EVALUATION MODEL AND PROTOTYPE OF DISTANCE LEARNING MANAGEMENT SYSTEM (DLMS)

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MODEL PENILAIAN DAN PROTOTAIP SISTEM PENGURUSAN PEMBELAJARAN JARAK JAUH (DLMS)

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DECLARATION

I hereby declare that the work in this thesis is my own except for quotations and summaries which have been duly acknowledged.

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ABSTRACT

Distance learning increases access to learning opportunities for people in different geographical areas, ages and different learning capabilities. Learning management system (LMS) is a web-based technology used as a tool in distance education to manage, implement, and access online learning and teaching with varying levels of support structures provided to students in a learning programme. There is a need for an evaluation approach to measure the success of distance learning technology among learners. Hence, the objectives of this study are: 1) to investigate user acceptance of using LMS; 2) to develop an evaluation model to examine the success of the LMS in distance learning; and 3) to develop a DLMS prototype. Purposive sampling technique was used to gather data from users in four universities which offer distance learning programmes and use LMS in their distance learning process. The used instrument adapted three sets of questionnaires taken from the literature. The total number of respondents was 425 students. SPSS version 17 was used to analyse data on user acceptance and LMS requirements while AMOS 18 was used to validate the proposed model. The findings of the survey indicate high acceptance level of use of LMS in distance learning programmes. Evaluation of DLMS is important to ensure effective implementation and positive impact on distance learning delivery. A review of information system (IS), quality assurance (QA) and critical success factors (CSF) evaluation studies indicates that improvement of the current LMS is required. Therefore, a new evaluation framework, Educational Technology Evaluation Model (EduTEM) was formulated based on the IS models, QA and CSF of educational technology in distance learning settings. EduTEM includes three dimensions: Quality of Technology (system quality, service quality, information quality, usefulness and ease of use) which are independent variables, Usage (intention to use and user satisfaction) and Net Benefit, which are dependent variables. In order to validate the EduTEM, path analysis was used and revealed that quality of technology has a significant impact on user satisfaction and intention to use the LMS. This study found that intention to use and user satisfaction influenced the net benefit. Furthermore, this study showed significant correlation (> 0.5) between the independent variables. The overall fit for the EduTEM is very good (CMIN/DF =1.057 and *p*-value = 0.383). For the third objective, user's needs were gathered using a set of requirements questionnaire. Findings suggest new system features such as plagiarism checker, Short Message Service (SMS), online survey, online journal and Really Simple Syndication (RSS). These requirements were implemented in a DLMS prototype, which was then heuristically evaluated by six panel experts. Findings showed that the DLMS prototype satisfied user requirements. The main contributions of this research are the EduTEM which can be used to evaluate any educational technology tool, and the design of DLMS prototype.

ABSTRAK

Pembelajaran jarak jauh akses kepada pembelajaran peluang bagi mereka yang tinggal di kawasan yang berbeza umur, geografi dan pembelajaran keupayaan yang berbeza.Sistem pengurusan pembelajaran (LMS) merupakan satu teknologi berasaskan web yang digunakan sebagai alat dalam pendidikan jarak jauh untuk mengurus, melaksana, dan mengakses pembelajaran dalam talian dan pengajaran dengan tahap yang berbeza-beza struktur sokongan yang diberikan kepada pelajar dalam program pembelajaran. Oleh itu, objektif kajian ini ialah: 1) untuk menyiasat penerimaan pengguna menggunakan LMS; 2) untuk membangunkan model penilaian dan 3) untuk membangunkan prototaip DLMS. Teknik persampelan bertujuan telah digunakan untuk mengumpul data daripada pengguna di empat buah universiti yang menawarkan program pembelajaran jarak jauh dan menggunakan LMS dalam proses pembelajaran jarak jauh mereka. Instrumen yang digunakan disesuaikan tiga set soal selidik yang diambil dari literatur. Jumlah responden kajian ini, adalah seramai 582 orang 425 pelajar. Perisian SPSS versi 17 telah digunakan untuk menganalisis data pada penerimaan pengguna dan keperluan LMS manakala AMOS 18 telah digunakan untuk mengesahkan model yang dicadangkan. Hasil kajian menunjukkan tahap penerimaan yang tinggi penggunaan LMS dalam program pembelajaran jarak jauh. Penilaian DLMS adalah penting untuk memastikan pelaksanaan yang berkesan dan kesan positif terhadap penyampaian pembelajaran jarak jauh. Satu kajian semula sistem maklumat (IS), jaminan kualiti (QA) dan faktor-faktor kejayaan kritikal (CSF) kajian penilaian menunjukkan bahawa peningkatan LMS diperlukan buat masa ke semasa. Oleh itu, penilaian rangka kerja baru, Pendidikan Teknologi Penilaian Model (EduTEM) telah dirangka berdasarkan model IS, QA dan CSF teknologi pendidikan dalam persekitaran pembelajaran jarak jauh. EduTEM termasuk tiga dimensi: Kualiti Teknologi (sistem kualiti, kualiti perkhidmatan, kualiti maklumat, kebergunaan dan kemudahan penggunaan) yang pembolehubah bebas, Penggunaan (niat untuk digunakan dan kepuasan pengguna) dan faedah sistem, yang merupakan pembolehubah bersandar. Bagi mengesahkan EduTEM, analisa laluan telah digunakan dan mendedahkan bahawa kualiti teknologi mempunyai impak yang signifikan terhadap kepuasan pengguna dan hasrat untuk menggunakan LMS. Kajian ini mendapati bahawa niat untuk menggunakan dan kepuasan pengguna mempengaruhi faedah bersih. Tambahan pula, kajian ini menunjukkan terdapat korelasi yang signifikan (> 0.5) pembolehubah tak bersandar. Berdasarkan keseluruhan untuk EduTEM adalah sangat baik iaitu ianya telah menunjukan (CMIN/DF =1.057 and p-value = 0.383). Bagi objektif yang kedua, keperluan pengguna dikumpulkan dengan menggunakan satu set soal selidik keperluan. Penemuan mencadangkan ciri-ciri sistem baru seperti pemeriksa plagiarisme, Khidmat Pesanan Ringkas (SMS), kaji selidik dalam talian, jurnal dalam talian dan Really Simple Syndication (RSS). Keperluan ini telah dilaksanakan dalam prototaip DLMS, yang kemudiannya heuristically dinilai oleh enam orang pakar panel. Kajian menunjukkan bahawa prototaip DLMS memenuhi keperluan pengguna. Sumbangan utama kajian ini adalah EduTEM yang boleh digunakan untuk menilai apa-apa alat teknologi pendidikan, dan reka bentuk prototaip DLMS.

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In the name of Allah Most Beneficent Most Merciful All praise is for Allah the Exalted and may the peace and blessings of Allah be upon His Messenger Muhammad and his family and companions and all those who follow them and their way until the Day of Resurrection

I am grateful to Allah that I have made it with this work so far and would also like to acknowledge those who have helped me throughout my study. This piece of work would not have been possible without the contributions from many people and organizations.

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الحمدلله رب العالمين

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LIST OF ABBREVIATIONS

AGFI	Adjusted Goodness-Of-Fit Index
API	Application Programmer's Interface
BI	Behaviour Intention
CFI	Comparative fit index
CIM	Computation Independent Model
CMIN/DF	Minimum discrepancy divided by its degrees of freedom.
CMIN	Minimum value of the discrepancy
COL	Commonwealth of Learning
DF	Number of degrees of freedom for testing the model
DLMS	Distance Learning Management System
GFI	Goodness- of- Fit Index
GUI	Graphical User Interface
IE	Internet Explorer
IFI	Incremental fit index
IMS	Instructional Management Systems
InQ	Information quality
ISM	DeLone and McLean information Success model
ML	Maximum likelihood
NB	Net benefit
NFI	Normed fit index
NPAR	Number of distinct parameters (q) being estimated
OSS	Open Source Software
PEU	Perceived Ease Of Use

PGFI	Parsimony goodness-of-fit index
PRS	Prototype requirement specifications
PU	Perceived Usefulness
RFI	Relative fit index
RMSEA	Root Mean Square Error of Approximation
RSS	Really Simple Syndication
SAT	User satisfaction
SCORM	Sharable Content Object Reference Model
SMC	Squared Multiple Correlations
SVQ	Service quality
SYQ	System quality
TEL	Technology-enhanced learning
TLI	Tucker-Lewis coefficient Index
ULS	Unweighted Least Squares estimation.
WAMP	Windows, Apache, MySQL, PHP
WebCT	Web Course Tools
WEL	Web-enhanced learning

GLOSSARY OF TERMS

Administrative features: The features in LMS used in administrations and usage rules such as defining users, updating detail, sharing information rules, defining backups, scheduling jobs, running management reports, and monitoring jobs, securing data and organizing files.

Administrators: Administrator is a registered system's users who have the most control over the functionality of the LMS. There are three types of administrators: content administrator, system administrator and university administrator.

Construct Reliability: An aspect of reliability measuring the internal consistency of a set of measures rather than the reliability of a single variable.

Construct Validity: An aspect of validity testing how well the results obtained from the use of the measure fit the theories around which the test was designed. In other words, construct validity testified that the instrument did tap the concept as theorised.

Content Validity: An aspect of validity assessing the correspondence between the individual items and the concept through ratings by expert judges, and pre-tests with multiple sub-populations or other means.

Dependent Variable: It is a variable of primary interest to the study, also known as the criterion variable.

Distance learning in Malaysia: Distance learning center or program in the specific university.

E-learning: E-learning is the use of ICT for teaching and learning.

Endogenous Latent Construct: A latent, multi-item equivalents to a dependent variable. It is a construct that is affected by other constructs in the model.

Exogenous Latent Construct: A latent, multi-item equivalent of an independent variable. It is a construct that is not affected by any other construct in the model.

Expert reviews: an expert studies a system and gives his or her view on it.

Independent Variable: A variable that influences the dependent or criterion variable and accounts for (or explains) its variance.

Instructional features: The features in LMS used in the creation of the course using, the implementation of the course within the distance learning environment, as well as the content of course documents, assignments, resources from internet, quizzes and surveys.

Interactive features: The features in LMS that requires a transfer of data within a computer or through a network. The interactive features in a LMS include chat rooms, discussion boards, digital drop boxes, the creation of external links and homepages

within the LMS, the act of uploading or downloading of files (text document, graphics, video, audio, animation), and the act of electronic file transfers between the LMS and other software application such as Microsoft Excel and Microsoft Word.

Learning Management System (LMS): A learning management system is "software designed to provide a range of administrative and pedagogic services (related to formal education settings e.g. enrolment data, access to electronic course materials, faculty/student interaction, assessment, etc.)

Organization: Educational organization, university, centre and institute that provide distance learning program.

Parsimony (Measure of Parsimony): A model high in parsimony (simplicity) is a model with relatively few parameters and relatively many degrees of freedom. On the other hand, a model with many parameters and few degrees of freedom is said to be complex or lacking in parsimony.

Perceived Ease of Use: The degree to which a person believes that using a particular system would be free of effort.

Perceived Usefulness: The degree to which a person believes that using a particular system would enhance his or her job performance.

Pilot Study: The study conducts to detect weaknesses in design and instrumentation and to provide proxy data for selection.

Reliability: The extent to which research findings would be the same if the research were to be repeated at a later date, or with a different sample of subjects.

Square Multiple Correlation: It is referred to an item reliability coefficient. It is the correlation between a single indicator variable and the construct it measures. In other words, SMC is the proportion of its variance that is accounted for by its predictors.

Structural Equation Modelling: A multivariate technique combine aspects of multiple regression (examining dependence relationships) and factor analysis (representing unmeasured concepts-factors with multiple variables) to estimate a series of interrelated dependence relationships simultaneously.

Support features: The features in LMS used in giving advice and solving problems within the system and offering good training for the stakeholders such as help sessions, technical support, user community, site map, user guide and availability of Help desk.

Technology features: The LMS hardware and software requirement such as system compatibility with a variety of multimedia plugins (QT, PDF, Flash, ZIP), The system compatibility with the client side platforms (Mac, Windows XP/Vista/2000, Unix), compatibility to use any internet browser (Firefox, Internet Explorer, Google chrome, other), and the ability to access the LMS from mobile devices (iPhone, Blackberry, etc).

Users: The LMS actors (stakeholders) including learners, instructors and administrators involved in the distance learning program.

Validation: Determining that a system performs as intended by the customer.

Verification: Determining that a system performs according to the design requirements.

Visual features: The features that make up the visual appeal of the entire LMS, which include the overall layout, the design of graphic interfaces, and the overall design of LMS using colours and shapes of buttons, the different types and different sizes of font, as well as the relationship of all these elements to one another and interface customization.

CHAPTER I

INTRODUCTION

1.1 OVERVIEW

Electronic learning (e-learning) refers to the use of information and communications technology (ICT) to encourage the process of learning, support communication in learning settings, assess learning activities, manage resources, and create education materials. Malaysia's vision of achieving fully developed nation status by 2020 in the global economy has made ICT a big agenda in transforming the country from a production to a knowledge-based economy. The government recognizes e-learning as a phenomenal tool in improving education and ensuring Malaysian students' competitiveness in the era of globalization. Future development calls for more collaboration efforts from the government agencies, industries and more creative innovations that can take e-learning further forward (Rahman 2004). E-learning is a method which evolved from distance education, has received special attention from public universities in implementing distance learning courses (Goi & Ng 2009).

1.2 DISTANCE LEARNING

Distance learning is very important for any developed country by providing education to the people living in different geographical areas, of different ages and different learning capacities. Distance learning increases access to learning opportunities to those people who have lost their learning chance for reasons such as age, illness, war, some family relationships, economic and geographical problems. It also supports learners who are unlikely to attend the traditional classroom instruction in an institution. In a number of situations it can serve as many or more learners per dollar spent. Distance learning saves learners, instructors and universitues cost and time

(Isman et al. 2003). In our daily lives there are many difficulties faced by adulst, which prevent them from completing their studies. The obstacles may come from work and family responsibilities which often make attending the traditional class time inconvenient, experiencing a lack of public transportation systems in many parts of the city, living in places with no convenient access to regular classes and / or with no full self-confidence to attend lessons in a big classroom or facing teachers and many other students (CDLP 2010).

Distance education is defined as any educational or learning process or system where the student and instructor are separated or in which students are separated from other students or learning resources, and rely on technologies of delivery (such as email, real time chatting, internet technologies). Current technology, Learning management system (LMS) which integrates these features is being widely adopted for distance learning, in order to accomplish communication and interaction. Various types of media have been utilized in course delivery and in facilitating two-way communication between students and teachers at a distance. Distance learning is considered one of the e-learning applications that utilizes the use of available technology (NinthBridge 2001). Corrine (2000) mentioned two categories of distance learning study: Instructor-led and independent learning. Instructor-led distance education is generally conducted in the form of a virtual classroom whereby the instructor directs the learning process. These live sessions may require the students to be at a predetermined place and time. Technologies usually used for this type of learning delivery include real time chatting, forums, online conferencing, or internet simulcast. On the other hand, independent study puts the student in charge of the education process using traditional print-based lecture notes, emails, audiotape, tutorials, and even web-based training. These educational opportunities are available on demand and may be taken anytime and anyplace the student can access the necessary recourses and technology (Corrine 2000).

Distance education is a very popular mode of education among learners and working adults in general. This trend is recognizable in Malaysia, with the appearance of several higher education institutions using LMS to support the educational process such as University Putra Malaysia (UPM) and the Open University Malaysia (OUM)

(Lim Chiu Yiong et al. 2008; Lim & Tan 2008). There are several components of LMS that may facilitate the distance learning such as application settings, email, content delivery, learning management module, portals, content import, course catalog, reporting, roles and permissions and user management. LMS is applied widely in Malaysian universities according to the available technologies that can support and encourage distance learning activities. For instance, the universities promote their application forms to students around the world through the use of internet technology and also publish their websites which can be accessible for everyone and anywhere (Amirrudin 2005).

1.3 LEARNING MANAGEMENT SYSTEMS (LMSs)

A Learning Management System (LMS) is a Web-based technology or a software application used to plan, implement, and assess a specific educational process. In general, the LMS provides teachers or instructors with a way to create and deliver the course content, assess learner's performance and monitor learner involvement. The LMS provides the students with the ability to use communication and interactive features such as chat rooms, video and audio conferencing, emails and discussion forums (Noverant 2006).

According to Haugen (2003), LMS is software that automates the administration of training events. The LMS manages the registered user's login, records data from students, provides reports to management and manages course content. Also, the LMS provides high accessibility for a large number of users that may include administrators, content creator or instructor and students. The LMS plays an important role in the implementation of e-learning. The LMS should be able to handle various modes of delivery such as, automating the complex process of enrolling students, registration, reports, records, schedules and transcripts, and should integrate evaluation, testing capabilities and assessments (Haugen 2003).

Distance learning uses the LMS technology to enhance and to provide the users different ways to interact and communicate with each other. In addition, distance

learning uses the LMS to facilitate user access to the learning resources. Furthermore, the LMS provides the distance learning actors a useful and easy way to use the technology environment that allows them to collaborate with each other, in order to accomplish the learning process in a proper way. Figure 1.1 shows the elements of distance learning and its relations with LMSs components which represent the LMS services in the form of deliverables, plans, and managing of the distance learning course or programme.

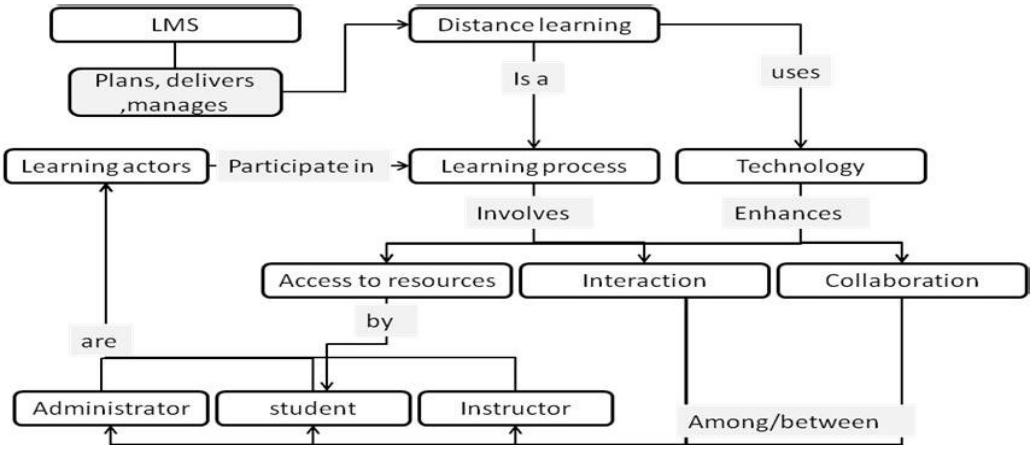

Figure 1.1 Distance Learning Concept Model
Source: adopted from (Otto 2003)

The LMS is very important to higher education since it offers the distance learning users tools they need to complete the learning process by communicating, collaborating and interacting with each other. Furthermore, the LMS saves users time and cost by providing them with a virtual learning environment to teach, manage, assess and learn in one place with no need to travel from home to the university, so the users (students and instructor) can complete the learning process easily anywhere and anytime. Many higher education students did not complete their study because of time and cost factors, having to leave home, job, and sometimes leaving their countries.

During the learning process, some of the students may face difficulties due to the distance between the university and their home or work place. The students may have difficulty attending classes and participating in other activities. These problems can be solved with alternative resources such as internet connection and multimedia

technology using LMS to replace the physical attendance of students and could save more time and cost.

1.4 PROBLEM STATEMENT

Distance learning is a very popular mode of study all over the world and the number of students keeps increasing (Abas 2003). The universities have used LMS, which they adopted from other universities or companies; some of the universities have developed their own LMS. The current LMS needs to be updated from time to time since the user needs to keep up with the constant changes in technology (De Smet et al 2012). Furthermore, the LMSs used are mostly developed for regular learning in general or for administrative purposes (OECD 2005) and not specifically for distance learning use. Ibrahim and Silong (1997) pointed out that the available LMSs developed in western institutions are not always appropriate for other countries and cultures. Mainwhle, the LMS mostly designed to address the basic needs of some institutions, but not the more advanced needs of other institutions (Wright 2006). In addition, some of the features in the existing LMS remain unused (Rahman et al. 2010; and Mitchell & Skinner 2005); and some new technologies are not included (Dzakiria 2004).

To come up with a comprehensive and usable LMS for distance learning, the user's acceptance which is important for a successful implementation of LMS (Van Raaij & Schepers 2008), and the success factors need to be studied (Fındık & Özkan 2010). Developing a good LMS should start by analysing the related factors of the LMS use (Ayub et al. 2010). Analysing the existing LMS is the first step to achieving good LMS quality (Ismail et al. 2010). However, there is a lack of research on developing an evaluation model to measure the success of LMS among studnets in distance learning programmes.

Technically, there are many problems that hinder the students from participating online, such as: operating the portal and accessing the online system needs to be addressed effectively to encourage the students to participate in online activities (Murugaiah & Thang 2010); appropriate interactive technology, such as e-

mail, should be provided to encourage small groups and individual communication (Dzakiria 2004); poor management of online interactions (e-mails and bulletin boards) and difficulty in tracking learners' academic progress (via threaded discussions and tests) (Ramli 2009). In addition, there are some features that do not exist or are not properly used. For example, in OUM, the university started using mobile learning in 2009 to collect student's opinions using short survey tool for answering questions and for announcements (Lim et al. 2011). Until today, the students can respond to what the university asks but they do not have options to communicate with their instructors or administrators using the SMS individually. According to Latif and Bahroom (2003), not all features exist in the current LMSs in Malaysia. Thus, there is a need to study the operational factors include reliability, external support, flexibility in design and functions, and features of the LMS (Unal 2011).

When developing the LMS, we must take into account users' needs and requirements since this will increase the acceptance of using LMS (Davis 1993). According to Miller-Cochran and Rodrigo (2006) many researchers have found that most learning supports provided by institutions are not based on the student needs and requirements. Ibrahim and Silong (1997) also suggested an evaluation of the distance learning programme provided by the Institute for Distance Education and Learning (IDEAL) in UPM to determine whether IDEAL meets the students' needs and requirements. Another issue occurred in USM, as highlighted by Hussin (2004) who reported that 58% of USM students who enrolled in the distance learning programme had difficulty in accessing the materials online, with 40% claiming that the computers in campus were inadequate and 54% complaining that the downloading of the materials was time consuming. Hence, upgrading the existing LMS according to the latest technologies (e.g. group work, content sharing, photo/video sharing, and social networking and portfolio) will enhance the quality of teaching and learning, and encourage more efficient student involvement in LMS, which is very important to the success of distance learning programmes (Taylor 1995). Based on the literature review, there is a need to develop, update and improve the LMS to address the distance learners needs. Thus, this improvement and enhancement of the LMS will increase the success of LMS and that will raise the level of acceptance among LMS

users in distance learning programmes (Al-Fadhli 2009). With these issues, the following objectives are addressed.

1.5 RESEARCH OBJECTIVES

The objectives of this research are:

i. To measure the user acceptance of using LMS in distance learning**.**
ii. To develop an evaluation model to examine the success of the LMS in distance learning.
iii. To propose a prototype of a DLMS with the following sub objectives:
   - To elicit the user requirements for distance learning management system (DLMS).
   - To develop a DLMS prototype (by updating and integrating the current LMS) based on user requirements.
   - To evaluate the DLMS prototype.

1.6 RESEARCH QUESTIONS

This research intends to measure the user acceptance of using LMS and intends to come up with an evaluation model to measure the success of LMS in distance learning and to implement user requirements by developing a DLMS prototype. In order to achieve the main issue raised above, the following issues need to be addressed:

1. Is the use of LMS in distance learning programme accepted by the students?
2. What are the factors that influenced the success of LMS among distance learners?
3. What are the distance learning learners needs for the future LMS?

1.7 SCOPE OF THE STUDY

The scope of this study is the students involved in distance learning programmes from the distance learning centres or schools in the following universities: Open University

Malaysia (OUM), Universiti Tun Abdul Razak (UNITAR), Universiti Sains Malaysia (USM), and Universiti Putra Malaysia (UPM). These four universities are selected as a final scope based on the number of students (e.g. 100,000 in OUM; 8,700 in UPM; 10000 in UNITAR; and 5533 in USM); LMS usage for distance learning and programmes offered (e.g. 55 programmes in OUM; 56 in UNITAR; 13 in UPM; and 72 in USM). In other words, the selected universities offer distance learning programmes and use LMS in their programmes. USM is selected because it was the first established distance learning school (Abas 2003) in Malaysia. We selected UNITAR because it has established the first virtual university in Malaysia (Nawawi 2003). The selection of UPM is based on the fact that it is Malaysia's largest university of science and technology with a number of student enrolments in its distance learning programme (8,700 students in 1995) (Hamid 1999). OUM is selected due to the fact that it is the first open university in Malaysia, focused only on open and distance learning programmes (Latif & Bahroom 2003). The scope of this study is limited to the LMS, e-learning applications used in distance learning programmes, mobile learning and distance learning in the above mentioned universities.

1.8 SIGNIFICANCE OF THE STUDY

The findings from this research will be beneficial to the university students, instructors and administrators and will be beneficial also to the country as a whole. This study will be very useful at the individual level because there are two different approaches of using the technology in education: (1) use of technology as a classroom aid; and (2) use of technology for distributed learning (Bates 1999).

The use of technologies especially the internet means that teaching, assessment and administration are all carried out more efficiently and effectively, saving more time for research and leisure (Jones & Fox 2009; Madden & Fox 2006; Ryan 2000). If the university employs the findings from this research by planning the strategies to support LMS usage, it is likely that users will use the LMS more in their work. Using the LMS will help users save time, cost and energy, such as using email for communications resulting in lower cost compared to using a phone. In addition,

accessing information and knowledge through the internet is more effective than going to the university library. Whether using own or public transport. Therefore, teaching and learning through technology will help in changing user's professional practice especially in the teaching and learning process. The users can work more effectively, efficiently and productively, and save more time, energy and cost. In turn, these will lead to enhance the quality of the working and learning life of the users. Consequently these technological facilities help the university to achieve the educational objectives and goals more cost-effectively (Ryan 2000).

At the organizational level, the technologies will enable changes in teaching and learning in distance learning processes (Leidner & Jarvenpaa 1995). Under the right circumstances, teaching and learning through the LMS can have several advantages over traditional classroom teaching as learners are able to access high-quality teaching and learning at any time and any place. Also, good LMS can be more effective than traditional classroom methods because students can learn more easily and more effectively through illustration, animation, different structuring of materials, and increased control of interaction with learning materials (Bates 1999). According to Bates (1999), the benefits of using new technologies such as the LMS are:

i. Improved quality of distance learning.
ii. Improved students' IT skills which they need in their work and life.
iii. Reduced distance learning costs.
iv. Time saved for distance learning users and organizations.

The critical issues of how to make full use of LMS in facilitating teaching and learning processes are of national concern. It is essential for all users in higher education to use LMS, in order to interact and communicate with students who have already had LMS experience. The evaluation model and the LMS requirements model proposed in this research will provide necessary information in explaining what promotes LMS usage and what hinders usage. This study will help support National Policies especially the policy to increase technology usage as part of the learning process at all levels of education and help support the strategies of e-learning according to the Malaysian Vision 2020.

1.9 THESIS OUTLINES

This thesis consists of eight chapters which are arranged as follows:

Chapter II: Literature Review

In this chapter, the concept of distance learning, the current status and problems of distance learning are discussed. Besides these, problems of the existing LMS are discussed by reviewing previous studies that have been done on some existing distance learning technology and LMS in order to explore the features in the existing LMS. This chapter justifies the reason for conducting this research and gives an idea about the problems in the current system, and an appropriate approach to achieve the research objective.

Chapter III: Educational Technology Evaluation Model (EduTEM)

In this chapter, a framework is constructed based on the information system (IS Success Model and technology acceptance model), critical success factors and quality assurance of educational technology. EduTEM addresses the essential components of IS, namely: net benefit and technology quality, and the essential components of QA namely: quality of input and resources, process and practices and quality of output, and essential components of CSF, namely: stakeholders needs, system quality and system outcomes. In order to validate its usefulness, this framework is tested in distance learning settings.

Chapter IV: Research Methodology

This chapter explains the method used to accomplish the purpose of this research, which includes the general method for design research and gathering information methodology. The gathering information methodology used to gather information for this study using hard-copy and online questionnaire to evaluate the current LMS, gather information about the students needs and collect the user requirement. In this chapter, the researcher gathers information about the population, required sample size and technique. Also, in this chapter the researcher describe the questionnaire design process and conduct a pilot study to ensure the questionnaire content and design are understandable and related to the scope of the study.

Chapter V: Result of Data Analysis

In this chapter, the data analyses that provide significant information to attain the objectives of this research are discussed. The data analyses include describing the characteristics of the sample and checking variables for any violation of the assumptions underlying the statistical techniques used. On the other hand, this chapter consists of two sections of analyses as follows:

i. Data Analysis of user acceptance of LMS

In this part the researcher measure the acceptance of LMS performance among students. The survey technique using questionnaire (chapter IV) is used to measure the acceptance of LMS using technology acceptance model (TAM). This part consists of descriptive statistics, reliability test, validity test, and correlation and regression analysis to test the user acceptance hypothesis using Statistical Package for the Social Sciences (SPSS) 17.0.

ii. Data Analysis for LMS Success Using EduTEM

In this section the researcher tests the proposed EduTEM which was developed after having critically appraised the existing findings of IS, QA and CSF evaluation studies (Chapter III). In this section the researcher uses data from the survey that was discussed in chapter IV. Data are analyzed using Structural Equation Modeling (SEM) AMOS18. This section consists of analysis of the EduTEM instruments, testing the hypothesis and correlation analysis.

Chapter VI: Requirement elicitation

In this chapter, the system development methodology which is used in this research to develop a DLMS prototype is discussed. The purpose of this chapter is to propose a suitable requirement model for the proposed DLMS. The requirement model gathered and addresses the users need and ensures that the prototype will include all technology that can help the organization and the students to accomplish the learning process in a proper way. This chapter consists of prototyping methodology, requirement elicitation methodology, requirement model, system architecture, gathering requirement using survey questionnaire, general use case for the stakeholders, and software and hardware requirements.

Chapter VII: DLMS Design and Evaluation

In this chapter, the design of DLMS prototype based on the developed DLMS conceptual model for distance learning institution in chapter six is discussed. The updated prototype is developed and called DLMS because it's an LMS based on the distance learning institution needs. Finally in this chapter the researcher evaluate the usability of the DLMS prototype heuristically. The researcher applies the verification method to evaluate the prototype by using expert review usability evaluation technique.

Chapter VIII: Conclusion

This chapter concludes the thesis by giving a summary of its main contributions, objective achievement, limitations and future work towards further research directions. The findings are summarized and suggestions for future improvements are given in this chapter.

CHAPTER II

LITERATURE REVIEW

2.1 INTRODUCTION

In this chapter, the concept of distance learning, current status and problems of distance learning are discussed. In addition, problems of existing LMS are discussed by reviewing a number of previous studies done on some existing distance learning technology and LMS in order to explore the features in the existing LMS.

2.2 OVERVIEW OF DISTANCE LEARNING

Distance learning is an important direction in higher education. Many institutions, universities, national and international organizations started using distance learning in their programmes to meet the students' needs and provide them with an effective and efficient learning mode which allowed them to study from a distance. Distance education has grown faster than any other form of education over the past twenty-five years. Recently, the subject of argument has been between those who regard it as an inferior kind of education and those who see it as a great chance for developing countries (Perraton, 2000). In addition, distance learning meets the increase of technological developments and the new learning theories (NinthBridge 2001).

Bill and Melinda (2001) defined distance education as any educational or learning process in which students and instructors are separated by location or in which students are separated from other students or educational resources but they rely on technologies of delivery to achieve the learning goal and to communicate and interact with each other. The current status of ICT provides the users of distance learning with a variety of media, which is employed in course delivery to make

communication among learners and instructors easier from a distance (Bill & Melinda 2001). Corrine (2000) mentioned two categories of distance education. They are: Instructor-led and independent study. The instructor-led distance education is generally conducted in the form of virtual or online classroom in which the instructor directs the learning process. This mode of distance education requires the students to be at a predetermined place and time. The most common technologies used for this type of delivery are chat rooms, video and audio conferencing and whiteboard. On the other hand, independent study gives the choice to the student by putting the student in charge of the learning process, which allows the student to study using the available resources, such as lecture notes, CD-ROM, SCORM, online documents and web-based training. These learning opportunities are available on demand and may be taken anytime and anywhere the participants can access the necessary technology (Corrine 2000).

Perraton (2000) claimed that distance learning was started by Michael Young and Brian Jackson in 1963 when they established the National Extension College as a pilot for an open university. In addition, UNICEF used distance education to train teachers in Palestine (Perraton 2000). Distance education has been around for the last 75 years or more. Since the early 1930s, it has experienced phenomenal growth both in the number of people opting for distance education based on initiatives against a traditional classroom, and the use of technology. Until late 1980s, and up to early 1990s, television has been a predominant tool for distance education. With the beginning of the internet and multimedia technology, television has been replaced by video and Web conferencing as the means of their choice (Patcha & Scales 2005).

Distance education in the organization or the universities may take various kinds of distance learning modes depending on the students, organizational needs and the available resources of learning. NinthBridge (2001) described three types of distance learning programmes including:

i. Self-instructional courses: In this type of distance learning programme, the organization designs the course materials to meet the learning needs of the target student population.

ii. Facilitated/collaborative courses: In this programme, the courses are a mix of synchronous and/or asynchronous interaction with teachers through communications and static information or content.

iii. Hybrid courses: This programme may be called a mixed-mode course, which takes the form of traditional courses supplemented with online resources and other forms of distance education, or may take the form of a primarily distance education course that includes a face-to-face element, such as an onsite residency or a laboratory components.

An organization or institution may decide to develop one or a combination of these types of programmes, depending on the available resources and status. The type of learning and the technologies included in a programme of distance education must meet the needs of the learner and the educational requirements of the content and issues relating to the organization's resources. Distance learning provides a variety of technologies delivery to achieve the education objectives, and many types of media are available for use within a course delivery which can make the communication and the interaction among the learners and the instructors more effective. These kinds of interaction or course delivery are categorized either as synchronous or asynchronous learning based on used of technology and course design (NinthBridge 2001).

In distance learning, the advantage of synchronous learning is the communication or interaction in real time such as video and audio conferencing, traditional classrooms, telephone calls, chat rooms, instant messaging (i.e. ICQ and Skype) and whiteboard. On the other hand, asynchronous learning does not require real-time communication between students and instructors. Also, there is no need for the students to be in the same location or same time with instructors. Instead, the students are able to choose suitable time to interact with the learning resources or materials and instructor based on their schedules. Asynchronous learning is more flexible than synchronous learning, but, from experience, the time limitation in synchronous learning is necessary for students' involvement (CDLP 2010). Selecting the location and time by students is an advantage of asynchronous learning, which

facilitates the interaction opportunities among the students and instructors. The success of synchronous or asynchronous learning depends on three significant elements: instructional design, technology, and available support (CDLP 2010).

The new age of distance learning needs several kinds of users to work together. The professional educational developers are the main players and the design of high quality contents is the most significant factor for the success of a distance education course (Shih & Hung 2007). In order to support efficient delivery in a distance education course, there is a need for technicians to manage network and computer systems to ensure that video or web-based contents can be accessed efficiently (Shih & Hung 2007). Therefore, an administrative office needs to gather different types of professionals, including instructors, designers, and technicians. The course administrator needs to develop curricula and maintain records for students and accounting, and to ensure that the operation is running smoothly (Shih & Hung 2007) Previous studies show the importance of distance learning and what are the important features that enable distance learning to be successfully used, thus giving more benefits to both users and organization. The next section describes the distance learning in Malaysian universities.

2.3 DISTANCE LEARNING IN MALAYSIA

Malaysia's vision of achieving full developed nation status by 2020 in the global economy has made ICT a big agenda in transforming the country from a production to a knowledge-based economy. The government recognizes e-learning as a phenomenal tool in improving education and ensuring Malaysian students' competitiveness in the era of globalization. Future development calls for more collaboration efforts from the government agencies, industries and more creative innovations that can take e-learning further forward (Rohana 2005).

E-learning and distance education are rapidly becoming a popular mode among working adults in the international level and in Malaysia as well. This popular mode and the technological developments have led to the emergence of a number of distance learning universities or institutions using e-learning to facilitate the learning

activities, such as: University Putra Malaysia (UPM) and Open University of Malaysia (OUM) (Lim Chiu Yiong et al. 2008). Abas (2003) reported that the distance education programme in Malaysia was started in 1971 by University Science of Malaysia (USM), followed by the OUM and Universiti Tun Abdul Razak (UNITAR), and other institutions which deliver distance education course in a significant way by using the internet. Some other universities in Malaysia (16 public and 21 private) are rapidly following the pioneering universities to meet the high demand for distance education, growing demand of technology and the increasing number of students as well as a variety of courses among the public and private universities. Abas (2003), also mentioned that internet usage in Malaysia has grown very fast over the last decade and the number of internet users increased from a few hundred to over four million, making the country an ideal place to to implement the distance education. In the next subsections, we will describe distance learning in the chosen universities.

2.3.1 Distance Learning in USM

USM initiated the distance learning programme in 1971 through the School of Distance Education (SDE) and used Moodle LMS to deliver the course contents, including print material, which is the main medium used in the course delivery supplemented by face-to-face meeting during two weeks of residential course. In addition, a web-based delivery mode (i.e. live video and audio conferencing, electronic portal and streaming media) is used to facilitate the course delivery. Learning and teaching activities and practical classes in USM are also conducted at the 12 regional centres located around the country to allow students to learn As such, the distance learners are equivalent to full-time or on campus students (USM 2010).

2.3.2 Distance Learning in UPM

In UPM, distance learning started in 1995 at the Distance Education and Learning Institute (DEAL), which was officially launched by the Honorable Minister of Education. The DEAL aims to provide the working population of Malaysia with quality degree and non-degree programmes through distance and open learning. UPM uses two LMS, eSPRINT and PLMS (http://www.upm.edu.my). The LMS consists of

a series of lecture notes, tutorials, assignments and quizzes where instructors can input relevant notes and information about a learning module used in teaching. The LMS also provides two way communications between students and instructors. These two groups of users represent separate functionalities and each interacts with the system differently. The authorized student can view the information and download the notes. The instructor provides persistent data to the LMS, such as: the lecture notes for every module, news, tutorials and the references to other related websites (UPM 2010).

2.3.3 Distance Learning in OUM

The OUM also uses an online system for teaching, learning and communication. OUM uses myLMS to guide all forms of virtual interaction for the purpose of delivering the distance learning course. Basically, myLMS is an e-learning platform that supports and enhances the teaching and learning of OUM tutors, students, administrators and full-time faculty. More importantly, online learning through myLMS bridges the gap between fortnightly face-to-face tutorials and module-based independent study (OUM 2009). This tool also functions as a bulletin board for all notices, announcements and samples of tests or examinations, and provides a forum for tutor-learner and learner-learner collaborative online interaction. MyLMS includes features such as course summaries, announcements, course content, support materials, references, staff info, course mates, forum, chat, quizzes, digital drop-box and e-books (OUM 2009).

2.3.4 Distance Learning in UNITAR

UNITAR is dedicated to ensuring a holistic university campus experience that builds the portfolio of an all-round graduate. UNITAR provides students with quality higher education and equips them with a broad range of knowledge, technical competency, soft-skills and industry-relevant skills. UNITAR's goal is to nurture graduates who are able to contribute to the society, industry and nation as competent professionals of high integrity. UNITAR uses the Virtual Online Instructional Support System (VOISS) as an LMS consisting of information on face-to-face tutorials, online

tutorials, quizzes, examinations, assignments, course outlines and courses registered, syllabus, FAQ, exam locations and results (UNITAR 2010).

Table 2.1 describes the LMSs used and their features in the above-mentioned universities in Malaysia that offer distance learning programmes.

Table 2.1 Examples of LMSs Used in Malaysian universities

University	LMS	Features used
Universiti Sains Malaysia (USM)	Moodle	PowerPoint slides, lecture notes, assignments, interactive multimedia, learning, live video conferencing, electronic portal and streaming media
University Putra Malaysia (UPM)	eSPRINT	lecture notes, tutorial, assignments and quizzes
Open University Malaysia(OUM)	MyLMS	course summaries, announcements, course content, support materials, references, staff info, course mates, forum, chat, quiz, digital drop-box, e-books.
Universiti Tun Abdul Razak (UNITAR)	VOISS	online tutorials, quizzes, examinations, assignments, course outlines and course registration, syllabus, FAQ, examlocations and results

In this research, we will focus on the above-mentioned universities for a number of reasons, which are:

- The first distance learning school was established by USM (Abas 2003).
- The first virtual university in Malaysia is UNITAR (Nawawi 2003).
- UPM is the largest science and technology university in the country and started distance learning in 1995 with a student enrolment of 8,700 students (Hamid 1999).
- OUM is the first open university which focused on open and distance learning (Latif & Bahroom 2003).

In the next section, some of the problems in distance learning are discussed.

2.4 PROBLEMS RELATED TO DISTANCE LEARNING IN MALAYSIA

Since the distance learners posses a relevant competency in the associated technology in online learning, their distance learning requires the adoption of a new teaching and

learning paradigm. Although the quality is an important issue in higher learning, the impact to the usability of online distance learning in Malaysia has not been well understood. Thus, it is imperative to investigate the quality characteristics of the online distance learning system, and most importantly understand how these variables (characteristics) can influence the success and value of the programs (Yousef 2009).

Technologies enhance the interactivity to occur in distance learning. We need to realize that although the distance learning providers and institutions seem excited and eager to realize the potential of distance learning, problems and level of interactivity is still lacking among the participants of distance learning (Dzakiria 2002).

Ibrahim and Silong (1997) suggested an evaluation of the distance learning programme provided by the Institute for Distance Education and Learning (IDEAL) in UPM to determine whether IDEAL meets the students' needs and requirements. Another issue occurred in USM, as highlighted by Hussin (2004) who reported that 58% of USM students who enrolled in the distance learning programme had difficulty in accessing the materials online, with 40% claiming that the computers in campus were inadequate and 54% complaining that the downloading of the materials was time consuming.Hence, there is a need to understand the factors that affect the success of LMS used in the distance learning process.

One of the problems facing the implementation of distance learning in Malaysia is the attitudes of the distance teachers and distance learners toward using the technology (Dzakiria 2004). If the organizations fail to adapt their system to meet the requirements of distance learning users, this leads to decrease of students' attitudes toward using distance learning. Therefore, improving and developing distance learning tools that satisfy requirements of individuals are needed.

The use of technology in open and distance learning is not sufficient or helpful enough to facilitate distance learning. Thus, not all students benefit from the use of technology, and there is no guarantee that technology can enhance and improve distance learning (Dzakiria 2004). Most of the e-learning content has low interactivity

and moderate impact on learners. Accessibility and connectivity need to be further improved (Anuwar 2004). Furthermore, there is minimal dependence on technology in a blended mode, but in a pure online mode, dependence on technology is high. As such, the technological advances must keep up with the demands of online learning. These processes include all tools and services from registration to finance and examinations. Thus, there is a need for better technological support (Kaur et al. 2010).

Technical and operational issues can hinder a student's enthusiasm in participating online. Problems with operating the portal and accessing the online system need to be addressed effectively to encourage the students to participate in online activities (Murugaiah & Thang 2010). However, the underlying cause of the set-backs and frustrations faced in using technology is the lack of support of student needs (Dzakiria & Idrus 2003). To function effectively, the learners need quickly to become comfortable with the nature of teaching and learning at a distance. The delivery systems should be adapted to best motivate and meet the needs of the learners (Dzakiria 2004).

The previous studies described the need for reassessment to address the user's needs and to build the LMS based on the students' needs and desires. Also, the current LMSs in Malaysia need to give more motivation to the students to move forward to distance learning by providing them with new technologies such as video streaming, video chat and social networks. The reassessment can start by studying the level of acceptance and the success of distance learning technology among distance learning users and by addressing the users' needs to follow the growing demand of technology. Hence, in this research, we will focus on studying the user acceptance of LMS; developing a model for evaluating the success of LMS among distance learners; and eliciting learners requirements in order to update the current LMS with new features to satisfy their needs. The next section discusses the LMS, which is the most important technology used in distance learning.

2.5 OVERVIEW OF LEARNING MANAGEMENT SYSTEM (LMS)

The Learning Management System (LMS) is a system that automates the administration of training events, manages the log-in of registered users, manages course, record data from learners, and provides reports to management. The LMS provides an integrated platform for content, delivery, and management of learning, as well as accessibility by a range of users that may include learners, content creators, and administrators. An LMS acts as the central component of e-learning implementation enterprise (Haugen 2003). LMS can meet the different educational requirements, administratiion and deployment. The virtual distance learning environment used by universities and institutions enables teachers or tutors to manage the courses and to share information (Gil et al. 2009; Oneto et al. 2009).

Ravi and Pamela (2004) presented five elements to build an effective and efficient LMS, which are: good framework or design, implementation, tailored curriculum or intelligent analysis, high availability, and security. A good framework or design is divided into several components which are adaptive student interface, Course Creation Fellows (CCF), registration, dynamic assessment, and click streaming components. The CCF is the first element of the successful LMS, which allows users to directly submit their concepts and sub-concepts into the LMS; the registration holds the personal information of all stakeholders; the dynamic assessment provides the users with exams, quizzes and labs at each concept level; and the click stream collects the data streaming in the background. The second element after the design process is implementation which considers as important step for effective LMS. The success of LMS implementation depends on four critical issues which are reusability, compatibility, scalability, and high availability. Intelligent analysis is the third important element of LMS success and it requires course content to be tailored to the learner's performance and ability. The fourth element of LMS success is high availability, which is related to the hardware and software quality. To ensure high availability of courses via the LMS platform and to give the students their self-paced learning, the LMS server must include high performance hardware and open access 24/7, which give the students the time to study with no error or delay time to access the course information. The security function of LMS is very important to

course content, specifically for online test and grade tools. The LMS provides high security to the users information and to the course data (Ravi & Pamela 2004).

We can conclude that the LMS is the most important technology in distance learning, and the success of distance learning depends heavily on the success of LMS development. Hence, in our research we will focus on LMS and measure the success of LMS in distance learning programmes in Malaysia.

2.6 PROBLEMS RELATED TO LMS

An LMS must be capable of handling various delivery modes; it must automate the process of learner enrolment, registration, records, transcripts, schedules, and reports, and it must incorporate evaluation, assessment, and testing capabilities (Haugen 2003). The importance of the evaluation and assessment is to introduce the changes in existing instructional systems and to address the needs of all users. The assessment the web-based distance learning is significant for every new programme (Sherry & Morse 1996). LMS combines many administrative, organizational and technological components that make it a very complex system. Different users have different needs and all LMSs may not be suitable for all users and all environments, due to their different features and functionalities. The increasing number of LMSs is not surprising since there has been growing interest in identifying the design principles and features that can improve user satisfaction. The satisfaction of users with technologies associated with distance and collaborative learning applications has been found to be significantly associated with usability, that is, the effectiveness, efficiency and satisfaction of the distance education users. This learning application is related to LMS functions that are used to make the distance education more effective and efficient (Arh & Jermam 2007).

The LMS is expected to allow for adaptive recovery of history and state, comparison of outcomes, monitoring of educational research, shared reference database, and a problem scenario database. The next generation of LMSs is necessary for a standard extension to LMS. Therefore the extension must include a user interface to define and edit the database. As learning objects need to access the database, the

extension must also include a search engine and security feature (Sessink et al. 2003). In addition, the Organization for Economic Co-operation and Development (OECD) reported the virtual classroom, with capacity for live chat, utilization of a collaborative whiteboard, and group web browsing, is available in the LMS, although its capacity for use by instructors may still be limited because of its demand on the commitments from both instructor and students during a specific time frame (OECD 2005).

It is not easy to develop an LMS based on international standards of fields, as the analysis, design and implementation pose different needs such as: requirements of variety of interactions, communications between LMS users, user interfaces, and database designs. Those needs require high cost and responsibility from the developer or the organization. In addition, the LMS must include high security access to all the available resources, tools and features, which must be able to integrate with other tools such as Microsoft word, PowerPoint, SCORM and content management system (CMS). User-friendly environment is an important issue in LMS, where users can easily access the LMS platform and use it without a need for long waiting time. The LMS used by different users who may be from different countries requires providing a multi language environment (Burcu & Nergiz 2007).

According to Wahlstedt and Honkaranta (2007), the LMS consists of pedagogical devices, human interactions, learning contents and assessment supporting and advancing traditional learning in school or in higher education. LMS must satisfy the needs of the users. Teachers can use the LMS for distributing courses and interacting with students compared to the traditional class room; LMS is largely used as a useful content distribution system. There seems to be a gap between the reality and the many advanced teaching tools, such as multimedia materials, which are considered as possible means for enhancing the teaching, but not utilized. To bridge this gap, an LMS system should be built to be more adaptive and modular. This is to support teachers or instructors with different computer skills levels (Wahlstedt & Honkaranta 2007).

There are several components of LMS that make the distance learning usable such as application settings, email, content delivery, learning and content management

module, portals, reporting, roles and permissions, and user management. LMS performs student registration, course enrolment, course presentation, student bookmarking, track learner progress, record test scores, and indicate course completions, and allow instructor to assess the performance of their students. There have been several efforts to develop frameworks for analyzing LMS from educational and institutional perspectives. Generally, these frameworks and methods are used for general usability testing of e-learning or distance learning technology and they are vaguely used in any general evaluation. Only a few studies focus on usability analysis of LMS, whereas some analyze specific modules while others compare LMS software with another LMS (Georgiakakis et al. 2005).

According to Lehsten et al. (2010), to facilitate the learning process, distance learning utilised mobile devices to provide the learners with different ways to communicate and include the capability to access the available recourses. But, the LMS is still unable to adapt itself to modern mobile devices with restrictions such as reduced display size. By recognizing the device and its restrictions it is possible to optimise the LMS interface. Additionally, by using device features such as position, acceleration sensors, or the camera, it is possible to detect the intentions of users (Lehsten et al. 2010).

2.6.1 Problems Related to LMS in Malaysia

In Malaysia, the LMS provides an integrated platform for content, delivery and management of learning, and accessibility by a range of users (Rahman et al. 2010). There are many factors that may influence the quality of LMS such as understanding the students' requirements and meeting their needs, expectations and awareness. Analyzing these factors and expectations is the first step to achieve a good level of LMS or e-learning portal quality (Ismail et al. 2010). LMS with good design will help users to browse it without any problem. There is a need for further studies to identify other factors related to the use of LMS (Ayub et al. 2010).

According to Rahman et al. (2010), OUM is fully operated as an open and distance learning environment and has successfully implemented the LMS to ease the

learning process. The authors reported that most of the students do not fully utilize the LMS effectively such as using online submission of course works, online discussion as well as to self-evaluate their learning performance. They prefer to have paper based tests rather than online quizzes. The students tend to do many activities manually, for example, they discuss the subjects face-to-face with their instructors, tutors and other students. In addition, according to Dzakiria and Idrus (2003), the reason for the setbacks and frustrations faced in using LMS is the lack of support of student needs. Hence, there is a need to understand why the students do not prefer to use LMS to conduct online activities (e.g. online quizzes or examinations).

Technically, there are many problems that hinder the students from participating online. These include: operating the portal and accessing the online system, which needs to be addressed effectively to encourage the students to participate in online activities (Murugaiah & Thang 2010); appropriate interactive technology, such as e-mail, should be provided to encourage small groups and individual communication (Dzakiria 2004); poor management of online interactions (e-mails and bulletin boards) and difficulty in tracking learners' academic progress (via threaded discussions and tests) (Ramli 2009). In addition, there are some features that do not exist or are not properly used. For example, in OUM, the university started using mobile learning in 2009 to collect students' opinions using short survey tool and for answering questions and for announcements (Lim et al. 2011). Until today, the students can respond to what the university asks but they do not have options to communicate with their instructors or administrators using the SMS individually. Even if the students have to respond in relation to any assignment he/she must go to LMS or Facebook forum to share their knowledge but they cannot respond immediately via the SMS tool. In order to effectively utilise the SMS feature, it should allow the instructor or administrator to contact students individually or as a group of students. The important part of this feature is also to notify the students if there are any content updates or schedule changes. Furthermore, the administrator can use the SMS feature to notify the instructors and students about site updates, contents, and important announcements and to notify the distance learners about registration and exam dates. Students also can discuss content with instructors using the SMS tool and instructor can provide immediate feedback to the students without a need to come

back to his/her personal computer. SMS tools can be used as a backup plan if the user loses communication or can report if there is any problem or errors faced by the user.

In addition to the SMS feature, a plagiarism deduction feature must be employed to improve the quality of higher education. However, until today the universities still use external plagiarism detector systems (i.e. OUM) which cost the university more money and the quality cannot be guaranteed (Ahmad 2006). Table 2.2 presents a comparison between OUM's LMS, MMLS, and WebCT. The comparison is conducted based on a number of standard features.

Table 2.2 Comparison between OUM's LMS, MMLS and WebCT

Features	OUM_LMS	MMLS	WebCT
Platform & database Independence	✓	✓	
Integration with student's database	✓		
No HTML Knowledge for quiz Material	✓	✓	✓
User Name and Password Security	✓	✓	✓
File Management for uploading to server	✓	✓	✓
Multiple file uploading and Auto sequencing	✓	✓	✓
Search Tool for Course Material			✓
Student can make Private Annotations for course material	✓	✓	✓
Student can share note with his/her learning communitys	✓		
Assignment Module	✓		
Question templates / bank	✓	✓	✓
Intelligent Navigation	✓	✓	
Online examination and Grading	✓	✓	✓
Feedback of content	✓	✓	
Students Tracking	✓	✓	✓
Graphical representation of grades/tracking data	✓	✓	
Email	✓	✓	✓
Forums		✓	✓
Chat	✓	✓	✓
White Board			✓
Video Conferencing			✓
Bulletin Board		✓	✓
Bulletin Board according to learning unit	✓		
Bookmark	✓	✓	
Announcement	✓		

Source: Latif and Bahroom (2003)

As shown in Table 2.2, there are a number of features which are not included in the OUM system (e.g. Search tools for course material, forums, whiteboard, Video conferencing, and bulletin board according to learning unit). Even though, today, OUM system includes external search tools, such as Google search engine, it does not include search tools specific for the LMS to allow the students to search for materials inside the LMS. Some of the features shown in the table are updated and included in the OUM LMS but not appropriately employed.

Ali et al. (2006) said, Malaysia has many distance learning centres and programmes, and the number of students is increasing and the LMS has become the most popular system used in HEIs. The universities have used distance technology, especially the LMS (adopted from other universities or companies) and some of them have developed their own LMS. The current LMS and the distance learning technology in general need to be updated from time to time since the user needs change parallel with changes and advances in technology. A well-designed LMS is one which helps the users to access and browse the LMS with no problem, while previous research recommended further studies on the factors related to the use of LMS (Ayub et al. 2010). The content sharing, photo/video sharing, and social networking should be integrated into the current LMS.

Passages from the internet are copied and pasted to be presented as the student's own work without substantial rewriting or due citation. The instructors can look at the students work and check the changes to ensure there are no "cut-and-paste" of submitted work by students. But maybe not all instructors have time to check, thus, to ensure uniformity in the treatment of all submitted work some form of automatic detection of plagiarism must be employed. Deterring plagiarism and training students to abhor plagiarism would certainly contribute to improving quality in higher education. However, until today the universities still use an external plagiarism detector system such as in the case of OUM, which costs the university more money and the quality cannot be guaranteed (Ahmad 2006).

According to Puteh and Hussin (2007) in UNITAR's case, it would have been better to have selected a more stable technology, rather than investing so heavily in

virtual learning, which at the time was a largely untried technology. Furthermore, UNITAR was further hampered by a number of other factors. These included the level of technology adoption by students, the sophistication of the software and Malaysian society's overall view of the value of technology. Perhaps all these things need to change before distance learning will be fully appreciated by both students and lecturers (Puteh & Hussin 2007). Furthermore, the rapidly changing technology also requires continuous upgrading of technology for the e-learning system which is one of the most important challenges that face UNITAR (Huey et al. 2007).

The interactive learning materials are very important to distance learning in which the learner is in control of the progress of the lesson to some degree. This means that such materials can be designed to easily adapt to the pace and learning style of the individual who is using them. In most schools today, teachers are overstretched at times and are unable to give dedicated attention to individual students for very long, so using interactive materials can help provide a tailored learning experience without the need for continuous teacher intervention. Even OUM has excellent tools for open and distance learning but it does not provide interactive learning materials (Puteh & Hussin 2007).

This section has mentioned some of the problems that are related to the LMS in Malaysia. In order to solve these problems, in this research we will focus on user needs and requirements to develop LMS prototype. Furthermore, we will measure the related factors to the LMS success in Malaysian universities. The prototype will include new or modified features which provide the users with a suitable distance learning environments, and will save the cost of LMS implementation by providing the universities with an open source LMS. In the next section, some LMS evaluation studies are discussed.

2.7 BACKGROUND STUDIES OF LMS EVALUATION

The LMS has been used in education for a long time and many universities use different types of LMS. As Georgiakakis (2005) claimed, only a few studies focused on usability analysis of LMS and most of the evaluation studies done were just