

E-Learning In Jordanian Universities, The Case Of Al-Hashemite University

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Abstract- The emergence of the internet and widespread use of the web technology provide an opportunity for businesses to deploy technology features for new ways in education and training. This study explored the case of Hashemite University in Jordan and the implementation of their e-learning system. The study focused on two objectives: the first is to explore four dimensions of Khan's framework; the pedagogical, interface design, technological, and the evaluation dimensions. The second objective is to evaluate the e-learning system at HU for two dimensions: the pedagogical and interface design, and using different evaluation techniques. The results obtained from analyzing the pedagogical dimension show that e-learning system in Hashemite University has robust software system (Blackboard). Usability testing results indicate that the usability level of e-learning system in Hashemite University is moderate (0.59) but it is near to good. Free online testing tool showed that the usability level of e-learning website is high.

Keywords- e-learning, pedagogy, interface design, usability, Hashemite University.

I. INTRODUCTION

This research investigates the e-learning system in the Hashemite University (HU) in Jordan. The importance of this study is to highlight a specific strategy that leads to a good design for e-learning material; if the users are involved in every phase of e-learning material design, this will help design educational system that satisfies users' requirements, apply the human computer interaction principles, and reduce the evaluation cost. This study utilized Khan's e-learning framework (2005) which includes 8 dimensions: pedagogical, technological, interface design, evaluation, managerial, resource support, ethical and institutional. Various factors discussed in the eight dimensions of the framework can provide guidance in the design, development, delivery and evaluation of e-learning environments.

This research has two objectives: the first is to explore four dimensions of this framework; the pedagogical, interface design, technological, and the evaluation dimensions. The second objective is to evaluate the e-learning system at HU for two dimensions: the pedagogical and interface design, and using different evaluation techniques.

II. LITERATURE REVIEW

The new achievements in the information and communication technologies (ICT) allow universities to satisfy the needs of students who wish to study any time and place [1]. Worldwide, the e-learning market has a growth rate of 35.6% [2]. In 2005, about 3.2 million students had one or more online courses in the United States [3]. Part time students can easily access their courses overcoming many barriers of traditional education [4]. A successful e-learning system relates to a systematic process of plan, design, development, evaluation and implementation of effective and efficient online learning environment [5].

Educational material, if effectively designed, will facilitate the achievement of desired learning outcomes for students.

Reference [6] alleged that the construction of e-learning system is still carried out without a systematic approach to the development process; resulting in poor analysis, design, and evaluation. Effective design of e-learning material relies on instructional design processes that reflect the absence of reduction in face-to-face instruction [7]. With the increasing number of institutions adopting e-learning strategies, their success depends not only on the availability of technology but also the innovative ways to integrate technology into the learning experience. Pedagogical practices must be adapted, and a reliable and robust technical infrastructure must be maintained in order to utilize e-learning effectively [8].

Paying attention to the core elements of e-learning material design can reduce the gap between educational intention and the reality of student experience. E-learning is not simply a matter of digitizing traditional material, but involves a new approach which must take into account many issues to form a well-designed educational system. The design phase means planning e-learning material [7]; much deliberation in the literature concerning e-learning material design. Discussions of many considerations related to technological, organization, pedagogical, media options, and the evaluation elements that should be considered in design.

II.I Pedagogical Dimension

According to reference [9] it is very important to first know the pedagogical objectives, and the various web strategies available. The designers should make clear the objectives they want to achieve. Second, and based on such objectives, decide what type of interaction students will experience via the web. And third, choose the best matching web resources to develop online activities. Reference [10] work described the pedagogical approach used by educational experts in designing and developing teaching material in an e-learning environment. The theoretical content and practical content forms the framework for the material used by the e-teacher and the e-learners. The theoretical content refers to: 1)

theoretical aspects of the program and mastery of knowledge; 2) psycho-pedagogical aspects: structure aspects, quantity, external links, internal connections and format of the content. The practical content is based on the following: 1) planning of activities: initial explanations, objectives (practical aspects); 2) design of the activities: personal implications, time dedicated to their realization. Another issue that the designer of e-learning material should consider is the interaction issue, i.e. interaction between students and teacher and between students and content [10].

II.II Technological Dimension

Computer technology is the major component that assists instructors in delivering educational material. The real question for instructors and course designers is how to incorporate technology in order to effectively deliver course material [11].

Under this dimension there are a number of issues considered for delivering e-learning material effectively, the first is *infrastructure planning*, which is a combination of hardware and software used for creating online teaching material [12]. Infrastructure must address organization's existing culture, process, and structure that will contribute to e-learning success or failure [13]. This requires adequate bandwidth networks, course management systems, technically equipped classrooms, and adequate computing equipment [14]. Reference [15] argued that a good design of e-learning is attained through a comfortable access to learning material.

The second element is *hardware requirements*; which depend on factors such as the capacity for integration, reuse and maintenance of the system, and guaranteeing its interoperability with respect to existing web and informatics architectures adopted in the future [16]. Other hardware requirements that need to run e-learning applications are: amount of memory, data storage capacity, networks, amount of RAM, amount of hard disk storage, graphic accelerators, and sound cards [17]. Finally, the last element is *software requirements*; where E-learning systems require at least an operating system and other special utilities needed. E-learning industry needs effective manageable system to monitor the learners, learning, measure it, and provide reports on learning efficiency. Learning Management System (LMS) allows individuals to develop, deliver learning content, interact with students, and facilitate open discussions [18]. Some LMS features are more technically sophisticated, such as holding virtual office hours, reminding students about the deadlines, and dividing students into groups for online projects. It is important to determine the teaching needs of the faculty at universities before designing such systems [19]. Examples of e-learning systems that are currently used in higher education are the following: WebCT, TopClass, LearningSpace, Blackboard, Virtual-U, and FirstClass Classrooms.

II.III Interface Design Dimension:

User Interface Design (UID) is the structural design of an interface that presents the features and instructional support of an information system [20]. The design of user interface should be user friendly, easy to navigate, accessible, and provides a sense of human interaction and responsiveness.

User interface provides, with each online lecture, multimedia features and buttons for navigation, interactivity and animations that encourage active participation in e-learning [21].

Reference [5] categorized page and site design, content design, navigation, accessibility, usability testing as sub dimensions under interface design dimension. Scholars used these sub dimensions and interface design dimensions as criteria for e-learning system *usability*. Involving users in every phase of design reduces their efforts in understanding the system, solves expected problems in design, allows for better learning process, and reduces the evaluation cost [22].

II.V Assessment Dimension:

This dimension deals with two issues: *assessment of learners* and the *evaluation of instructions and learning environment*. Reference [24] defines the assessment of learners as a tool for measuring learning; it collects information about students' learning achievements and shows the teaching effectiveness of instructors. Instructional designers struggle to make learners assessment as anything more than a multiple choice test, because multiple choice test items mainly measure low level retention of isolated facts [25]. Evaluation of instruction and learning environment is related to students' level of interest in online learning and ease of locating information which is affected by the organization of information, site navigation and clarity of instructions. Also the instructional design has been found to be a key characteristic of student satisfaction [26]. Students' evaluations provide data that serves a variety of purposes including the revision of courses, programs and instruction, institutional accreditation, and instructors' performance [27].

II.IV Evaluation Process, Dimensions & Attributes

Evaluation of e-learning system is necessary to measure the success of implementation in the selected environment. Several dimensions need to be included in the evaluation of e-learning courses such as content, user-system interaction, software, usability and other dimensions. This research focused on two dimensions: pedagogical, and interface design dimensions of the e-learning courses used in the Hashemite University.

A. Pedagogical Evaluation

This study combined the Pedagogy Effectiveness Index (PEI) and the Conversation Model (CM) in the evaluation process. The CM supports learning through dialogue between teacher and student, using discussion boards as an example. This model uses the conversation style for learning depending on many learning styles like cognitive perspective, behavioral perspective, and constructivist perspective. On the other hand, the PEI emphasizes different learning styles that engage students in interacting with material itself, other students, and the teacher. The PEI is applicable in the use of discussion forums, online collaborative activities, and chat. Both models support the interactive aspects of learning such as animations, video, and simulation. Also, both models provide feedback on e-mail exchange, discussion forum, and bulletin boards. Based

on the two models, the study used the following evaluation factors: media, interaction, adaptability and reflection.

B. Interface Design Evaluation

Usability, according to ISO 9241, is a complex outcome of effectiveness, efficiency, and satisfaction. These features are present also in the Formative Evaluation where effectiveness is the achievement of instructional objectives, efficiency represents how quickly learning objectives are achieved and satisfaction describes the user’s interest and desire in learning [22]. Usability is categorized into seven categories (criteria), described as follow: content and organization, visual design, navigation, accessibility, interactivity, learnability, and motivation.

III E-LEARNING SYSTEM IN HASHEMITE UNIVERSITY

The Hashemite University in Jordan established an e-learning center to manage e-learning infrastructure, training, course/curriculum development, and support practices (www.el.hu.edu.jo). The center’s mission is to provide quality education that is accessible anywhere, anytime and to promote and support the effective use of technology in the curricula through improvements in existing programs and the creation of new technology opportunities for faculty, students and the community. The Hashemite University encourages students (on campus and off campus) to use the e-learning system because it encompasses freedom, flexibility and power to break free from the conventions of traditional learning methods. The Hashemite University provides infrastructure requirements in order to support e-learning using a set of tools and e-learning management systems including the following: Blackboard.Inc, Lectora, Elluminate Live, and Tegrity_

IV RESEARCH METHOD

Two models from the literature were used to evaluate the e-learning system: Pedagogy Effectiveness Index and conversational model. In the first stage pedagogical evaluation criteria was used including media, interaction, adaptability, reflection that discussed earlier to evaluate the software system that is used in Hashemite University which is Blackboard academic suite. The purpose of this step was to show if the software system and its tools used in Hashemite University support these criteria.

The second testing technique was an empirical test using a survey filled by students who use the e-learning system. This survey is developed depending on standard criteria and checklist [26], [23], [31], [28], [30], [29], [32]. Two versions of the survey were used; an English and Arabic language survey and both were distributed in paper form. The survey is divided into two main sections: demographic information and usability construct, which contains (28) items, utilizing a Likert scale from 1 to 5. The scale ranges from strongly disagree as (1) to strongly agree as (5) with corresponding levels as in Table I.

After converting all answers to their corresponding merits and according to [30], points of any usability criterion, x , is

defined as: $x = [S(\text{Merit for each question of the category})]/[\text{number of questions}]$

Then the result of this formula can be represented into five quality levels as described in Table II where the lowest level is the bad usability quality level and the highest level is the excellent level. These usability quality levels describe how much the e-learning system is accepted.

TABLE I
SCALE CORRESPONDING MERTIS

Response	Meaning	Merit
1	Strongly Disagree	0
2	Disagree	0.25
3	Neutral	0.5
4	Agree	0.75
5	Strongly Agree	1

TABLE II
USABILITY CRITERION POINTS and QUALITY LEVEL

Points of Usability Criterion (x)	Usability Quality Level
$0.0 \leq x < 0.2$	Bad
$0.2 \leq x < 0.4$	Poor
$0.4 \leq x < 0.6$	Moderate
$0.6 \leq x < 0.8$	Good
$0.8 \leq x \leq 1.0$	Excellent

Online testing tools are another technique used to assess website factors. These tools are free, available, and widely used. Several website usability evaluation tools are available such as WAMMI which was developed by Human Factors Research Group (HFRG). WAMMI is based on a questionnaire filled by visitors of a website, and gives a measure of how useful and easy it is to use the visitors found about the site [30]. Other like W3C validator (W3C Org, 1994-2008) that checks the markup validity of Web documents in HTML, XHTML, SMIL, MathML, etc. In addition, the Html ToolBox is developed by the NetMechanic (1996-2007) foundation by Keynote Systems Inc. in May of 2002, which is the largest, independent provider of website tools. The Html ToolBox is an automatic, easy web tool that tests and with possibility of repairing HTML code, also it checks the sites’ spelling, browser compatibility, load time, and finds broken links.

V DATA AND RESULTS

V.I Pedagogical Evaluation Results

Blackboard Learning System in Hashemite University allows instructors to create, deliver, and manage web-based components for e-courses. It can be used to add online elements to a traditional course, or to develop completely online courses with few or no face-to-face meetings.

The ways that course contents is presented to students will reflect the teaching style of the instructor, i.e. if the course contents supports animation, simulation, video and audio, the instructor has role to select a method of organization that best fits the goals of the course. Content for Blackboard courses

can be created directly within the course, or it can be created using other applications such as word processing, spreadsheet or HTML authoring tools and then uploaded into the course. Links to content on the internet can be incorporated inside a course to bring it directly to students.

Based on reference [33], Blackboard has many communication tools that allow instructors to participate in activities, engage with students and adhere to course objectives. Also, research has shown that using Blackboard would empower students to interact and collaborate with each other [34]. Communication aspects available for students at Hashemite University include the following: e-mail communication, discussion boards, collaboration tools, rosters, messages, and group tools.

V.II Adaptability Evaluation Results

Reference [33] proclaims that Blackboard is highly adaptable. The instructor has flexibility to structure the course content in a hierarchical form, using Units of Learning Material (UML) tool. Also, he/she can update and edit the course content to meet course objectives.

V.III Reflection Evaluation Results

Research results stress the importance of feedback mechanism available in Blackboard systems; direct feedback can be provided when using Blackboard's Test Manager Function for quizzes and exams [34]. Students can take their tests and have all objective based questions graded immediately after they submit their answers. Essay questions must be graded individually, students can review sample answers in order to have a good idea of their outcome on the test. Also, Blackboard allows students to submit their homework assignments from anywhere and see if the assignments they have submitted have been graded. Using the Blackboard Gradebook, assignments and grades can be viewed confidentially.

From the results of 2008 survey [35] identified Blackboard as one of the most used enterprise or institutional virtual learning environment. And it remains the market leader, arise to 50% from its 43% score in 2005. Blackboard comes out as the leading institutional platform 47%. It is predominantly amongst 56% higher educational colleges.

V.IV Survey Results:

The empirical test used to evaluate the usability of Hashemite University e-learning system utilized students' opinion about e-learning system. 102 responses were analyzed with respect to their age, gender, study year, and college. The following table describes the sample demographics:

TABLE III
SAMPLE DEMOGRAPHICS

Demographic Factor		%
Gender	Male	39
	Female	61
Age	18 years	21
	19 years	27
	20 years	23
	21 years	19
	> 21	10
Year of Study	First year	43
	Second year	29

	Third Year	22
	Fourth Year	6
Faculty		%
Applied Health Sciences		3
Economics and Administrative Sciences		37
Faculty of Science		10
Faculty of Medicine		3
Faculty of natural resources		6
School of Nursing		5
Faculty of Information Technology		17
Faculty of Engineering		5
Faculty of Childhood		3
Faculty of Educational Sciences		11

V.V Usability Results

Usability factor was evaluated using the survey, which contains seven sections: Content, Visual Design, Links and Navigation, Accessibility, Interactivity, Learnability, and Motivation to Learn. The students' responds or answers are analyzed by using statistical measures-numbered scale measure. Table IV describes all results of this factor and its categories.

Table IV shows the results of usability factor. The total usability qualitative rate is 0.59 which indicate the usability quality level of e-learning system in Hashemite University is moderate. The highest usability quality rate is .65 for navigation and links category, and the lowest usability quality is .53 for interactivity category. Reasons for this low interactivity level might be the instructors' need for more training and awareness on how to use e-learning systems in way that enrich the teaching process by utilizing the features and benefits of e-learning system that increase the attention, and maintain motivation of learners.

TABLE IV
USABILITY DIMENSIONS' POINTS and QUALITY RATES

Dimension	Usability Points	Quality Rate	Result
Content	406.25	0.57	Moderate
Visual Design	256.00	0.63	Good
Links & Navigation	263.75	0.65	Good
Accessibility	179.00	0.59	Moderate
Interactivity	107.75	0.53	Moderate
Learnability	130.25	0.64	Good
Motivation to learn	226.75	0.56	Moderate

V.VI Usability Testing Tool Results

HTML-ToolBox is an online tool used to evaluate the e-learning system website in Hashemite University. It is a free online testing tool which is used to test load time, browser compatibility, Html code, and links error. The test was conducted on Wednesday, May 06, 2009. Table V presents the results of this testing tool. The table indicates the e-learning system website has minor problems; no error in the language used, no bad links in the website, one problem in browser compatibility, and seven errors in Html code.

TABLE V
HTML TOOLBOX RESULTS

Factor/Measure	Result
Load Time	1.30 seconds
Browser Compatibility	1 problem
Spell Check	0 errors
Link Check	0 bad links
Num. of Html Errors in Code	7 errors

VI CONCLUSION

This study has two objectives; the first objective is to describe effective ways for designing e-learning material as shown in the literature through applying Khan's framework and focusing on specific dimensions that are important when designing e-learning material. The second objective is to evaluate the e-learning system from two dimension: pedagogical and interface design which is evaluated based on usability factors,. This research explored Hashemite University as a case study to evaluate its e-learning system. The first objective is analyzed through Khans' framework and literature review. The second objective is measured through models adapted from literature and by using questionnaire technique and free online testing tools. This study deduced a number of recommendations, in order to improve Hashemite University e-learning system especially in the usability dimension.

The results obtained from analyzing the pedagogical dimension show that e-learning system in Hashemite University has robust software system (Blackboard). It continues as one of the most used enterprise or institutional virtual learning environments through its wide range of supports and features to instructors and students.

Usability testing results indicate that the usability level of e-learning system in Hashemite University is moderate (0.59) but it is near to good (as concluded from students' responds). Free online testing tool showed that the usability level of e-learning website is high.

VII RESEARCH LIMITATION and RECOMMENDATION

There are a number of limitations that face the implementation of this research. The most significant limitation is time; this research needs a long time to finish it. In design phase, literature review section, there are some dimensions are not covered. In evaluation phase, methodology section, two dimensions are covered.

The following for improving e-learning system in Hashemite University are based on the results and the analysis described in previous sections:

- 1) The e-learning system in Hashemite University is new experience, so the level of usage of e-learning system features depends on instructor's desire; therefore they need more training and education about how to use this system to enhance the teaching process.
- 2) The Hashemite University needs to increase the instructor's and student's awareness about the importance of e-learning system in higher education development.

- 3) The instructors need to prepare teaching contents that have simulation, activities, case studies that increase the students' motivation to learn.

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