DISTANCE LEARNING MANAGEMENT SYSTEM REQIUREMENTS FROM STUDENT'S PERSPECTIVE

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ABSTRACT

The importance of evaluation and assessment is to introduce the changes on the existing LMS and to address the need of distance learning students and updating the current system due to technology changes. The new requirements are needed to increase student utilization of the LMS in order to ease learning process and to achieve learning goals. This study aims to gather LMS requirements which provide desired functionalities for distance learning instruction. A survey is conducted to view distance learning student's perspective of LMS requirements. Through literature reviews, five dimensions of user's needs are identified. Based on the dimensions a set of questionnaire is constructed which then is administered to distance learning students in four universities in Malaysia which offer distance learning courses. The collected data are analyzed using the Statistical Package for the Social Sciences (SPSS). From this study students show positive agreement of the proposed requirement dimensions and strongly suggest to include the new feature in the future LMS such as plagiarism checker, Short Message Service (SMS), online survey, online journal and Really Simple Syndication (RSS).

Keywords: *Distance Learning, Requirement elicitation, Learning Management System*

1. INTRODUCTION

Understanding the requirements is critical to the success of interactive systems and it is a central part of information system (IS) design. It is now widely understood that successful products and systems start with understanding of the requirements and needs of the users. In system development, requirements elicitation is the practice of obtaining the requirements of a system from users, customers and other stakeholders. Thus, a good requirements elicitation may gain many benefits such as increasing user satisfaction, reducing training and support costs, enhancing quality of work and increasing productivity [1]. A Learning Management System (LMS) is a software application or web-based technology used to plan, implement, and assess a specific learning process. Typically, a LMS provides an instructor with a way to create and deliver content, monitor student participation, and assess student performance [2]. LMS may also provide students with the ability to use interactive features such as threaded discussions, video conferencing, and discussion forums [3]. Learning management system manages the log-in of registered users, manages course catalogs, record data from learners, and provides reports to management. 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. In other words, LMS provides educational institutions a convenient platform to

manage teaching and learning activities as well as manages student's registration and records.

Distance learning requires the adoption of a new teaching and learning paradigm. Online Distance Education (ODE) is still young in Malaysia and needs better requirements understanding and more system enhancements. For instance, distance education strategies and delivery modes were perceived by the distance learning as not adapted to meet the needs of the larger intakes of learners, and the learners' diversity which directly raises the issue of learning support in distance learning [4]. Therefore it is important to evaluate and assess the current instructional systems and to address the need of all system users. The assessment of the web-based distance learning is significant for every new program [5]. In addition, LMS requirements always change over time and hence different LMS will be needed at different stages in order to provide desired functionalities.

The evaluation of the LMS is crucial to ensure their effective implementation and positive impact on distance learning delivery. Many institutions find it quite easy to start with a commercial LMS, but they encounter many problems such as, pricing, linguistic, assessment tools, and suitability to target users [6]. The university use the LMS but unfortunately the people tend to resist adoption of a new LMS because they were attached to what they had built in the first LMS [7]. Furthermore, LMS is largely used as a useful content distribution system. LMS is used by the instructor for distributing courses and interacting with large number of students compared to the traditional classroom. Therefore LMS system should be build to be more adaptive and modular. Modularity would support better the range of instructors and students with diversity computer skills and user needs. Since students are the largest number of LMS users, their opinion of LMS user's needs are the most important. Although users are not experts on evaluating the system implementation or the basic system features, the requirements for a novel LMS should be jointly evaluated by LMS experts [8]. An effective implementation of an LMS needs to determine the critical features of the system and their implementation [9].

The requirements should include and address the users need and ensure that the system will include all technology that can help the organization and the students to complete the learning process in an appropriate way, saves time and cost. There are several LMS available that are used by Malaysian higher education Institutes. For instance, Blackboard, WebCT and Moodle which some of them are leading educational systems that are used worldwide. Nevertheless, many institutions are trying to develop their own LMS with specific purposes such as LearningCare and SPIN. However, many features of the current LMS are not fully utilized. Therefore this study is attempting to identify student's requirements of an LMS. The research question is highlighted as, what are the distance learner's needs from the new technology to improve the current LMS? To answer this question, this study is conducted in order to elicit the requirement dimensions and to investigate distance learning students needs for an effective LMS.

2. REQUIREMENTS ELICITATION

Requirements elicitation can be defined as a learning, uncovering, surfacing, extracting, and/or discovering stakeholders needs, customers, and other prospective users. An another definition of the requirement elicitation is understanding the system and user requirements from various sources [10-11]. This study attempt to elaborate further on these definitions by saying that requirements elicitation is all about understanding and learning the expectations, desires, needs of all users such as students, instructors and administrators, and understanding the existing system and the new technologies

The requirements elicitation is based on the feasibility study in the early analysis stage of the requirement engineering process. Studies on application domain, services that the system should provide, performance issues and hardware and software requirements are conducted. Each area of investigation is put through the steps of analysis and classification, where all conflicting issues are addressed and prioritized. The final result will be documented in the requirements document.

According to Chad [12], understanding and improving the user requirements are investigating into the underlying and common activities of typical system's requirements. The author categorized the different individual requirements elicitation tasks into five interrelated and fundamental activities. The five requirements elicitation activities are: 1.Understanding the Domains; 2. Identifying the Sources; 3. Selecting the Methods; 4. Eliciting the Requirements; 5. Organizing the Information [12]

Kotonya and Sommerville [13] provide a suggestion that a good process of elicit the requirements must include:

1. Background knowledge acquisition (organization and structure, existing systems, application domain);
2. Object setting (goals, problems, budget, schedule, constraints);
3. Stakeholder requirements collection (user, domain and organizational requirements);
4. Knowledge organization (identify stakeholders, roles and responsibilities) [13].

The requirements elicitation process and analysis was conducted using the following steps as shown in Figure 1, as outlined by Sommerville [14].

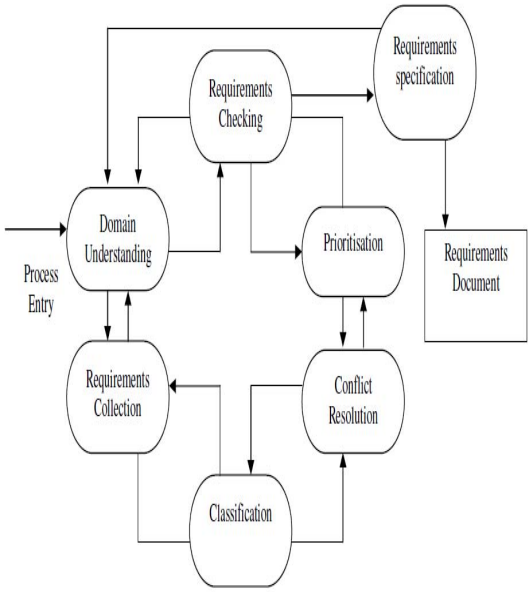

Figure 1 Requirements elicitation and analysis process [14]

Requirement elicitation process by Sommerville has been divided into six steps as follows:

1. Understand the domain: The requirements analysis framework consists of accumulating and researching various forms of documents regarding the problem domain. In this step, the traditional techniques of introspection, analysis of existing documentation and the analysis of hard data are used. Most of the elicitation of materials and knowledge is gathered from printed research materials such as published papers, journals, books and other documents.
2. Requirement collections: In this step, requirements are collected through some materials online, ideas, concepts, functional methods, hypotheses, and experiments. From all the literature reviews, critical aspects, techniques and knowledge are extracted to be included into the proposed system.
3. Classification: All requirements collections are studied carefully. Each new idea and concept is classified and prioritized according to their functionality and area of usefulness.
4. Conflicting: Due to having too much information, conflicting knowledge arises. The task of identifying relevant information for the implementation and resolving conflicts is a tough one.
5. Requirement prioritization: this task can help to determine which ones of the requirements or functions should be implemented first. Many organizations pick the easiest requirements that are implementing first, and some pick the lowest cost requirements to implement without regard to importance.
6. Requirements checking: check the final requirements to be correct and free of conflict and specify domain.

Similar requirement elicitation techniques are employed to gather the system requirements of distance learning management system. In order to group the requirement items, several dimension related to LMS requirements are modeled.

3. REQUIREMENT MODEL

The requirement model for distance learning users or DLMS is constructed as shown in Figure 2. These dimensions and related requirements are gathered from previous LMS evaluation studies such as Mohawk College of art and applied technology at Canada (2009), Humboldt State University (2007), Bristol Community College (2009), Idaho State University (2007) and Ohio University (2008). The following are brief descriptions of requirement dimensions and items that are employed:

- **Instructional features** refer to those features in distance learning system that are used in the creation of the courses offered using the distance learning instruction, 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 [15-17].

- **Interactive features** refer to those features in distance learning system that requires a transfer of data within a computer or through a network. The interactive features in distance learning system include chat room, discussion board, digital drop boxes, the creation of external links and homepages within distance learning environment, the act of uploading or downloading of files (text document, graphics, video, audio or animation), and the act of electronic file transfer between distance learning technology and other application software such as Microsoft Excel and Microsoft Word [18-20].
- **Administrative features** refer to those features in distance learning system that are used in administrating the system such as defining users, defining backups, scheduling jobs, running management reports, and monitoring jobs which are centralized [17, 19, 21].
- **Visual features** in distance learning technology refer to the features that make up the visual appearance of the entire distance learning platform, which include the overall layout, the design of graphical user interfaces, and the overall aesthetic design of distance learning technology using colors, icons and shapes of buttons, the different types and different sizes of font, as well as the relationship of all these elements to one another [15, 22-23].
- **Support features** refer to those features in distance learning system that are used in giving advice and solving problems within the system and offering a good training for the stakeholders such as help session, technical support, user community, site map and user's guide [17, 19, 22].
- **Technology features** (hardware and software requirement) refer to those features in distance learning system that are used in such a way the system is compatible with a variety of multimedia plug-ins (QT, PDF, Flash ZIP), any internet browser (Firefox, Internet Explorer Netscape, Safari, other), various devices other than computer to access the distance learning platform (iPhone, HTC Blackberry, etc.) [18, 23-24].

In this study the researchers focus on student's requirements. Students are the main registered actor of the DLMS. They are the most important and the largest number of users compare to instructors and system administrators. Student's feedback is essential to make the learning process using DLMS effective.

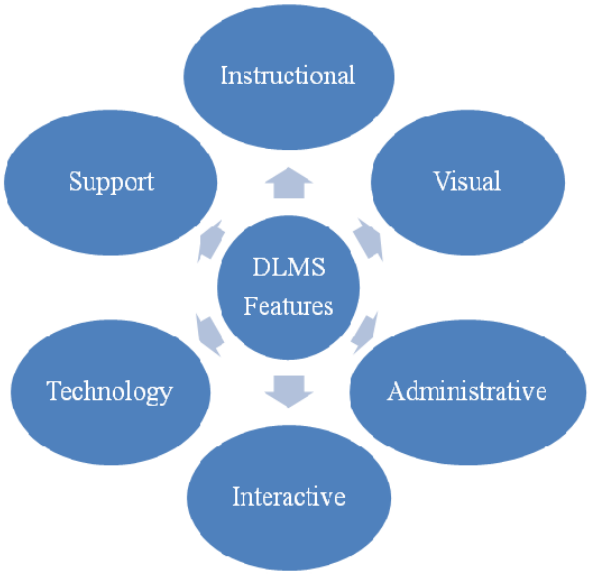

Figure 2 Proposed DLMS Requirement model

4. REQUIREMENTS GATHERING

After a comprehensive review of the literature, the questionnaire is designed based on a collection of previous studies surveys and by adapting the requirements and selecting the significant questions that reflects the user's needs and compatible to the current technology. Moreover, the literature helps in identifying new additional requirements that encourage the DLMS usage among the Malaysian higher educational society, and specifying their preferences. The gathered DLMS requirements are adopted from the following studies.

- Idaho State University: A survey on moving their LMS from WebCT to Moodle was conducted. An evaluation of the WebCT, Sakai, and Moodle was decided by the faculty staff, students, and administrators during the academic year 2006-2007. The questionnaire was developed by the Instructional Technology Resource Center, and their online questionnaire contained of 164 questions which are grouped into open-ended questions and five likert-type scales and one check-all-that-apply scale. The questionnaire was distributed among 1700 students and 70 faculty members. A total

response of 242 students and 36 faculty members were received [19, 25].

- Ohio University [15]: A web survey was conducted to measure the perception of LMS (Blackboard) design and Blackboard perception. The questionnaire was developed by the researcher himself, and the questionnaire contained of 150 questions that are grouped into open-ended questions and five likert-type scales and one check-all-that-apply scale. The questionnaire was distributed among 1208 faculty members, teaching at the main campus of the Midwestern University during the academic year 2007-2008. A total response of 154 was received [15].
- Humboldt State University [21]: This survey was conducted as an evaluation study of the used of LMS for renewing the LMS license agreements for the academic year of 2006-2007. An online questionnaire was used which contained of 136 questions for students, faculty, staff and vendors.

This study involves in addressing the requirements of the LMS among the Malaysian higher educational society. A survey has been carried out to distance learning students in four universities that offer distance learning instruction and use LMS which are, Open University Malaysia (OUM), Universiti Tun Abdul Razak (UNITAR), Universiti Sains Malaysia (USM) and Universiti Putra Malaysia (UPM). A survey was conducted using a set of hard copy questionnaire and online questionnaire. The questionnaire was developed based on issues raised by past research and studies, as well as concerns mentioned in the literature related to this study. Students are given questionnaires during the examination week in each university and 425 of them have given their feedbacks to the survey.

The questionnaire consists of 43 questions excluding the demographic information. The main reason for the analysis of the data is to get an insight on the users' opinion on the system requirements. The requirements analysis inclusive of the functional and non-functional requirements are divided into six categories based on the LMS dimensions and features namely Instructional features, Administrative features, Interactive features, Support features, Visual features, Technology features. The questions are used to measure how important are these features to the users. In order to address the user's need for the future LMS, the evaluation is done by using 4 point-likert-scale: very important; important; not important; strongly not important. The collected data are analyzed using the SPSS 17.0. User requirements are then refined and verified by the obtained feedback.

5. STUDY FINDINGS

The reliability test is the first step in data analysis which aim to indicates the extent to which the measure is without bias (error free) and hence offers consistent measurement across the various items in the instrument and across time [26]. The reliability helps to assess the goodness of measure, and indicates accuracy in measurement. According to Sekaran [27], a reliability coefficient Coefficients in the 0.70 range are deemed acceptable and .80 or .90 indicates that a scale is well-constructed and a coefficient in the .50s or .60s indicates that a scale is less well constructed [27]. The reliability index of the student's questionnaire is .975 which indicates as well-constructed scales and instruments.

The analysis of demographic information shows that 49% of the respondents are female whereas 51% of them are male and 71% of the respondents were married. The participant's ages are between 20 to 40 years old. Most of the respondents are undergraduate students (53%), 24% of them are diploma students, and the rest of them are PhD and master students. All students have good experience (more than one year) of using computer and LMS. The analysis shows that 50% of the distance learning in those universities is fully online learning and 25% is hybrid learning.

Result in Table 1 is a summarized of the student's requirements. The mean of each dimension is shown in Table 1. The technology features has the highest mean which is 2.97. This indicates that this feature help the distance learners to access the course contents, available resources and interact with their instructors and other students in their university. The mean of others features are; administrative features (mean = 2.92), instructional features (mean = 2.90), support items (mean = 2.88) and interactive items (mean = 2.88) which shows the average level of important of the dimensions among students. On the other hand the lowest mean is for the visual features (mean = 2.83). Nevertheless, the result shows that all of the features are important to ensure the quality and the success of LMS for learners in order to complete

their learning process successfully in their studies. The mean for each item are shown in detailed in the Appendix at the end of this paper.

Dimension	Mean
Instructional features	2.91
Administrative features	2.93
Interactive features	2.88
Visual features	2.83
Support features	2.89
Technology features	2.98

Table 1: Mean of DLMS requirement dimensions

6. PROPOSED REQUIREMENTS

The LMS must provide the students with effective and efficient tools which allowed them to interact and communicate with other students, instructors and to interact with the course content as well. In Figures 4 the use of case diagram explains the general function in the LMS which is providing the students with necessary tools for accessing the educational material and communicating with each other. LMS allowed students to use many features as summarized in Figure 4 where by Students should be able to:

- Interact and collaborate with the instructor and other students using available tools such as; chat, wiki. Forum, SCORM and etc;
- Fill and submit the evaluation form or the survey;
- Get their current grades and position in the class online;
- Update details including the personal details and changing password;
- Take exam and quiz, and view the previous year or semester exam questions;
- Fill up evaluation form and create a survey tool for their study;
- Publish work and research paper in online journal;
- Check assignments and research paper for plagiarism;

Those are among the essential features that are suggested by this study.

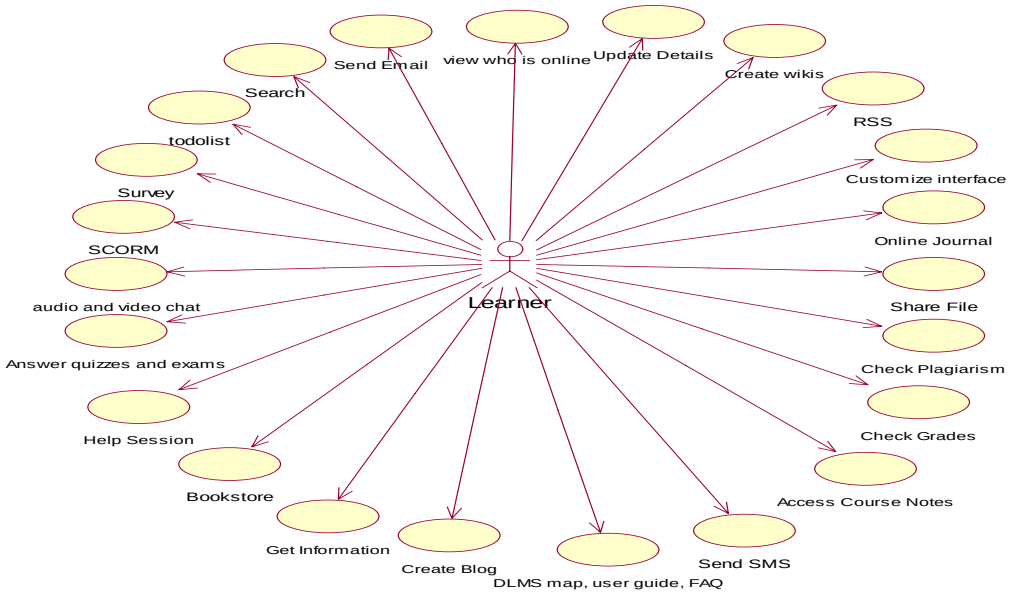

Figure 4 Use case diagrams for student actor.

7. CONCLUSION

The importance of the evaluation and assessment is to introduce the changes on the existing LMS and to address the need of distance learning students and updating the current system by new technologies which will help and increase the students interactions with the LMS and that will lead to achieve the learning goal. The assessment of the LMS for distance learning in particular is significant for every university. The advancement of technology indicates that it is essential to gather new requirements for the learning management system (LMS) in distance learning institutions. Therefore this study aims to gather a requirements for the LMS since different features of LMS would be added at different opportunity in order to provide a desired functionalities. Since this study is done based on distance learning student's needs, the proposed requirements model is called a DLMS requirement model. This study discussed the student's requirements for the LMS based on the survey which are conducted using a set of questionnaire that are administered online and normal method. From the survey, the researcher gather all the functional and non-functional requirement which play important role in the distance learning institution and this requirement will be up-to-date as the new technology always been. This findings indicate that it is important for the students to include the new features in the future DLMS such as plagiarism checker, Short Message Service (SMS), online survey, online journal and Really Simple Syndication (RSS). Finally, hopefully the gathered requirements will be suitable for any distance learning user and university in Malaysia or other countries. Furthermore this study will provide a good starting point for the programmers and analysts to design a good DLMS to satisfy distance learner's requirements.

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Appendix

Mean of Items for Student's DLMS Requirements.

		Mean
A	**Instructional feature**	**2.9**
1.	Provides me with my own blog	2.8
2.	It provides me with an e-Portfolios	2.8
3.	It lets me check my grades	3.0
4.	Provide bookstore	2.8
5.	It gives me a page that I can edit and add files	2.8
6.	It saves paper by providing a place for my instructors to put handouts online	3.0
7.	I can post events in the online course calendar	2.9
B	**Administrative feature**	**2.9**
8.	Provides me with an online space to store my files	2.9
9.	I can bookmark any content material in a course	3.0
10.	Who is online	2.8
11.	The system provide comment's box	2.8
12.	The LMS support automated virus scanning of uploaded and downloaded files	2.8
13.	Student can subscribe to RSS (Really Simple Syndication) ability to subscribe to updates	2.9
14.	I can get to Library Resources from it	2.9
15.	I only need to remember one password for all the university's systems	2.9
C	**Interactive feature**	**2.8**
16.	It makes it easy to share files among a group	2.8
17.	It provides an open discussion space for each of my courses	2.8
18.	It provides for student created/led communities	2.9
19.	It lets my instructors use video and audio files in courses	2.8
20.	It supports synchronous audio and/or video meetings	2.7

21.	It provides a place for my clubs and community groups	2.8
22.	Provide online shopping	2.7
23.	Provides me with photos of other students in the course	3.0
24.	Students can search all course content	2.9
25.	Students can search chat or virtual classroom session records	2.9
D	**Support feature**	**2.8**
26.	There is always a support person for me to contact	2.8
27.	The system include Course/site map, user guide/ FAQ	2.9
28.	High level of training is available for the system	2.9
29.	The user community is very helpful to me	2.8
30.	I receive a text or voice message in my phone when content is updated	2.8
E	**Visual feature**	**2.8**
31.	The feature to customize course menu buttons	2.7
32.	Formatting tools such as font style, font colors, font format, and layout of page	2.8
33.	The feature to change the course banner	2.8
34.	I can easily use the HTML/WYSIWYG Editor	2.8
F	**Technology (Hardware/Software requirements)**	**2.9**
35.	Works when I need it to	2.8
36.	My data (grades, journals, etc.) is secure	2.9
37.	The LMS Include application (PDF, audio, video.) content that can be downloaded to mobile devices	2.8
38.	The system is compatible with a variety of multimedia plugins (QT,PDF, Flash, ZIP)	2.9
39.	Won't slow down when many people are using it	2.9
40.	It works for disabled students	3.0
41.	I can use any browser like Firefox Internet Explorer Netscape Safari other	3.0

42.	The LMS have an interface with no requirement to download additional software (plug-ins, Java)	3.1
43.	Access the LMS from mobile devices (such as: iPhone, HTC Blackberry, etc.)	3.0
	Valid N (listwise)	425