E-Learning Design in Malaysian Higher Educational Institutions: Principles and Guidelines

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Abstract: E-learning is a recent learning tool that can be engaged with via websites through the Internet. Therefore, there is a need to identify various factors that will affect students while accessing learning resources from websites. In Malaysia, many educational institutions will be required to implement or improve the e-learning techniques in their education system. A specific guideline on the design process of e-learning websites to accommodate developers is required. This paper aimed to identify and examine the basic principles, user interface design guidelines, and challenges of integrating e-learning in Malaysian higher educational institutions. The results of the study indicate that there is no specific design standard for e-learning in Malaysian higher educational institutions. The basic components of e-learning include infrastructure, the platform, and content development as outlined by the Malaysian Higher Education Ministries. The design process of user interface design for e-learning would benefit from adding localization elements to be included as a guideline.

Keywords: localization, web objects, website, university.

马来西亚高等教育机构的电子学习设计：原则和准则

摘要：电子学习是一种最新的学习工具，可以通过互联网通过网站进行使用。因此，在从网站访问学习资源时，需要确定将影响学生的各种因素。在马来西亚，将要求许多教育机构在其教育系统中实施或改进电子学习技术。需要针对电子学习网站设计过程的特定指南，以适应开发人员的需求。本文旨在确定和研究基本原理，用户界面设计指南以及在马来西亚高等教育机构中整合电子学习的挑战。研究结果表明，马来西亚的高等教育机构没有专门的电子学习设计标准。电子学习的基本组成部分包括基础设施，平台和马来西亚高等教育部概述的内容开发。用于电子学习的用户界面设计的设计过程将受益于添加本地化元素以作为指南。

关键词：本地化，网页对象，网站，大学。

Introduction

Technology has rapidly changed in recent years, and the learning processes have also been transformed to incorporate the use of the Internet and digital devices [28]. Many schools and colleges have transformed their learning management systems from a physical medium to virtual servers. The increasing knowledge about how to create content and deliver more e-courses effectively has also made the e-learning process grow rapidly. The e-learning system is based on collective intelligence that can be obtained through the Internet using digital devices to access learning anytime and anywhere [10]. Today, more than 90% of students have access to the Internet, and they can also visit websites to access Internet resources [20]. The Internet creates a network that delivers learning facilities to the online servers for easy access by students. Network technology also facilitates the delivery of comprehensive, individualized, and dynamic learning content in real time, thus promoting knowledge in our community [25].

Indeed, the adoption of e-learning technology has increased the number of universities and institutions of higher learning across the world. There are different types of e-learning systems, such as Second Life and Blackboard [1]. Both kinds of e-learning are used for attending lectures, doing assignments, and many other learning services. The Second Life platform was developed for public use, but few developments were added; today, it is used for education and training [27]. The features in Second Life incorporate the use of the 3D technique, thus creating a conducive learning environment for the students.

The success of the e-learning system depends on the understanding of various factors influencing the student's usage and acceptance of a given e-learning system. This paper will analyze the general design of the e-learning system of Malaysian educational institutions. It is important to find out whether the lecturers can upload lecture notes, assignments, and projects through the institution's e-learning platform. It is also important to identify whether the students can download lecture notes and assignments, upload assignments and exams, and communicate among themselves and with the lecturers [29]. It is not currently clear whether they are satisfied with the user interface (UI) of e-learning systems offered in Malaysian institutions or not. This uncertainty exists because satisfaction with the e-learning system depends on six main factors: technology, system design, environmental category, student, teacher, and course [15]. This paper aims to identify and critically analyze the basic principles, user interface design (UID) guidelines, and challenges of integrating e-learning in Malaysian higher educational institutions (HEIs). Various technological innovations are highly dependent on UID to facilitate users' control and interactions and to convert their technical capabilities into a usable product. For the e-learning system, UID is described as the "structural design of an interface that presents the features and instructional support of an information system" [34]. This interface plays the role of a vital point that facilitates interaction between the user and the system. Thus, the main problem this article focuses on is the guidelines for designing e-learning websites to allow developers to be able to work within a design process based on recommendations from Malaysian HEIs' virtual learning communities. In particular, this paper aims to provide an answer to the question "What is the recommendation deemed as an appropriate design for e-learning websites for Malaysian HEIs?" [7] by using a systematic review method. This method is carried out by conducting a kind of writing audit that utilizes precise strategies to gather auxiliary information, basically by evaluating research and combining discoveries subjectively. The method in this study is limited to the scope of the e-learning UID by identifying and blending previous research to answer the research questions.

1 Related works

The development of innovation has changed the learning conditions for both students and instructors in Malaysian higher education. Here, e-learning has taken numerous structures, including being completely on the web, a blended or hybrid mode, and web-assisted. Thus, it has been proven that e-learning has overcome numerous challenges that had dominated the traditional classroom teaching; in particular, the lack of flexibility when accessing learning resources. [13] discussed that when a country embraces the use of online learning, it leads to diverse educational and cultural backgrounds. That is, many students from different parts of the country can interact together in a virtual class. The authors also suggested that the students will be required to be well informed and prepared for learning in an online environment. [26] found that e-learning is still underdeveloped because it is struggling to gain full recognition and accreditation within higher educational institutions. The development of e-learning has been affected, especially in terms of finding ways to improve the quality of its provision and effectiveness. Due to this, [11] described a model that helped to solve the challenge. A conceptual framework that would identify the factors leading to improving the quality of fully online degree programs was implemented. [23] argued that the complexity of accountability and authority issues in quality assurance has increased because of globalization, use of the market mechanism, and the transitional provision of higher education. Nevertheless, academic advancement needs are closely associated with institutional arrangements [2], along with the area of the growth programs inside the institution that will either add or detract from their perceived effectiveness. [2] also has discussed the questions of, where is the best place to establish such growth programs? How frequently and when should they come about? How can they become sustainably implanted? And how can they be rendered more compliant for busy academics?

The majority of the universities in Malaysia use their e-learning website essentially to distribute resources beyond their traditional classroom forms, for example, slideshows, notes, documents, PDFs, and videos. Consequently, an e-learning website aided both the academicians and students in terms of time management. Apart from that, academicians can do online evaluations for their students. E-learning website has been built to cost-effectively support and enhanced learning experiences beyond those offered in the traditional classroom. However, there challenges along with the implementation of e-learning besides its benefits, in particular in the development phase and to be more precise on the designing process. The

challenges involving e-learning interaction might be for the justification that of difficulty in connecting to the website backends and the intricacy of e-learning UID. [7] has stated that the limited availability of the standard for web objects creates UID complexity. These challenges if remain neglected will thus create the problem of confusing e-learning users of operation wise. Apart from that, users who do not have an understanding of utilizing e-learning might find that the website is too hard to decide for options should there be too many web objects on the home page of e-learning. The research also stated that the challenges of weakly designed interfaces are also revealed in current statistics that only 30% of users might carry out an e-learning course completely. In essence, the interactivity between the student and the interface has been deemed as an extremely crucial element in the latest studies on the process of knowing how to increase the quality of education via e-learning. Development and improvement of interface design can better stimulate the student's motivation and boost their completion rates of e-learning courses [32]. The related literature has also indicated that the quality of educational software is substantially correlated to its interface excellence and thus it can be concluded that, UID is very critical for the acceptance and usability of e-learning.

As a conclusion, most of HEIs in Malaysia has their very own e-learning platform to be made available for their users which mainly consists of students and academician. While there are specific guidelines and policies from the authority in regards to e-learning infrastructure development to be adhered to by HEIs in Malaysia, there are no particular or current standards and guidelines for the developer in terms of structures, layout, and GUI designs of e-learning websites [6].

2 E-learning principles

Before designing the e-learning platform, [1] presented five primary criteria for human capital perspectives. Additionally [1] did not covered a few markers under every norm, which the first was to reinforce academicians' comprehension of cutting-edge innovation. The example given was to give fundamental preparation just like the help that fixated on the product offered to the academician. The second marker was to improve students' roles in shared responsibility in the learning cycle. For instance, the endeavors to achieve a high level in undergraduate studies in those who partake in online correspondence and conversations. The third pointer was to improve undergraduate studies' scholarly uprightness (e.g., the effort to achieve a higher percentage of students who participate in online discussions) by giving web-based components to assignments, which will reduce the rate of late submissions that occur. The fourth pointer

recommended giving additional opportunities to students in their roles and responsibilities in split learning courses. An example of this is online distance learning courses being made available to the students. The fifth was to reinforce specialized laborer skills, for instance, in expecting specific information technology partners to sign up for some specialized short seminars on their new Learning Management Systems (LMS). However, there are points to consider when planning compelling e-learning stages. Therefore, universities will want to choose an LMS that will help their instructive processes to be improved, productive, adaptable, and effective. It is pivotal for all universities to concentrate on the advantages related with any endorsed LMS, including the students' performance during a course and their results after completion. It is fundamental to mention that supporting both computer and cell phone gadgets is another component of universities inclination. For example, in Malaysia in 2011, Malaysian Ministers of Higher Education (HEIs) established e-learning policies and guidelines (DePAN) for all higher learning institutions in the country to introduce within five years. DePAN has outlined three phases from initiation, filling and optimization. The first phase (2011–2012) of the planning included setting up the infrastructure needed to implement e-learning. The second phase (2013–2014) was to implement the learning, before the final phase started in 2015 until the present day, and is continuing the "process of optimizing the infrastructures and platform of e-learning from time to time" [18].

2.1 Design Guidelines

Designing websites for e-learning platforms needs special attention since it will be the first experience that may affect a user's evaluation before the usability experience.

2.1.1 Attention Animation

E-learning needs to keep learners attentive by keeping them engaged and focused on what to do next. Therefore, due to improvements in technology, developers can do this by providing instructions on screen. This is achieved by the use of subtitle animations such as change of color and use of arrows, and this will draw the learner's attention to the next instruction [5]. As indicated by [30] media, for example: Text, illustrations, liveliness (the quality of being outgoing, energetic, and enthusiastic), sound, or video in e-learning permits the possibility to create a stimulating environment that catches the student's attention. The utilization of media in instructing meetings can give a chance to assist with encouraging acknowledgment of different substance cognizance which can't be handily grasped from the course with any composed written text.

2.1.2 Typography

This has become a key aspect in Graphic User Interface (GUI) design, especially when used with overlapping text. The key aspect is the font matching the course you are offering. Another aspect is a visual hierarchy that ensures the right font size is used when in the correct place. That is, titles should use the largest font size, subtitles should use a slightly smaller size, and the main bulk of text the smallest.

2.1.3 Overlapping Text

Overlapping text is a modern technique use when developing e-learning UI. The concept running through this technique is that there is white text that animates over an on-screen image. This is common on many websites in which the first page is a full-screen image with text that animates over it. The user must scroll down to view more content.

2.1.4 User Interface

In all education systems, the user interface is always a key feature that affects the effectiveness of the system. Thus, developing a user interface must include following the right guidelines. However, developing an interface that is web-based and has a pop-up window will improve the learning rate of the students, especially those with little experience of using the internet [21]. Much secondary research has shown that integrating different interfaces into e-learning can result in different learning patterns. Students can gain knowledge that will enable them to tackle complex problems since the interface will encourage high order learning. Problem-solving skills to students can also be improved by designing proper modules in e-learning. Also, an interface with interactive approaches such as touch screens will improve the efficiency and effectiveness of e-learning to the students [33]. The communication starts when the user interacts with the information system. Thus, the development of the UI will greatly affect how the students use the system functionality.

In Malaysia, many educational institutions have embraced the use of electronic devices such as computers, laptops, televisions, and mobile phones for teaching and learning purposes [3]. Many institutions have a web-based e-learning system that has a dashboard that interacts with the user. The UI provides the link or communication between a student and the e-learning platform. The design of this platform decides how well the students will interact with the system. That is if the tools used by the designer are well arranged, then the students will use the platform more easily. The first consideration that the Malaysian educational institutions should prioritize is the UID. When the design is too complicated, then the students will end up making mistakes, and it would frustrate them to acquiring effective learning [3]. This means

that UI is a critical part of the e-learning platform. Based on research by [19] on the students' satisfaction factors, there is a significant relationship between learner interface and student satisfaction, e-learning effectiveness, and perceived usefulness [4]. Universiti Teknologi Malaysia (UTM) through a survey conducted on students as participants, has analyzed the effectiveness of the e-learning design in the institution. The development of e-learning was to ensure that the level of education of UTM reaches the international level. The system consists of two-way communication that is, students and teachers, and amongst students themselves [16]. On the student's view, the UTM website has a virtual place for uploading assignments, exams, and slides. Also, the interface allows an interactive environment where students can share knowledge and discussions. The institution has some studies that are done through e-learning. The study that this paper carried out was to improve the e-learning by improving the UI. Also, it was important to focus on the effectiveness of e-learning implementation at UTM. For student's satisfaction, many factors were to be measured, including, UI, personalization, content, and learning community to improve effectiveness [17].

2.2 Design Guidelines

Although the Malaysian Ministry of Higher Education in 2011 established an e-learning policy and guidelines (DePAN) for all higher learning institutions in the country in three phases: initiation, filling, and optimization, the guidelines only touch on infrastructure and platforms to be implemented. Moreover, they do not mention the requisite e-learning design layout, information resources, navigational aids, and so on. UI is an integral part of an e-learning course. While not much consideration is given to it after its initial design, it can be a deciding factor in the success or failure of the course as a whole. The computer UI is a new and unfamiliar space where humans interact with the machine. It can be frustrating for users when they easily get lost in this space. Developers and designers must thus ensure that students have a smooth association with e-learning and also receive operational support. A benevolent UID is a fundamental concept of structuring learning encounters. It can impact a user's experience of a whole learning occasion [12]. Moreover, visual computerization creates engaging graphics. The text styles, format, and even the hue utilization all significantly impact the enthusiasm and commitment of e-learning site users [22].

2.2.1 Features

[31] drew attention to the fact that some design attributes are more imperative to utility while other plan credits are more applicable to upholding the framework. Framework qualities are, thus, perceived as a critical angle that influences the duration of clients'

utilization of a framework [14]. Numerous UI highlights of a data framework, for example, menus, symbols, and contact screens, are explicitly expected to upgrade the value and usability of various elements of the framework. The features of an LMS will vary depending on the content and courses that an institution is offering. But the following are the expected features that at least every e-learning platform should contain; Menu-based navigation, Help button, Audio controls, Menu structure, Next and back navigation, exit button, and Sign in and sign out button. According to [8] there are 14 standard web objects based on UMS E-Learning websites. Table 1 shows the 14 standard web objects as determined by [7]:

Table 1 Standard web object

No	Standard Web Object
1	Logo
2	Navigation
3	Faculty Categories
4	Course Categories
5	Search Course
6	External Links
7	Home
8	News & Announcement
9	Helpdesk
10	Feedback
11	Main Menu
12	Login
13	Calendar
14	Advertisement

Based on the two research outcomes, it can be concluded that the web object standards overlapped between Menu, Login, Help Button/ Helpdesk, and Navigation. This can indicate that these four web objects are the main UID to be put into high priority and designs.

2.2.2 User Interface Design Localization

Apart from design, the UID with features describe in the previous studies, there are other elements which can be held as a great aspect, such as UID localization [6]. According to the study by [7], localization is the process of adapting a product or a service to a particular language or culture so that it reflects the 'look-and-feel' expected by local users (country-specific). Their study also stated that the primary goal of the localization concept in UID is to improve the website by providing a natural platform in terms of culture, technology, and linguistics, while at the same time creating a framework that combines content and functionality for users with various cultural targets [9]. The following image depicts the result of localized e-learning UID as proposed by [8] which has involved participants from the University of Malaysia Sabah as respondents using a 7x6 grid analysis method based on

14 e-learning web objects (Figure 1):

Fig. 1 7x6 grid analysis method

E-learning users must be involved in the essence of the design process by identifying the most preferred visual patterns of the web objects in the system. This enables developers to gain a better understanding of user preferences for the elements of the website experience. From this process, element-based guidelines can be developed for web designers. According to [24], the critical requirement in the construction of website content is to understand the ordinary user's mental model or schema for the localization of objects on the web interface. The layout of the interface used by various regional and international sites may influence users' expectations. By using gaze analysis, the eye-tracking study of Moodle (the open-source course management system) by [24] found that the breadcrumb navigation and the "My courses" area were the most exploited navigation elements.

3 Conclusion

From the research, it can be concluded that developing many e-learning systems among the institutions in Malaysia will increase online classes and will be an excellent method of utilizing technology. There is a need for established standard guidelines for UID designs for Malaysian HEIs to facilitate developers and to increase the positive user experience of e-learning websites or systems. The design and implementation of the e-learning system should be simple in order to reduce the complexity of utilizing the application. Thus, the UID and other e-learning features can facilitate students' academic experience and affect the satisfaction of what is offered through the system. Malaysian educational institutions should ensure that every e-learning system is designed according to the guidelines provided above to improve the effectiveness of this learning technique. The institutions should consider adding a localization element in deciding standard guidelines for UID

design. Future research can focus on evaluating e-learning websites UID by using tools such as Kansei Engineering Methods to measure and verify emotional engagement elements to be included as guidelines for the design process.

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