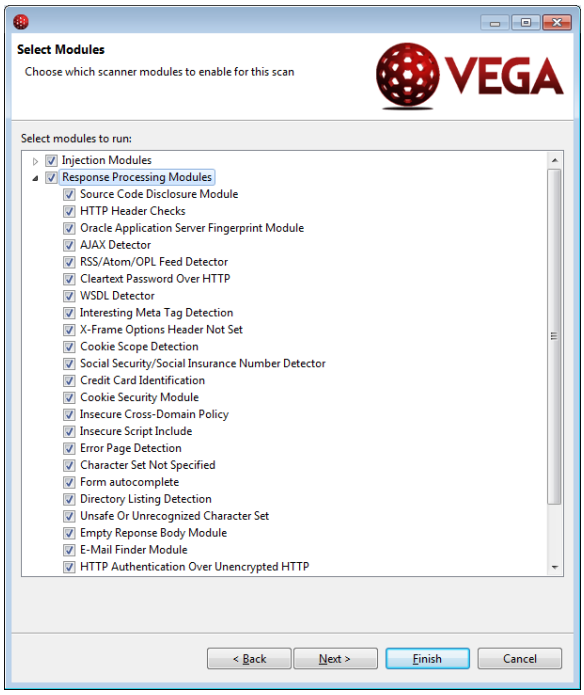


Fig. 8: *Selected Response Processing Modules*

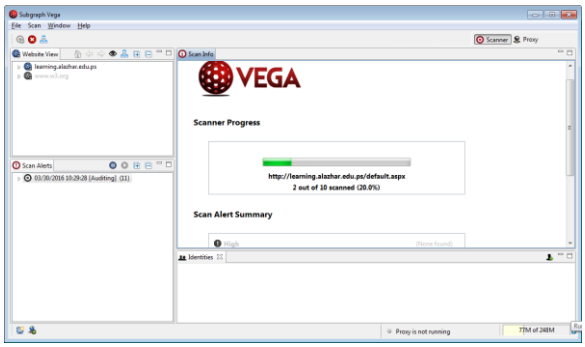


Fig. 9: *Scanner Progress for security test*

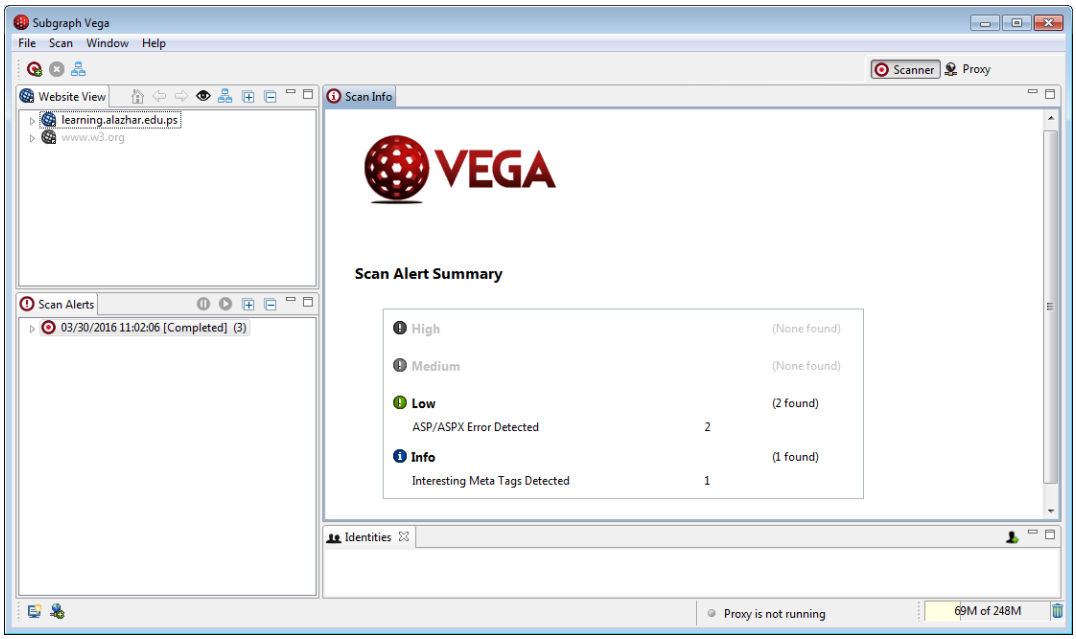


Fig. 10: *Scan alert summary*

## REFERENCES

[1] Maryam F. Khanghah, Siti H. Halili, Design and Development of Mobile Learning Application, The Online Journal of Distance Education and e-Learning (TOJDE), 3 (2), pp. 31-40, April 2015

[2] Kalloo, V. and Mohan, P., Correlating Questionnaire Data with Actual Usage Data in a Mobile Learning Study for High School Mathematics. Electronic Journal of e-Learning, 10(1), pp. 76-89, 2012

[3] Sam S. Adkins, The Worldwide Market for Self-paced eLearning Products and Services: 2010-2015 Forecast and Analysis. http://www.ambientinsight.com/Resources/Documents/Ambient-Insight-2010-2015-Worldwide-eLearning-Market-Executive-Overview.pdf (March 15, 2016)

[4] Global E-Learning Market to Reach US$107 Billion by 2015, According to New Report by Global Industry Analysts, Inc., http://www.prweb.com/releases/distance_learning/e_learning/prweb9198652.htm (March, 15, 2016)

[5] Spector, J. M., Foundations of educational technology: Integrative approaches and interdisciplinary perspectives. New York, N.Y.: Routledge, 2013

[6] Kenneth C. Laudon, Jane P. Laudon, Management Information Systems: Managing the Digital Firm, Prentice Hall; 13th ed., 2014

[7] http://www.efrontlearning.net/blog/2013/08/a-brief-history-of-elearning-infographic.html (February, 28, 2016)

[8] Rosenberg, M.J. E-Learning: Strategies for Delivering Knowledge in the Digital Age. New York: McGraw-Hill, 2001

[9] Hall, Brandon, Learning management and Knowledge Management. Is the holy grail of integration close at hand?, http://www.brandonhall.com. (April, 16, 2016)

[10] Hall, Brandon, E-Learning Guide. Six Steps to Implementing E-Learning. http://www.brandonhall.com. (April, 16, 2016)

[11] Wild, R.H., Griggs, K. A. and Downing, T, A framework for e-learning as a tool for knowledge management, Industrial Management & Data Systems, 102(7), pp.371-380, 2002

[12] Agboola, A.K., Assessing the awareness and perceptions of academic staff in using e-learning tools for instructional delivery in a post-secondary institution: A case study. The Public Sector Innovation Journal, 11(3), 2006.

[13] Cruthers, M., Education technology gives teachers a wider reach. ETNI, 5., 2008 http://www.etni.org.il/etnirag/issue5/mark_cruthers.htm (April, 10th, 2016)

[14] Vaughan, N. Perspectives on blended learning in higher education. International Journal on E-Learning, 6(1), pp. 81–94.

[15] Ghavidel, S., Farjadi, G., Razeghi, H., and Badiei, H., Forecasting of higher education demand for undergraduate and graduate levels in Iran's 2025 prospect. Quarterly Journal of Research and Planning in Higher Education, 18(1), 43-68, 2007

[16] Ali Rabiee, Zahra Nazarian, and Raziyeh Gharibshaeyan, An Explanation for Internet Use Obstacles Concerning E-Learning in Iran, The International Review of Research in Open and Distributed Learning, 14(3), 2013, http://www.irrodl.org/index.php/irrodl/rt/printerFriendly/1412/2540, (April, 10th, 2016)

[17] Rabiee, A., & Nazarian, Z, Obstacles to the privatization of higher education in Iran and presentation of appropriate strategies for their removal. Iranian Higher Education Quarterly Journal, 4(2), pp. 171-206, 2012b, Spring.

[18] Andersson, A., & Gronlund, A. A conceptual framework for e-learning in developing countries: A critical review of research challenges. The Electronic Journal on Information Systems in Developing Countries, 38(8), pp. 1-16, 2009

[19] Appana, S., A review of benefits and limitations of online learning in the context of the student, the instructor, and the tenured faculty. International Journal on E-Learning, 7(1), 5–22, 2008

[20] https://en.wikipedia.org/wiki/Oracle_Database, (December, 5th, 2015)

[21] http://www.oracle.com/technetwork/indexes/downloads/index.html, (December, 5th, 2015)

[22] https://docs.webplatform.org/wiki/concepts/programming/the_purpose_of_javascript, (December, 5th, 2015)

[23] Oracle SQL Developer User's Guide, Release 1.5, https://docs.oracle.com/cd/E12151_01/doc.150/e12152.pdf, (January, 15, 2016)

[24] D. Galin, Software Quality Assurance. Harlow, England: Pearson, Addison Wesley, 2004.

[25] NHS Shared Learning Quality Assurance Checklists for Evaluating Learning Objects and Online Courses, http://www.knowledge.scot.nhs.uk/media/4088630/quality_assurance_checklists.pdf (February, 16, 2016)

[26] Elizabeth A. Fisher , Vivian H. Wright Improving Online Course Design through Usability Testing, MERLOT Journal of Online Learning and Teaching, 6(1), http://jolt.merlot.org/vol6no1/fisher_0310.pdf

[27] Panagiotis Zaharias , Developing a Usability Evaluation Method for E-learning Applications: From Functional Usability to Motivation to Learn, http://dmst.aueb.gr/en2/diafora2/Phd_thesis/Zaharias.pdf

[28] Ahmed Mahmoud, 2012, Development of Matrix Cipher Modifications and Key Exchange Protocol, http://irep.emu.edu.tr:8080/jspui/bitstream/11129/120/1/Mahmoud.pdf (April, 17, 2016)

[29] Ahmed Mahmoud , Alexander Chefranov, A Hill Cipher Modification Based on Eigenvalues Extension with Dynamic Key Size HCM-EXDKS, I.J. Computer Network and Information Security, 2014, 5, pp. 57-65

[30] Alexander G. Chefranov, Ahmed Y. Mahmoud (ISCIS 2013) . Commutative Matrix-based Diffie-Hellman-Like Key-Exchange Protocol. Information Sciences and Systems 2013, Springer, Lecture Notes in Electrical Engineering 264, pp. 317-324.