A DEVELOPMENT OF A LEARNING MANAGEMENT SYSTEM FOR E-LECTURE (PIMC)

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ABSTRACT

The purposes of this research study were to develop a Learning Management System (LMS) for e-lecture created by PIMC (Presentational Instructor Media Creator) program, and to determine the functionalities and the level of quality of the system. Ten features of LMS were created as follow; 1) content editor, 2) database link, 3) registration, 4) import/export content, 5) communication tools, 6) file manager, 7) test manager, 8) custom interface design, 9) course tracker, and 10) print complier. The LMS was developed and modified from ATutor, an open sourced system, into a new form of learning management system that was suitable to the need of particular Thai educators, and was capable of holding large streaming videos/lectures created from PIMC programs. Software packages used to develop the system were MySQL, Apache Web Server, PHP, Windows operating system, and EditPlus. When the LMS was completed, the experts inspected their functions using software usability criteria. Eleven subjects were used to evaluate the functions of the system using 5 rating scale questionnaires. The research findings revealed that, 1) ten functions of the LMS worked properly according to the criterion set of usability, 2) the quality of the system function evaluated by the subjects of the experiment was at a high level, and 3) the e-lecture could be launched and retrieved in the LMS platform effectively.

KEYWORDS: Learning Management System, Electronic lecture, Streaming video, mySQL, PHP

1. INTRODUCTION

The development of web-based resources for online contents, interactions and computer-based courseware in colleges has seen a phenomenal growth in the past five years. The intention of each institute is to mix computer-based teaching strategies and contents into existing curricula. In many institutions, this involves
the creation of new courses and the adaptation of existing courses to incorporate web-based contents, interaction and communications by using Learning
Management Systems (LMS) [1]. There have been institutional attempts to develop LMSs to be open source software. Examples are Moodle [2], DoceboLMS [3], and Atutor [4]. LMSs have emerged in as educational communities tried to utilize the communication, courseware lesson, and multimedia capabilities of the Web. However, most of these systems were designed for the purpose of courseware learning based on typical classroom lessons.

In this project, we developed and modified an LMS base on ATutor to produce educational media that were highly interactive and personalized. Presently, we have been using streaming techniques of the Presentational Instruction Media Creator (PIMC) [5] as an authoring tool to produce e-lectures that maximize learning efficiency. However, in practice the templates of ATutor used by colleagues who have developed coursewares with the system were often limited to storage and management of multimedia-based contents (e.g., PowerPoint slides, graphics, and streaming video files). In short, these templates were too small and limited for media of PIMC. For example, ATutor can hold only 2 megabytes of multimedia contents, whereas a certain e-lecture needs up to 100

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2. LITERATURE REVIEW

Many authoring tools enable users to create a lesson that incorporating not only texts and graphics, but also audio, video, images, and PowerPoint slides. Currently, several programmers and instructors have been developing programs that can create and edit rich-media presentations, and are capable of publishing those presentations to either a local hard drive or to a remote server. Presentational Instruction Media Creator (PIMC) is one of those programs. It was developed by a group of Thai researchers who intended to provide the media, at no cost, to teach students, to train employees, or to give presentation effectively.

Presentational Instructor Media Creator (PIMC) appears to be one tool for developing pre-recorded presentations that can be used to assist instructors with software demonstrations as well as to allow students for further review. PIMC records the instructor movements on a PowerPoint slide being display, including any "click" or slide selections made by the instructor. In addition, the PIMC software can record voice and video that convert into AVI video format and using with Microsoft PowerPoint slides. The video capture can then be played back either by the instructor (in-class demonstrations) or by the students (self-paced learning). The PIMC software turns a computer into a Web-based Instruction that records every click and action "of instructors" on screen. Any instructor could use the PIMC software as an effective way to give lecture and create custom tutorials. Electronic lectures created by PIMC would also be empowerment media when they combined with the LMS that support learning everywhere through the concept of e-learning.

LMSs are an integrated set of tools with a variety of elements to support learning. Elements in any particular LMS support:

- synchronous or asynchronous communication, via e-mail, threaded discussions (newsgroups) and/or chat rooms;
- access to information in the form of text, graphics and video;
- provision of feedback through online testing and evaluation;
- navigation through a virtual learning environment (with library, search, and annotation tools); and
- administrative functions including security and online management of student courseware [6].

ATutor is an Open Source Web-based LMS designed with accessibility and adaptability in mind. Administrators can install or update ATutor in minutes. Educators can quickly assemble, package, and redistribute Web-based instructional content, and conduct their courses online. Students learn in an adaptive learning environment. ATutor generally consists of a set of templates which multiple-media content is placed, student access is administered, and student-student and student-teacher communication is facilitated.

The actual implementation of the system consists of a server running Windows 2003 Server, an Apache Web server running PHP, MySQL database to hold metadata and indexing for each media object, and a streaming server to provide uninterrupted streaming for MPEG-4 multimedia contents. The finished product would result in a platform for streaming digital video, which also include administrative functions, enabling users to index and annotate the slides. Organizing and indexing video was an important focus of this project because it was our aim to enable users to find the required video clip segment through a full content search.

3. SOFTWARE FEATURES AND DEVELOPMENT

This experimentation involved a modified version of ATutor that was suitable to the need of particular Thai educators as well as Thai software, especially PIMC. The researcher created and modified 10 features of the LMS as follow: 1) content editor, 2) database link, 3) registration, 4) import/export , 5) communication tools, 6) files manager, 7) test manager, 8) custom interface design, 9) course tracker, and 10) print complier. These 10 features were derived from the need assessment analysis in a development process.

A development of the LMS was devided into 2 sections.

1. A development of the LMS
2. A development of database system

A development of the LMS

The LMS was developed under the theory of Systems Development Life Cycle: SDLC [7] that composed of 5 features, need assessment, system design, development, implementation, and maintenance. However, only 4 features of SDLC theory; need assessment of the system, design of the system, development, and implementation, were used. Each phrase was developed as follow.

1. Need Assessment. The reseracher collected need assessment data from literature reviews, general e-learning users, and experts of the field. Then, the overall needs were analyzed into the desire features of the system.

2. Design of the system. Ten aforementioned functions of the system were formed that served for 3 groups of users; system/IT administrators, lecturers, and learners. Each function managed different jobs to three groups of users. Table 1 describes the detail functions of the LMS that served for a particular group of users.

Table 1. System Functions of the Software

System Functions	System Capacity		
	Administrator	Lecturer	Learner
1. Log in/out	✓	✓	✓
2. User database	✓		
3. Content database	✓		
4. Backup of data file	✓	✓	
5. Category of Curriculum	✓		
6. An LMS Registration	✓	✓	✓
7. Display of courses / registered courses		✓	✓
8. Custom interface design		✓	✓
9. Personal data file manager	✓	✓	✓
10. Course searching	✓	✓	✓
11. Data searching	✓	✓	✓
12. Help		✓	✓
13. Web site map		✓	✓
14. Import/Export content		✓	✓
15. Students' behavior tracking		✓	✓
16. Testing and project management		✓	✓
17. Other/related links		✓	✓
18. Student registration		✓	
19. Data file manager		✓	
20. Content manager		✓	✓
21. Printing		✓	✓
22. Management of course/content component		✓	
23. Mail box manager		✓	✓
24. E-mail	✓	✓	✓
25. Webboard	✓	✓	✓
26. Chat		✓	✓
27. Display of users that login		✓	✓
28. Disscusion board		✓	✓
29. Annoucement		✓	✓

3. Development. The programs/instruments used to develop the LMS were MySQL, Apache Web Server, PHP, Windows Operating system, and EditPlus. When the LMS was completed, it was tested with three Internet browsers; Internet Explorer, Mozilla Firefox, and Opera. The experts also inspected the LMS using the criterion set of software usability prior to the implementation of the system.

4. Implementation. The LMS was uploaded and installed on a server at the Department of Industrial Education Engineering, Faculty of Industrial Education, King Mongkut's Institute of Technology Ladkrabang. The URL of the LMS was located as http://161.246.14.139/LMS. After the LMS was completely installed, the subjects of the study were introduced to use and evaluate the LMS. Electronic lectures developed by PIMC program were also published into the LMS, and tried out by the subjects. Figure 1-2 show the LMS homepage and an e-lecture on its platform.

Figure 1. The LMS platform

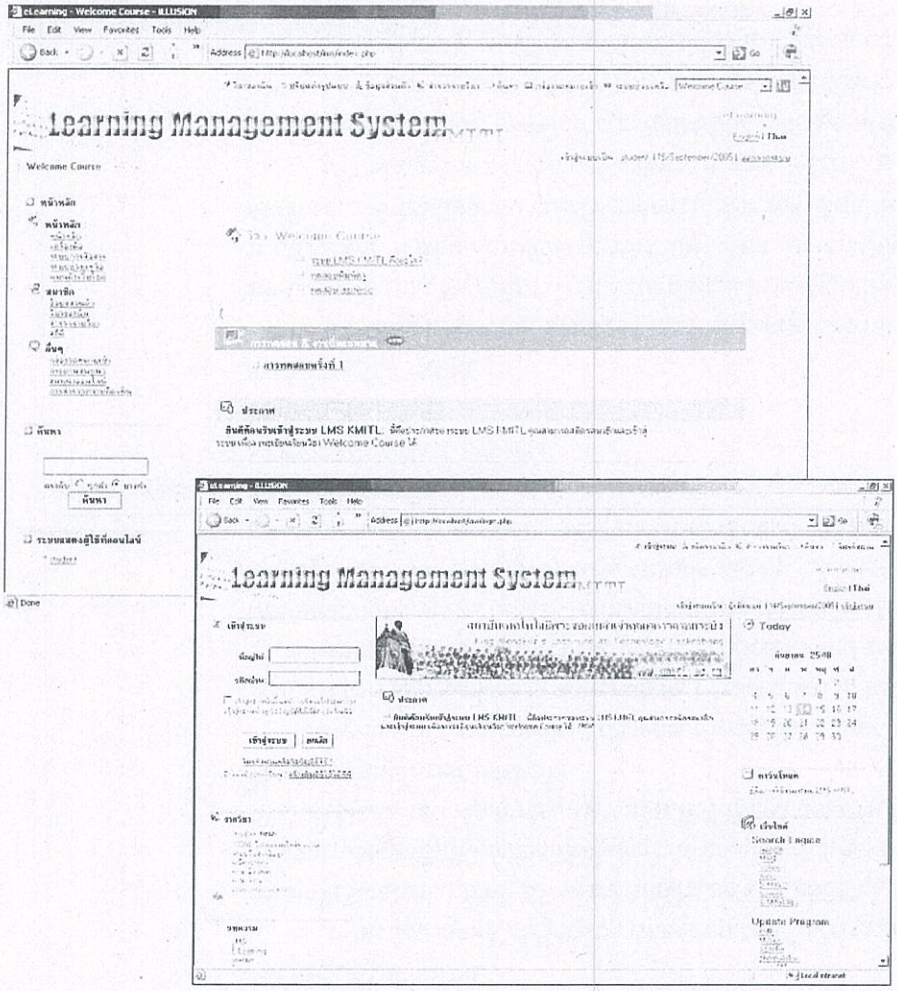

Figure 2. A full screen of an electronic lecture on the LMS platform

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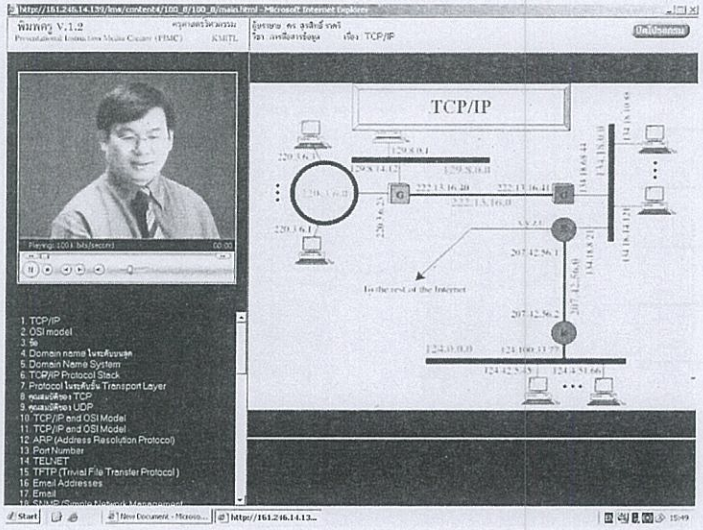


A development of database

The researcher created a data flow diagram (DFD) which derived from the users' need analysis in that each group of users worked differently with each function of the LMS.

From the data flow diagram, tables were created on MySQL. When completed, the database system was inspected by the experts, and used by the subjects of the study. The data flow diagrams are shown in Figure 3 and 4.

Figure 3. A Flowchart of Data Flow Diagram (1)

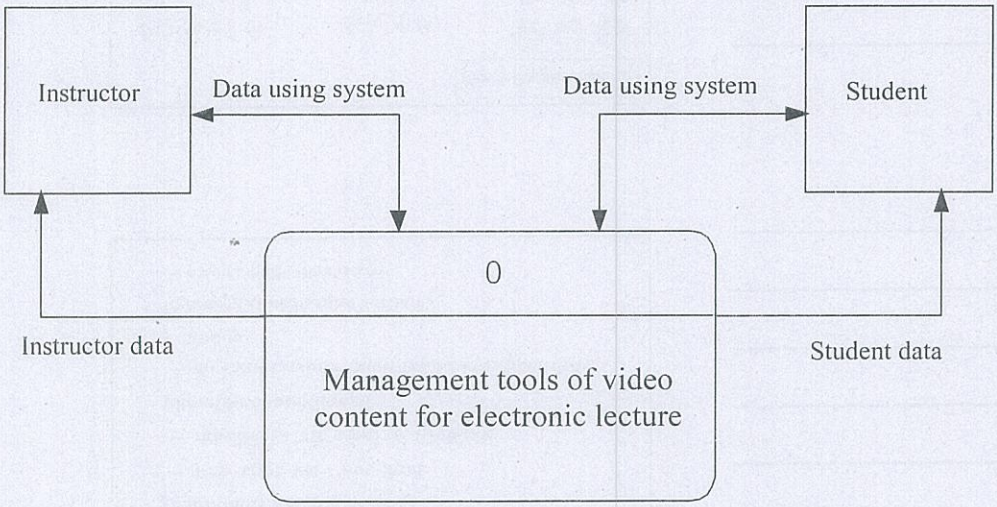
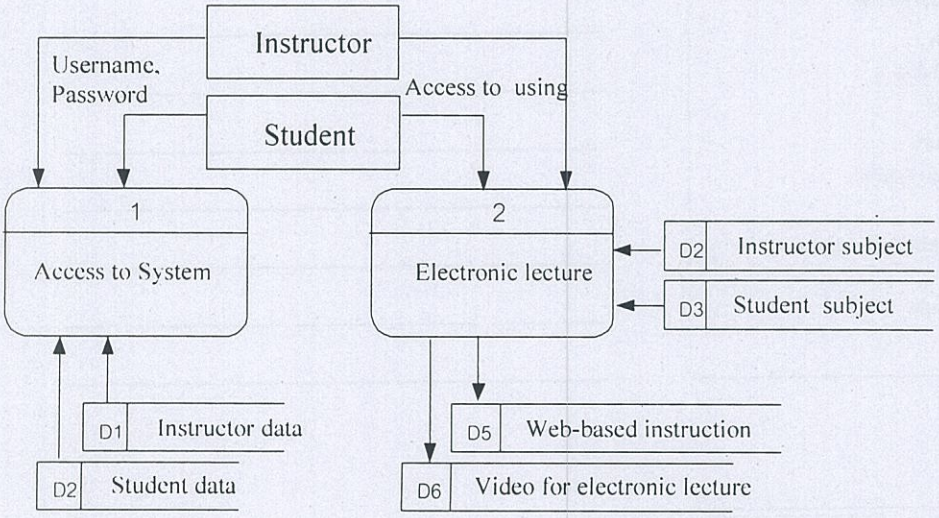


Figure 4. A Flowchart of Data Flow Diagram (2)



4. IMPLEMENTATION

The LMS was implemented by 11 subjects of the study who were selected using judgement sampling method. The instuments used to collect data of the implementation were, 1) five rating scale questionnaire asking 7 aspects of the system functions, and 2) a criterion set of system usability. Mean and standard deviation were used to analize the data. The results are shown in Table 2.

Table 2. Mean and Standard Deviation on Quality of System Functions

Quality of System Functions	$\bar{X}$	S.D.	Quality
1. System design	**4.61**	**0.50**	High
1.1 For Administrator	4.55	0.52	High
1.2 For Lecturer	4.73	0.47	High
1.3 For Student	4.55	0.52	High
2. System Components	**4.46**	**0.66**	Good
2.1 Content Editor	4.55	0.52	High
2.2 Database Link	4.45	0.52	Good
2.3 Register	4.64	0.67	High
2.4 Import/Export Course	4.64	0.67	High
2.5 Communication Tools	4.55	0.69	High
2.6 File Manager	4.64	0.67	High
2.7 Test Manager	4.36	0.67	Good
2.8 Custom Interface Design	4.09	0.83	Good
2.9 Course Tracker	4.55	0.69	High
2.10 Print Complier	4.18	0.60	Good
3. Assignment of system functions	**4.27**	**0.65**	Good
3.1 File and folder assignment	4.27	0.65	Good
3.2 Folder and subfolder assignment	4.27	0.65	Good
4. Database link and transfer	**4.55**	**0.57**	High
4.1 Internal Database link	4.64	0.50	High
4.2 External Database link	4.55	0.69	High
4.3 Data transfer	4.45	0.52	Good
5. Data presentation supporting	**4.53**	**0.67**	High

Quality of System Functions	$\bar{X}$	S.D.	Quality
5.1 Graphic	4.45	0.82	Good
5.2 Animation	4.45	0.69	Good
5.3 Video	4.64	0.50	High
5.4 Text	4.64	0.67	High
5.5 Sound	4.45	0.69	Good
6. Presentation Features	**4.55**	**0.55**	High
6.1 Text	4.64	0.50	High
6.2 Text color, background color, and graphic color	4.55	0.69	High
6.3 Buttons and Icons	4.55	0.52	High
6.4 Menus, Data presentation, and Data fill	4.55	0.52	High
6.5 English and Thai Language	4.45	0.52	Good
7. System Utilization	**4.58**	**0.50**	High
7.1 For administrators	4.45	0.52	Good
7.2 For lecturers	4.73	0.47	High
7.3 For students	4.55	0.52	High
Overall	**4.51**	**0.59**	**High**

The highest mean score of Table 2 was system design, $\bar{X}$ = 4.61, S.D. = 0.50 and the lowest mean score was assignment of system function, $\bar{X}$ = 4.27, S.D. = 0.65. The overall mean score was 4.51, and the standard deviation was 0.59.

5. CONCLUSION

The result of the implementation of the software showed that the system function was evaluated as a high level ($\bar{X}$=4.51, S.D. = 0.59), ten features of the LMS worked properly according to the criterion set of system usability, and the e-lecture could be launched and retrieved in the LMS platform effectively. The subjects were satisfied with the functions of the system especially system design that received the highest score. All the main features of the LMS also worked properly according to expert review of the system. Their interface design especially Thai language, and the location of icons used were also satisfied. Moreover, e-lectures created by PIMC program had been uploaded and retrived via the LMS, as well as tested by the subjects. It demonstrated that video file of e-lectures functioned perfectly via this platform. The LMS could retrieve and play the matching streaming segment of the relevant video file. The users were also able to search and browse the archives across the video collections. Another step of the continuing project, we will focus on the SCORM standard of this LMS system.

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