Website Development Life Cycle

New Proposed Model for Developing E-learning Website

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Abstract—Abstract Due to the increasing need for education and the increasing spread of technology, there has been a trend towards Electronic learning (E-learning), because of the ability to obtain information at any time, any place. Some of the problems and challenges associated with some websites that offer this kind of education are related to hardware, software, design and issues in operation and maintenance. The researcher proposed Web Development Life Cycle (WDLC) model to facilitate the development of an E-learning website and create it step-by-step to decrease cost, time and requirement efforts.

Keywords-component; E-Learning, SDLC, E-learning website, User Interface

Introduction

Developing enormous adaptations in various fields is the feature of our lifetime, especially in technological and electronic area. Because of these developments, E-learning presentations transfer from working on computer devices in closed rooms to the internet and mobile through networks and modern applications.Education in different levels, especially higher education, has been moved to E- learning environment as a supportive technique, or as a primary education method in different educational institutes, companies and organizations for those interested in learning and providing E-learning teaching techniques. Research is often focused on challenges within the E-learning with regards to problems that may appear when using this method of education and learning. Most of researches focus on these problems from one point of view. The researcher in this study tries to present these problems, explain additional challenges, propose development model, and provide some guidelines to decrees those problems and challenges in E-learning environment. The researcher, through proposed model, tries to achieve a successful E-learning (easy to use, flexible, simple design and get more interactive website) platform.

I. E-LEARNING

A. E-learning in general

E-learning definitions are presented by different papers and researchers.

"E-learning becomes more widely accepted and more courses are offered online, Geographic limitations between institutions and students are removed [30]. "Today E-learning is one of the mostly used phenomena in the internet world. Higher education institutions, businesses and trainers are increasingly going online in order to provide cheap and flexible online education and training" [2].

The broader definition is; E-learning can contain the use of the Internet, intranets/extranets, audio- and videotape, satellite broadcast, interactive TV, and CD-ROM, not only for comfortable delivery, but also for interaction between members[16].

The most important advantages of E-learning are

- "Quickly and effectively improve students' knowledge level" [22].
- "E-learning has an advantage of allowing for learners to study at any time and any place" [25].
- Provide an opportunity for learners to interact electronically with each other on the one hand and between them and the teacher on the other hand [3].
- Provide a flexible learning environment, and prepare qualified and skilled staff to use the strategies and methods of modern teaching [3].
- Cost effective learning style. "Through E-learning, more participants can be trained at an Affordable cost" [31].
- E-learning is less expensive to produce as compared to traditional learning. Most of the E-learning programs can be joined and studied when they are needed [1].
- There is no communication gap. E-learning provides a consistent messaging. It minimizes the problems related with different instructors teaching style, because everyone has their own teaching style and knowledge material on the same subject [1].
- "Learners regardless of where they are receive the same message and are able to engage other learners and practitioners globally"[17]

B. E_learning types

- Computer-based learning

It is a method of education in which a student learns by

using different style of learning and introduced by different computer applications with or without network: like presentations, multimedia- Audio, video and other applications. "Computer-based learning sometimes abbreviated to CBL; refers to the use of Computers as a key component of the educational environment" [21].

- *Computer hardware limitations*.

Hardware may consider as one of E-learning laminations especially in computer-based learning, the speed and technical problem may effect on effective learning. According to Arabasz, people who interviewed discussed several thinks about E-learning challenges; one of them they noted student technical infrastructure limitations such as lack of bandwidth and computer hardware limitations [6]. There is a gap between Information and communications technology (ICT) infrastructures in different countries. "It can be derived that investments into educational institutions for ICT infrastructure are more productive rather than helping on individual bases" [2]. "Technology such as videos can help blend classroom-based and E-learning and get the best of both worlds. As there is a shortage of good trainers and not everyone can have the live experience, technology allow people to share the best resources that we have available" [9].

- *Network based E-learning*

Computer network-based learning is broadly used in recent years because of its flexible and gives more group collaboration activates. "The advantages of E-learning system from its networked environment where rapid updating, sharing of information and instruction are conveniently performed. It promotes a team-learning pedagogy in which the primary focus is to foster a learning environment conducive to group interaction through collaboration and self-learning [14].

- *Web-based E-learning*

It is part of network-based E-learning; the main feature of web-based learning is that it allows flexibility in learning at any time and any place."The web can also support various forms of communicative features that can connect lecturers and students for teaching and learning activities. Features such as the synchronous learning activities (computer conferencing, chats, and web tutorials) and the asynchronous learning activities (e-mail, list servers and web courses) provide means of effective communication and reinforce the teaching and learning conducted through distance education"[7]. Web-based learning now has different Alternative names. "Synonyms for web-based instruction also include E-learning, online teaching and learning, distance education, distance learning, Web-based training, computer-assisted learning, computer-assisted learning, flexible learning, and technology-rich instruction" [20].

II. Learning Environment

A. Content Classification & Analysis

Asynchronous and synchronous content delivery:

- Asynchronous content delivery occurs at a different time than receipt by the student lecture module delivered via email.
- Synchronous content delivery occurs at the same time as receipt by the student lecture delivery via web cast -students use an application at the same physical location as other students and/or the instructor [30].

B. Content warehouses

Content warehouses can be developed and become available to professionals that use any application based on the common standards [22]

C. Course and content delivery:

Course and content delivery require additional attention through E-learning class than traditional class. Andersson and Gronlund discussed some paper as follows "There are discussions on the need to develop new curricula specifically designed for an E-learning setting; thereby showing awareness that E-learning is different from traditional class-room based teaching"[5].

III. E_Learning Managment Systems & Accessibility

Easy use of learning management systems (LMS); "The use of LMS can ease the distribution of course materials and the communication among students or between students and staff" [25].

- *User Interface (UI) design*

Marcus developed five components of user interface design [19]. These components are useful in all stages of development: (planning, research, analysis, design, implementation, evaluation, documentation, training and maintenance).

1. Metaphors: Essential concepts conveyed through images, words, sounds, touches, and even smells.
2. Mental model: Organization of data, functions, content, tools, tasks, roles, and people.
3. Navigation: Techniques of moving through the mental model, such as links, buttons, dialogue boxes, panels, and windows.
4. Interaction: Techniques of input, output, and the overall behavior of systems.
5. Presentation: Visual appearance characteristics, such as typography, color, Layout, sequencing; verbal characteristics, tactile characteristics, sonic, characteristics and aromatic characteristics [19].

IV. E_LEARNING WEBSITE TESTING, MAINTINENCE AND TRANING

A. *E- Learning website testing*

Usability test is very important issue in E-learning website, it should be Free of error and easy to use by participator because the cost and time of repair the website is more that the cost of testing. This idea was introduce by researchers "For administrators, the cost of not testing can be greater than the cost of testing [8], [23] in terms of retention, accreditation, institutional reputation, and competitiveness [24]" [12].

B. *E- Learning website maintenance*

"An E-Learning maintenance strategy is a project deliverable that looks both into the future and back to the past. When building the original eLearning course, it helps ensure you're considering future maintenance issues in your current design"[26].Other researcher added that "The longer-term maintenance issues can range from basic text and graphic changes, to editing complex animation and video, to wide-scale translation and localization requirements" [26].

C. *E- Learning website Traning*

Three related dimensions in E-learning environment

- *Teacher*

"In conventional classrooms, a teacher's job is to "tell", and students' tasks are to "listen" and the learning objectives of students are set by the teacher and institution. As a result there is a less interactive environment in the class, which makes the students less involved"[18]. The roles of teachers in e-learning classroom are different from traditional one, "Their role has become far more challenging than ever before. From course 'teller' now they have become course designer, developer, organizer and coordinator" [2].

Also e-learning environment need more time from teachers to preparing and developing courses matters. "The teachers' qualification and competence, in general and in online teaching in particular, and the time they have available for developing and taking part in E-learning courses matters" [5].

- *Learner*

Broadbent, 2002 introduced that "In traditional environment learners totally depends on the teachers' initiatives and ideas" [2].

All learners and teachers need the following

1. Easy Access E-learning website
2. Interactive website
3. Suitable cultural website
4. Website that contain suitable functions
5. Suitable design , functions and program compatible with common infrastructure(computers, server, etc)

V. SYSTEM DEVELOPMENT LIFE CYCLE (SDLC)

There are different definitions for SDLC; it defines as a logical process that used to develop system, waterfall model is a popular version of the systems development life cycle model for software engineering, [15], [29]. Waterfall model contains a sequence of phases that must be accomplished in sequence [11]. It includes the following phases; requirements and analysis, design, implementation, testing, deployment and maintenance. Figure 1 showes waterfall from IBM study on software models [11].

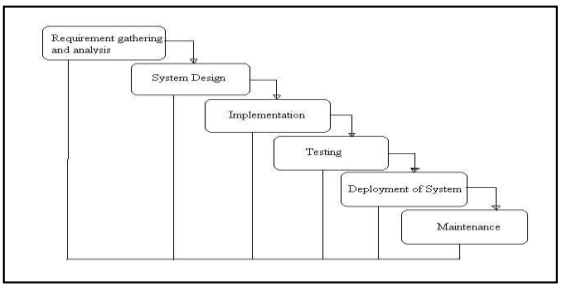

Figure 1: Waterfall Model [11]

VI. Research Problem

As a research domain, E-learning is complex and multi-dimensional fields. It covers variety of research topics, from those that focus on technological infrastructures to those with wide socio-cultural implications [13]. A lot of papers presented different types of E-leaning limitations; this study summarized those limitations and problems from previous studies and different observation from direct dealing with students and learners. Research problem can formulated as the following question

- Does the developer of E-learning website can integrate solution for all related problems (website design, website maintenance, content management and others) in design and developing environment?

VII. Proposed Model

Due to the large number of problems and challenges facing the E-learning, there is need of a new model to explain the basic phases that study specific problems that may arise at each phase and try to avoid them before moving to next phase. The software products go over the various phases in SDLC model and therefore, the researcher suggests a number of phases that we can go through to build an E-learning website model focused on E-learning systems needs and

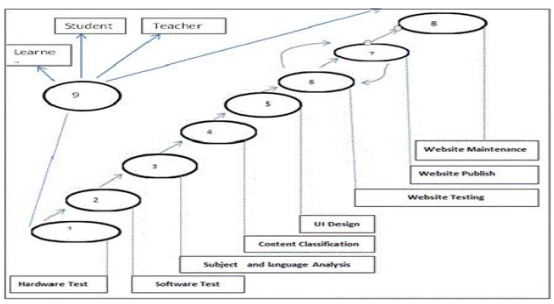

Figure2. Phases of E- Learning Website Development Life Cycle

requirements.

The Integrated model of hardware, software, design and other activities give successful E-learning website.

TABLE I. WDLC PHASES AND ROLES

Phase	Role
Hardware	Testing ICT; Hardware, servers and devices in first stage of constructions to save time and money. "stresses the need for the universities to develop in order to reach an acceptable and capable level of ICT infrastructure as this will make the e-learning delivery process as smooth as possible"[4].
Software/ Programming language	Testing suitable software to design and implementing E-learning website to save time and money.
Subject analysis and language	Subject analysis, "E-learning is just-in-time education integrated with high velocity value chains. It is the delivery of individualized, comprehensive, dynamic learning content in real time, aiding the development of communities of knowledge, linking learners and practitioners with experts"[28]. Language is a significant component to take into account in addition to visual objects in E-learning website.
Content classification & analysis	Web classification defined as "Web page classification is a type of supervised learning problem that aims to categorize web pages into a set of predefined categories based on labeled training data" [27] and it's important for retrieve information. "Classification of web content is essential to many information retrieval tasks" [28]. It also beneficial for search functions.
User Interface Design	All User Interface components (Metaphors, Mental Models, Navigation, Interaction and Appearance [19] should be taken into account based on target users and their culture.
E-learning website testing	This study "investigated the effectiveness of implementing usability testing into online course development for Improved course design"[12], and finding that "Findings indicated that usability testing may provide a model for improved online course design"[12]. Usability test (UT) for E-learning can - Advance the educational knowledge. - Increase learner outcomes. - Influence student acceptance.
E-learning website publish	Putting short-term and long-term maintenance strategies can save time and money of redesign and reconstruction.

Jackson (1999) provides us with the following definition: An Expert System (ES) is a computer program that represents and reasons with knowledge of some specialist subject with a view to solving problems or giving advice"[10].

Novice developers need to collaborate with experts in hardware, software, design, operation, and maintenance, therefore E-learning system creators can use expert system knowledge in each phase of E-learning website development system (for example, suitable hardware, software and design) to achieve the development goal in professional manner.

VIII. Conclusion

This paper presents different problems and challenges related to E-learning websites, some of these problems are taken from a survey of E-learning papers and others from observation in the academic field. A new research model is displayed in this study to accomplish the goal of a successful E-learning platform in graduated steps. This model minimizes unnecessary use of time and money resulting from the lack of organization and planning to build an E-learning site, which may require re-work in some aspects. In addition, developers can use expert systems, which are considered as a guide for developer in stages such as, choosing appropriate software , hardware, helping in design aspects (for example: color, shapes), and support in different model phases.

IX. Future Work

Researcher suggests an implementation of an ES application (using Prolog programming language) based on this model. It is effective at every stage by giving knowledge to developer that may require in each specific phase. This ES system will direct the researchers and developers to work together to add their experience from different areas (software, hardware, design and networking) to this system, to help developers in any place and any time to do their task perfectly.

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