

Developing E-Learning System to Support Teaching and Learning Activities Using DSDM Approach

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Abstract

Nowadays academic institutions have to follow development of technology to give high accreditation in education. Development in Information technology is considered as one of the leading factor that affecting the changes in higher education academic institution, especially through E-Learning system. The main objective of this research is to design how to develop E-Learning system in teaching and learning process at Industrial Engineering Department of Swiss German University, by using Dynamic System Development Method (DSDM). The developed E-Learning that is being tested by developer and user to be analyzed and assessed is called Moodle. The result shows that the teaching and learning processes can be well improved by integrating the developed E-Learning system including its specific interfaces and platform. It also shows that the developed system is also well accepted by potential users, as indicated by the user acceptance test. The result of the research is analyzed by using the descriptive analysis to reveal the capability of the system. It shows that developed E-Learning system is capable to be implemented in Industrial Engineering Department, provided that the infrastructure is also prepared to support such system.

Keywords: academic institution, e-learning, information system, learning management system, moodle, technology acceptance model, UML

1. Introduction

Business Strategy is defined as a major period plan of action that is generated in aiming achievement of particular objects and strengthening the performance of the organization or institution. A good and directed business strategy will make an organization or institution perform to succeed in its business field and how they compete with another competitor (Teece, 2010).

In this case the business strategy regarding to the education is educational process. The needs of Academic institution's service quality increased along with the increased focus on accreditation by the Indonesian education standardize. The situations lead to a competitive environment in the field of academic business (Boezerooij, 2006).

The rapid development of Academic Institution and competition, make every higher institution to brief service as good as possible for customer (student), which forced competing among Academic Institutions (more specifically are Universities) to develop strategies. Universities should generate better organization, creation, and distribution and application of technology as an important aspect of their activities. Based on idea of distributing subject matter through a platform from lecturers to students, experts have come up with a system to support teaching and learning process in a University in order for it to grow and become more competitive. That system is known as Learning Management System (LMS) (Ghoniem, Aljahdali, & Fahmy, 2010).

Learning Management System is the latest innovation and an excellent vehicle for training, evaluating and tracking the results of the students. In simpler words, Learning Management System can be defined as the type of software program that controls and performs various functions pertaining to the personal computer based techniques of disseminating and

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communicating learning experiences among the students of a University (Ghoniem, Aljahdali, & Fahmy, 2010).

A learning management system (LMS) is a software application or Web-based technology used to plan, implement, and assess a specific learning process. The E-Learning come under from application web based technology .Typically, a learning management system provides the lecturer with a way to create and deliver content, monitor student participation, and assess student performance. A learning management system may also provide students with the ability to use interactive features such as threaded discussions, video conferencing, and discussion forums with comprehensive distribution from lecturers to students (Ghoniem, Aljahdali, & Fahmy, 2010).

E-Learning is basically a web-based system that makes information or knowledge available to users or learners and disregards time restrictions or geographic proximity although online learning has advantages over traditional face-to-face education (Sun, Tsai, Glenn, Chen, & Yeh, 2006).

2. Methodology

System development methodologies are promoted as a means of improving the management and control of the software development process, structuring and simplifying the process, and standardizing the development process and product by specifying activities to be done and techniques to be used. It is often tacitly assumed that the use of a system development methodology will improve system development productivity and quality (Russo, 1995).

Developing an information system is literally complex process. There are many methodologies that are different or even similar have been developed to help building the information system. A developing method is regarded as a procedure or path by the developer proceeds from a problem of a certain class to a solution of a certain class (Jackson, 1982). It means a development method should be used as role for developer in identifying problems that found from the systems studies and generate the solution based on opportunities and requirement from problems.

The products are generated from deliverables that should be documented by DSDM. The 3 project phases in DSDM are Pre-project, Process Lifecycle (Feasibility Study, Business Study, Function Model Iteration, Design and Build Iteration, Implementation) and Post-Project (Marc Clifton, J.Dunlap, 2003).

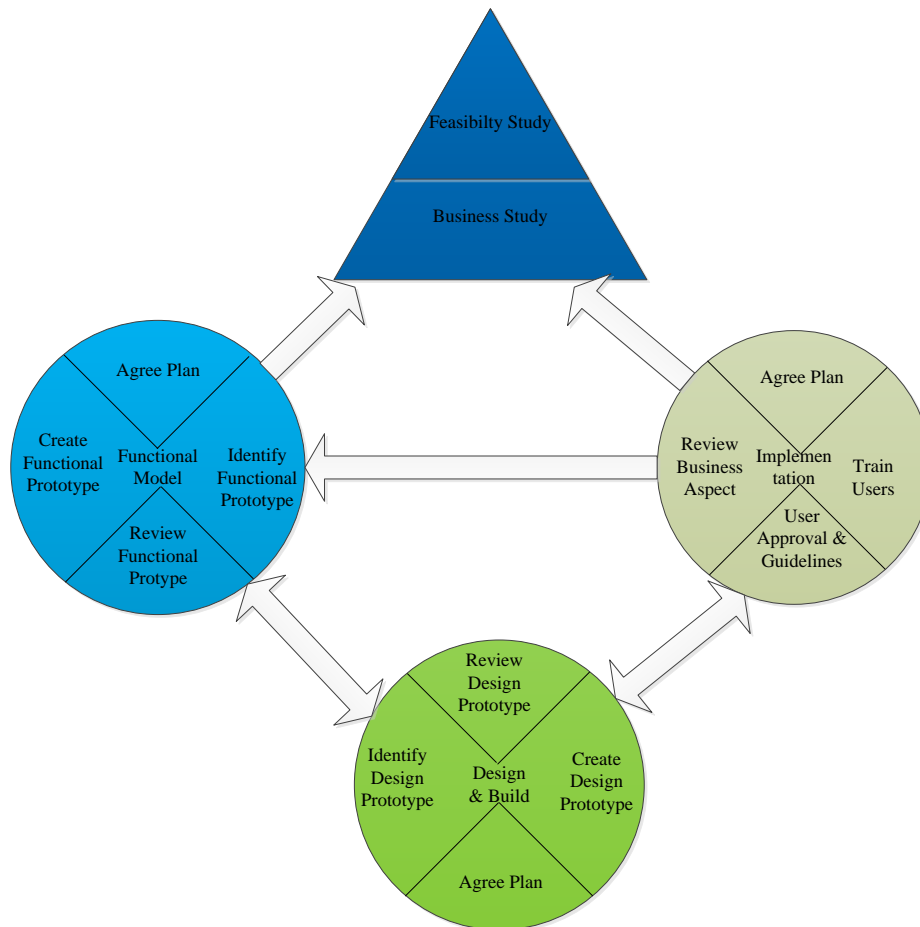


Fig.1. Process Lifecycle DSDM

Source: Marc Clifton, J.Dunlap, 2003

There are plenty advantages of applying Dynamic Systems Development Method which become foundational reason to conduct this methodology. The advantages of implement Dynamic Systems Development Method are, as gathered from many resources:

1. Dynamic System Development Method's result can be achieved within months (three until six months)
2. Dynamic System Development Method is proven to be able to give results in properly deadline.
3. Dynamic System Development Method might give high customer satisfaction, since in its process, it involve the users in development life cycle
4. Dynamic System Development Method is suitable for developing prototype of the system

Between any methodologies, Dynamic Systems Development Method is the suitable one in developing system to support teaching and learning system in Department Industrial Engineering in Swiss German University. According to DSDM, there are 3 phase which are the pre-project phase, the project life-cycle phase, and post project there are 5 stages of project life-cycle phase which are Feasibility Study and Business Study, Functional Model Iteration Phase, Design and Build Iteration phase and Implementation phase. Some Steps may be skipped based on the state and condition of this project. The Thesis methodology is figured in Fig 2.

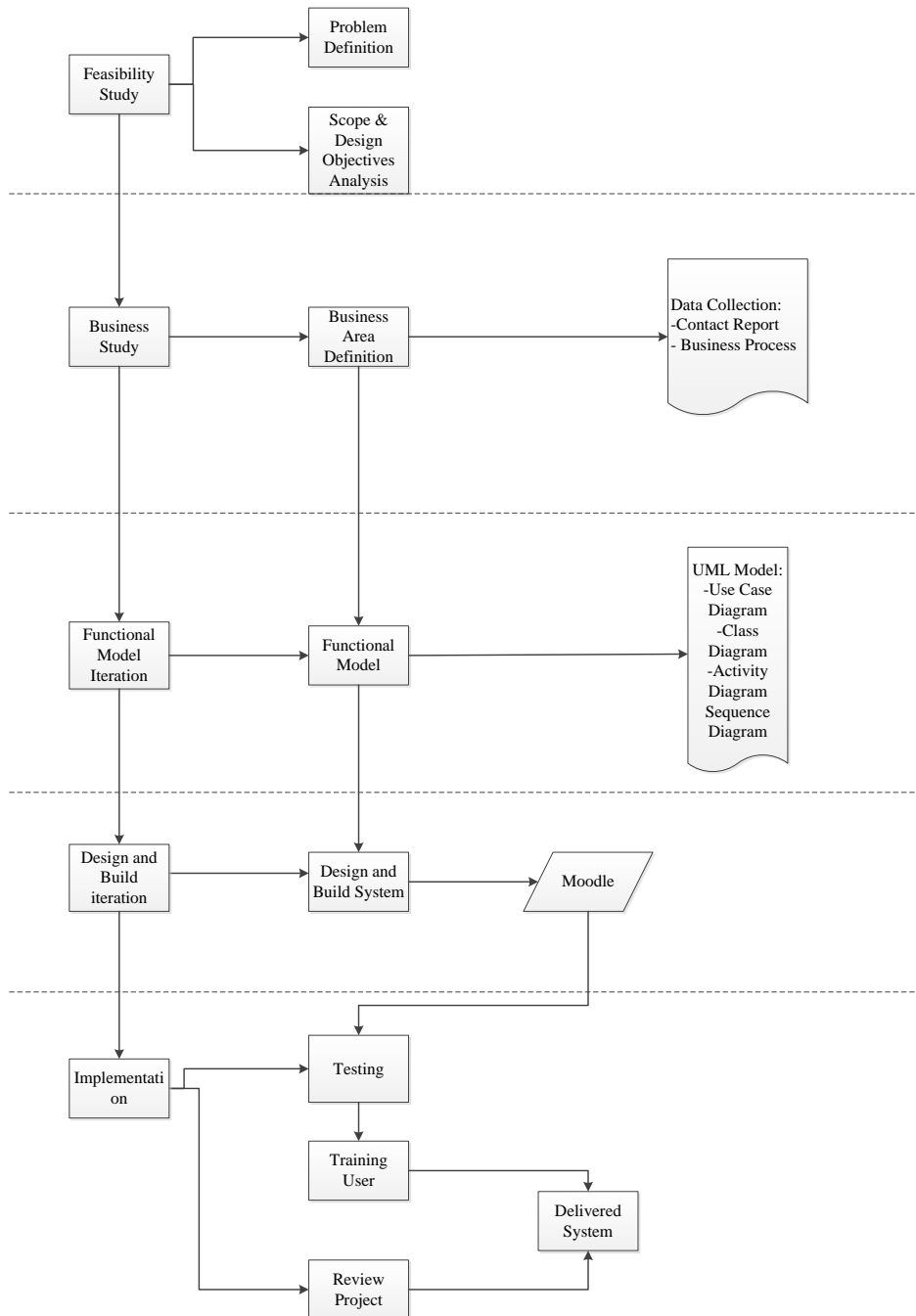


Fig. 2. Research Methodology

3. Result and Discussion

Every process from the research methodology will be described in this chapter. The structure will be deliverable based on project life cycle phase of Dynamic System Development Method.

The discussion will be objected to feasibility study to deliberate the objective and scope of the thesis. Second is the business study phase, which analyzes current learning and teaching process. The process will be determined in this chapter. The next step is Functional Model Iteration phase. In this phase various model that were unified model language constructed into prototype's model. Then Design and Build Iteration phase will be delivered. The design model of the system will be figured based on the business process model or learning and teaching process in Department Industrial Engineering of Swiss German University. The building phase will be figured which is the process from installation until configuration. The last phase which

is implementation phase will be displayed as final appearance of the software is only until software testing and user acceptance test.

3.1. Feasibility Study

The objectives of the project is develop E-Learning system to support teaching and learning activities in Department of Industrial Engineering in Swiss German University that leads to improve the current Learning Management System as well as aid every actors that are involved to work collaboratively.

The scope of the research is developing E-Learning system using Dynamic System Development Method in Department Industrial Engineering of Swiss German University. Developed E-Learning system is concentrate of operation and feature of Moodle. The result analysis of the thesis use qualitative analysis.

3.2. Business Study

This part considered on describing and analyzing the current process in Department Industrial Engineering in Swiss German University. The analyzed process is teaching and learning process that was running in there. The activities performed by the related agents with its resources and the event also. The model will identified the of business process model.

This process is performed in actual learning and teaching process, it is conducted to transfer knowledge to students. The actors that involved in this activity are lecturer and student. This current teaching and learning process illustrates the sequence of work teaching and learning activity. Knowledge adding also is also enclosed in teaching and learning processes, and it exists in core functions of knowledge management. In knowledge adding process that was core of the teaching and learning process, consists teacher deliver course, accessible resource and assessment.

The student would take course that already made from lecturer management. The course that held in class refer to teaching and learning process. In general, teacher deliver course is deliverable subject by traditional face to face classroom afterward students obtain the additional resource direct from lecturer or library then assessment of student using assignment, quizzes and exams. After all the activity had done, the process was end and then the student will become knowledge added student based on the teaching and learning process.

For the class of the users, there are two kinds of users which are internal agents and external agents. Internal agents are the agents that belong to inside organization, working with economical for an organization in this case are administrator and Lecturer. External agents are the students who work collaboratively on the system for a limited times.

Each user has its own responsibility. This research describes the structure of the E-Learning system so the role of the Agents will be explained in more detail. Moodle has three users. In which and every user own different role, functionality and working area coverage.

Administrator or Admin as the head of the system coordinator will be responsible to facilitate communication, assist in reproduction and distribution of materials among other duties. Administrator has responsible for infrastructure, hosting and support. The administrator has duties included system and teaching and learning activities setup, security, workflow, schedules and maintenance.

Lecturer as the instructor role for the system will be responsible as an instructor in learning and teaching activity. Lecturer duties include facilitation of Learning Management System based course using the E-Learning system. Lecturer could provide give the instruction in virtual environment. Virtual environmental provide the ability to communicate with students verbally and visually, share resources, assignment, course material or notes in a controlled security.

The last user's role, student responsibility related to the system is using the E-Learning platform to get resource that what lecturer delivered. Beside of that, student must consider the activity that the lecturer provides. Virtual environmental of the system provide the ability to communicate with the lecturer and other student also, get the resources and assess the assignment from the system

3.3. Functional model Iteration

The required functional model is designed by using Unified Model Language which are Use Case Model, Activity Model, and Sequence Model. In use case model shows the overall authority every role that involved in developed E-Learning System at teaching and learning process. Fig. 3. Show the use case of how agents interact with the event. The activity diagram model is a diagram to represent the workflows and steps of an entire system. Fig. 4. Show the business workflows and operational workflows of a system. Sequence model describe the way of the developed system for each actors carried out in the access pages. Fig. 5, show the sequence of steps carried out in the study course.



Fig. 3. Use Case Diagram of E-Learning System

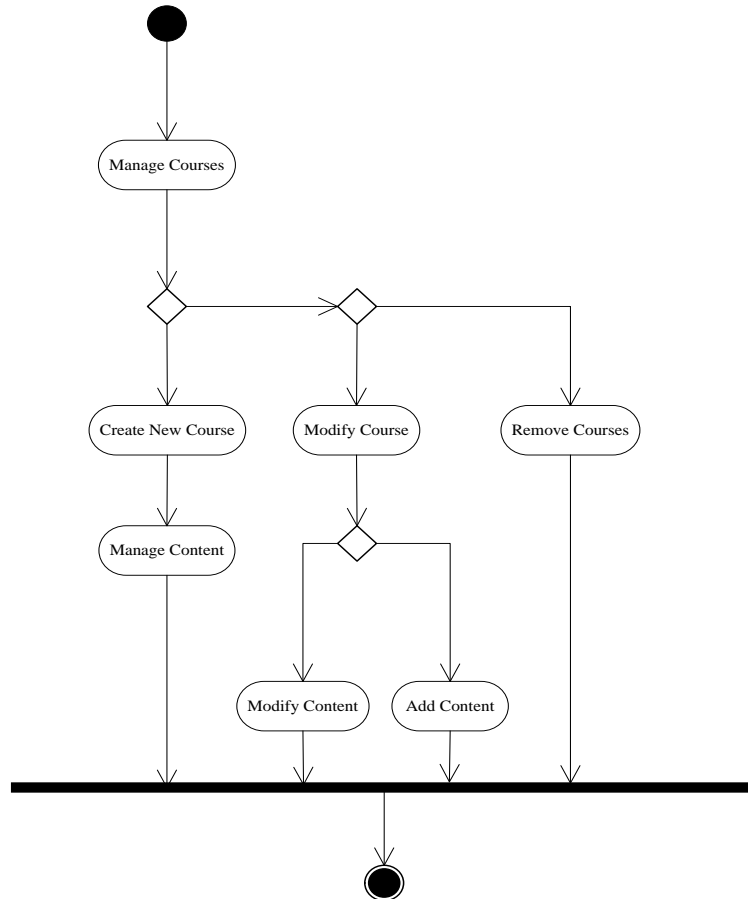


Fig. 4. Manage Course Activity Model

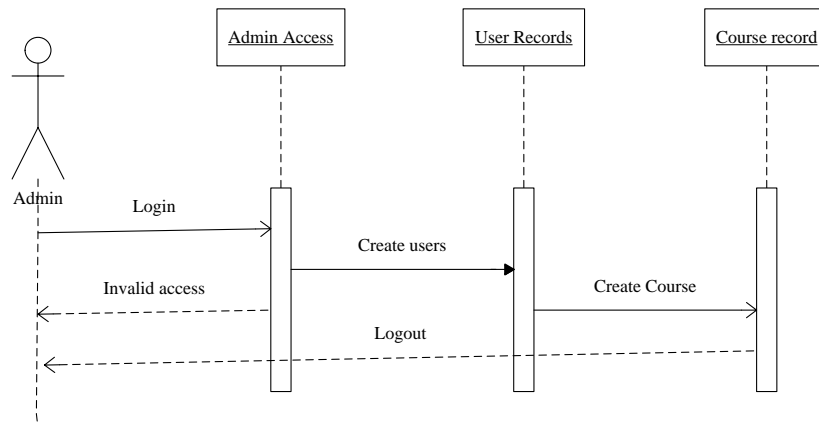


Fig. 5. Sequence Diagram Admin Access

3.4. Design and Build iteration

Designing a new system by adding developed E-Learning on the current teaching and learning process may support the teacher and learning activity on delivering the subject. The system designed is presented in business process model mapping. The new suggested teaching and learning process is displayed in Fig. 6.

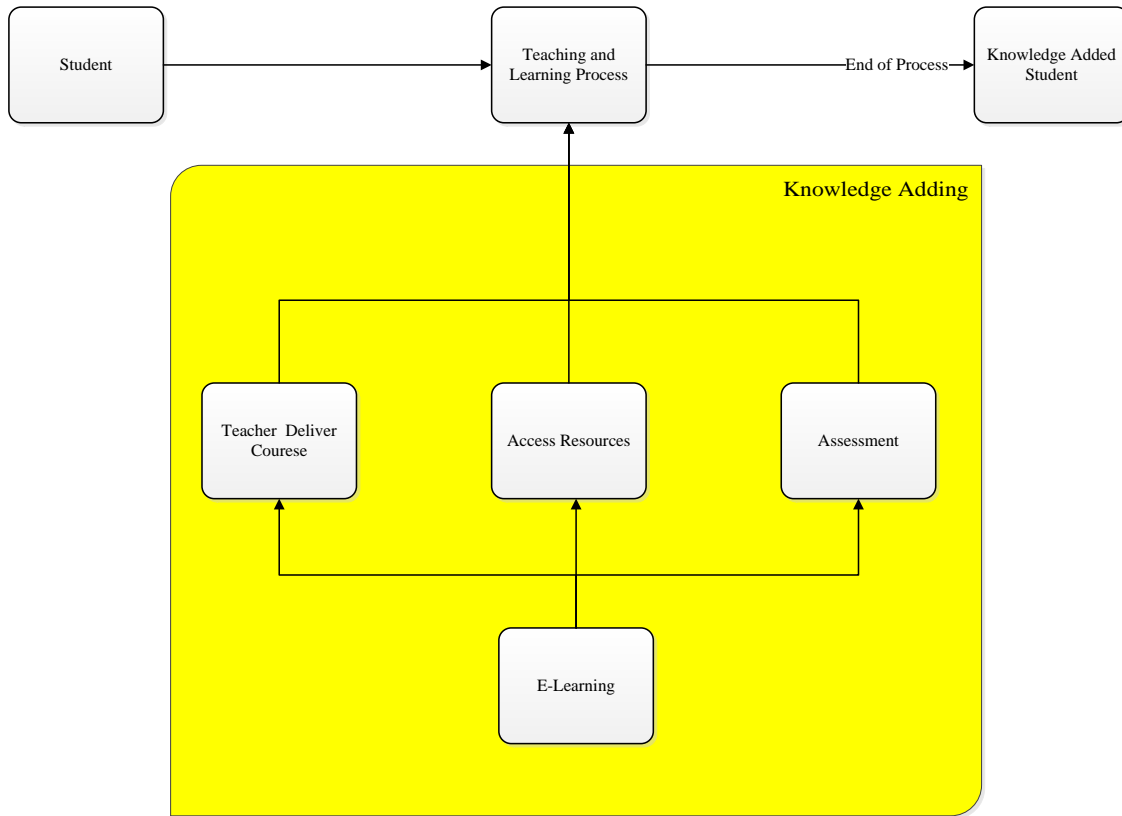


Fig. 6. Suggested Teaching and Learning Process Mapping

3.5. Implementation

The proposed developed E-Learning system is specifically intended to registered student. A registration is not opened, the Administrator would create user in user management for intended student. Only those registered can access the system, follow the course activity, download and upload assignment, attend online quizzes. Fig. 7. And Fig. 8. present screen shots from the developed E-Learning System.



Fig. 7. Home Page

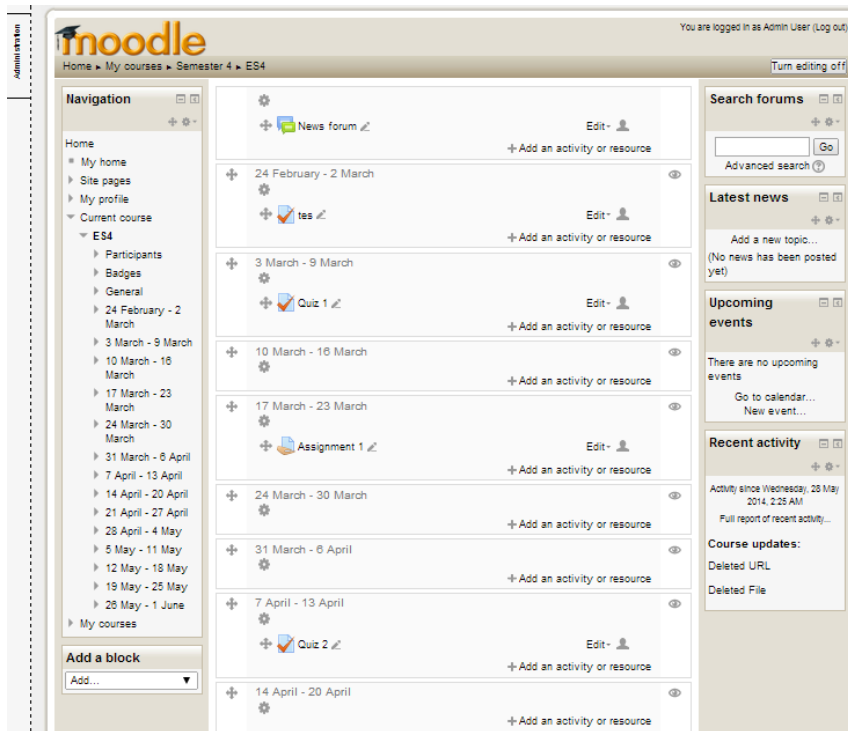


Fig. 8. Course Homepage

The developed system would be assessed by developer and potential users. The first test was tested by developer which is Alpha testing. Second test was tested by potential users, called Beta testing. The tests are intended to summarize the capability of the system based on the activities inside the system. The activities that was to be tested are create a user, manage courses, add activity and resources, deliver media through the system, manage online quizzes, manage upload and download assignment activity, deliver grade report and data encryption on its database.

The prototype of the system will be tested based on its function due to know the software reliability to be implemented in Department of Industrial Engineering of Swiss German University. The final test was User Acceptance Test (UAT). The potential user would assume if the system had been implemented and review it. The User Acceptance Test (UAT) would be using questionnaire weight listing.

To evaluate the proposed developed E-Learning System, The result analysis of the system measurement use descriptive statistic. The ranking was used scale measurement so each item consist of point between 1 to 5, The descriptive analysis was analyzed based on the descriptive statistic (Mean, Max, Min and Mode) point every statement. Based on the score assessment will create qualitative analysis of the descriptive statistic. The result analysis Table 1 based on the User Acceptance Test result towards the system.

Table 1. User Acceptance Result

No.	Statement	Mean	Max	Min	Mode
S.1	Developed E-Learning operation is easy to use	2.6	4.0	1.0	3.0
S.2	The menu items are well organize and easy to find	2.6	4.0	1.0	3.0
S.3	It is easy to understood the function of each module	2.6	4.0	1.0	3.0
S.4	All of the necessary function found in the main menu	3.4	5.0	2.0	4.0
S.5	The file sharing activity is convenient to use	3.2	4.0	2.0	3.0
S.6	Course management is easy to use	3.4	4.0	2.0	4.0
S.7	The site administration to manage user and role is easy to use	3	3.0	3.0	3.0
S.8	Developed E-Learning make it easier for lecturer to inform the grade to students	3.8	5.0	3.0	4.0
S.9	Internet in Swiss German University is reliable to developed E-Learning system	1.8	2.0	1.0	2.0
S.10	Overall impression of developed E-Learning system is impressive	3.8	4.0	3.0	4.0
S.12	Developed E-Learning application will effectively improve teaching and learning activity in SGU	4.8	5.0	4.0	5.0

The analysis is analyzed gradually from the highest mode to the lowest. The respondents have stated that the developed E-Learning system will improve quality teaching and learning system in Swiss German University. This is definitely the benefit of the implementation of the E-Learning system where E-Learning will help user in knowledge management. This is advance technology implementation too while many higher education institutions already use E-Learning comply with their course management.

The user also stated, they have good impression on developed E-Learning system and the function of grade information help the students to see their score. Both of the users regard, Moodle system is impressive if the system is being implemented. It also has the function to reveal gradebook; the student is literally convenient to see their gradebook, lecturer can reordering the grade of the students, and administrator can check the digital signature of the student's submission file.

The operational of the E-Learning system is very crucial. Since the users have stated that they feel course management in developed E-Learning system is enough convenient to use and the functions could be find in the menu. They also stated the file sharing activity is convenient to use, especially for students but lecturer find the file sharing activity is not to convenient. The users stated regarding to another operational function of the developed E-Learning system. Such as user management, overall operation, the aesthetic of the menu item, and understandable in Moodle are not convenient enough. Some of the users also comment, for implementation of the developed E-Learning system, the candidate user need training before the implementation especially for lecturer and staff on operation of the developed E-Learning system. The measurement revealed, the users have operation trouble when operate the system.

Last assessment stated that current internet condition is not reliable to implicate the E-Learning system. The university need improve the stability of the connection and also accommodate good enough infrastructure for the server. The web page should be could access everywhere and the maintenance of the server should be considered more. This again is a commendable co-operation from the students, without the good infrastructure the quality of the

E-Learning activity will hardly be successful. To put it precisely, in the E-Learning activity, student in this case is the customers are of the view that they are receiving all the support the need of regular classroom activity.

In addition to the above qualitative analysis regarding the capability of the developed system were collected from interviews. Based on their qualitative feedback, it is found that students felt the developed E-Learning system is impressive. As one mentioned, “The planning of implement developed E-Learning system is very impressive, it will help the student to get resources from lecturer conveniently if the infrastructure is also capable and sustainable”. On other hand, there is a student gave their comment on lack of the developed E-Learning System. He felt the interfaces of the system is not user friendly but he also comment if the system is going to be implemented with the instructor that familiar towards the system, the learning process will be improve.

In the other time, the lecturer also participated in this study to give their comment against the developed system and its impact on teaching and learning development. Both of the lecturers comment about the operational of the system that still bit unfamiliar. The infrastructures need to be improved before implement the system. They express their interest and clear positive comments towards the developing E-Learning system in Department of Industrial Engineering at Swiss German University.

4. Conclusion and Recommendation

This research did a prototype of developed E-Learning System by using Moodle in higher education academic institution. The result assessment was conducted using software system measurements which are Alpha and Beta testing and User Acceptance Test. The results will become the supporting foundation on developing a new system in teaching and learning process and its design of the function model.

By the perspective of users, developed E-Learning is capable to be conduct in teaching and learning process through a system and create collaborative work between lecturer and student. Based on this research developed E-Learning was well qualified to be implemented in Department Industrial Engineering of Swiss German University for supporting its teaching and learning process.

Developed E-Learning system by using Moodle platform is already used software. It is proven the developed E-Learning is capable in conduct Learning Management Activity in University because currently. There are many higher education institutions is used E-Learning System.

The Learning Management System’s function prototype was work properly. The developed E-Learning can be used for lecturer and student to improving teaching and learning activity. Moodle has several functions such Site management, User management, Course Management. Site management and User Management are managed by an administrator user. The Course management is managed by lecturer to control over all setting for a course. The student is an end user in this system.

It is recommended to apply DSDM in developing E-Learning system in department Industrial Engineering in Swiss German University. In order to increase the development process that is related to development quality and development system, the methodology is closely to comply with DSDM

Teaching and Learning process in Department Industrial Engineering in Swiss German University can be improved. This thesis work reach prototype design and user acceptance from the implementation phase of DSDM. The further developments from thesis work are:

1. Implementation and train user of E-Learning system in Department industrial Engineering
2. Implementation of improvement additional features and modules in E-Learning system

In result and discussion, the developed E-Learning system should be implemented within near or late implementation for future system in Department Industrial Engineering but before implementation, the in infrastructure needs to be improved and sustain.

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