Open Source E-Learning Model Base on Cloud Computing Technology

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Abstract

Several studies have explained that the implementation of E-learning in universities has been widely implemented and has provided many benefits, such as providing effectiveness and efficiency in the learning process. However, based on observations in several universities that have not implemented e-learning, it is constrained by the cost of making an e-learning system and the infrastructure needed to support e-learning implementation. The purpose of this paper is to help universities implement e-learning at a relatively low cost and flexible. The final result of this research is an open source based e-learning model using cloud computing technology

Keywords
E-learning, open source, cloud computing, model

1. Introduction

An effective learning process will produce satisfactory learning output in accordance with the targeted goals. Learning objectives can vary depending on the institution that carries them out but in general the purpose of learning is to increase knowledge and expertise and both of these can be obtained well if supported by an effective learning process. The satisfaction resulting from an effective learning process will be accepted by all stakeholders such as students, teachers, parents, management of educational institutions and others. Satisfaction means satisfaction in the process carried out and the results obtained

On the other hand, the use and development of information technology is used in almost all aspects of human life because the use of information technology provides many benefits and conveniences for human life. One aspect that currently uses information technology a lot is the field of education with e-learning. E-learning provides several benefits in the learning process and convenience for students and teachers. As an example of e-learning it can shorten

learning time, facilitate interaction between students and material, flexibility of place and time and others. However, these significant benefits do not make universities implement e-learning. Open source-based e-learning is an alternative that can be used by educational institutions as a solution to problems or constraints on the cost of developing expensive e-learning. The implementation of e-learning is not sufficient only with a system or software application, but requires the support of infrastructure that is needed so that e-learning implementation can be used optimally. Cloud computing technology is an alternative solution for educational institutions that do not have adequate infrastructure to support e-learning implementation.

1.1 Objectives

There are several factors that cause universities to not implement e-learning where one of the factors is the high cost of making e-learning systems and the unavailability of information technology infrastructure that supports the implementation of e-learning. The purpose of this research is to help educational institutions implement e-learning using cloud computing-based and open source technology. The result of this research is an open source e-learning model based on cloud computing

2. Literature Review

2.1 E-learning

E-learning is a form of learning model that is facilitated and supported by the use of information and communication technology. E-learning has characteristics, among others (Clark & Mayer 2008):

1) Has content that is relevant to learning objectives;
2) Using instructional methods, for example presenting examples and exercises to improve learning;
3) Using media elements such as words and pictures to convey learning materials;
4) Enables direct teacher-centered learning (synchronous e-learning) or is designed for independent learning (asynchronous e-learning);
5) Build understanding and skills related to learning objectives either individually or to improve group learning performance …

2.2 Learning Management System

Learning Management System is software that automates training administration. LMS records users, tracks courses in a catalog, and records data from students. And also provides report management. An LMS is usually designed to handle courses by multiple publishers and providers. Usually does not include authoring abilities alone; rather, it focuses more on the course arrangements made by various other sources (Kaplan, 2000).

Another definition of LMS is software that automates the administration of training events. All LMSs manage logins of registered users, manage course catalogs, record participant data, and provide report management. [5, hall] Based on the two definitions above, the authors conclude that LMS is an application software that provides administrative facilities, documentation, tracking, and reports of courses, classes, and training made.(Hall, 2000)

In using LMS in eLearning an LMS must have the following functions (Cole, 2008):

(1) Uploading and Material Sharing In general, LMS provides services to facilitate the content publication process. By using an HTML editor, then sending the document via the FTP server, thus making it easier for instructors to place their teaching materials according to the syllabus they created. Most instructors upload lecture syllabi, material notes, assessments and student articles whenever and wherever they are.
(2) Forums and Chats Online forums and chats provide two-way communication services between instructors and participants, whether done synchronously (chat) or asynchronously (forum, email). So that with this facility, it is possible for students to write their responses, and discuss them with their other friends.
(3) Quizzes and Surveys Online quizzes and surveys can be used to provide instant grades for course participants. This is a very good tool to use to get direct feedback from students according to their

abilities and absorption. This process can also be done by building a question bank, which can then be generated randomly to appear on the quiz.

(4) The process of giving grades and scoring to students can also be done online with the help of an LMS.

(5) Recording Grade another function of the LMS is to record student grade data automatically, according to the configuration and arrangement made by the instructor from the start of the lecture.

Some of the standard features of the LMS are as follows (Commonwealth, 2004):

1. Administration which includes: Managing user registration (User Registration); Manage curriculum, chart certificate paths, Manage internal finances, user payments, and fines (chargebacks); Create standards and reports on the performance of both individuals and groups; Print certificates; Create schedules for attendees, teachers, and classes.2.2 (1) Security which includes: Encryption (encode and decode messages). Ability to provide privacy; Authentication (verify user identity). Username and password with forgot password facility. Access (Access) which includes: password and login individually / group; Determine Access Rights: set user profiles, assignments, assign teachers; Browser access capabilities; Course Authorization - Teachers accept registration; Registration integration - Registration, Prerequisite Screening, Cancel Notification.
2. Integration with other systems (Integration with other systems)
   Integration, Design, and Course Development (Course Design, Development, and Integration) which includes: Changing the look and feel (Customizable look and feel); Supports virtual classes and classes (Virtual Course); Class template (Course Template); Use and access learning objects; Web-based authoring; Supports multimedia types; Accessibility compliance; Tools for designing instructions (Instructional Design Tool); Curriculum Management; Easy navigation (Easy Navigation / linking); Easy course structure (Easy Course Structuring); Long-term architecture (Extensible Architecture); Supports Style Sheet.
3. Monitoring the Course (Course Monitoring) which includes: List of Courses / Catalog (Course Listing / Catalog); Course Description; Schedule, and schedule availability; Course User Taking
4. Assessment Design which includes: Creating test questions and test administration facilities; Automated Test and Scoring; Course path settings - lists and diagrams (Path Maintenance - Path lists and diagrams); Competency Mapping / Skill Gap Analysis; Self-assessment (self-assessment)
5. Collaboration and online communication (Online Collaboration and Communication) which includes: Learning communities or collaboration components that support communication; E-mail - the ability to concatenate messages sent from the account with POP; Chat rooms; Online support / help desk; File exchange; Online Journal; Notes (Notes); Whiteboard; Discussion groups / forums.
6. Productivity Tools which include: Bookmarks; Calendar / Reviewing progress (Calendar / progress review); Orientation / help; Search (Search); Work offline / synchronize (Work offline / synchronize).

2.3 Moodle

Cole and Foster (2008) define Moodle as an acronym for Modular Object-Oriented Dynamic Learning Environment which means a dynamic learning place using an object-oriented model. Moodle application was first developed by Martin Dougiamas in August 2002 with Moodle version 1.0. Currently, Moodle can be used by anyone open source.10 As well as being an acronym, Cole and Foster (2008) also define Moodle as a verb which means the process of doing something like a fun game and leads to additional insight and creativity.

Moodle can be installed online or offline. The systems needed for the Moodle application to run well offline are Apache Web Server, PHP, MySQL or PostgreSQL databases. All three can be obtained by downloading Xampp. Moodle installed directly online requires Moodle hosting, domain, and files. The control panel needed is no longer offline in the form of a xampp control panel but is done through an online control panel, namely

using cPanel. The Moodle installation was done on cPanel. Moodle has various facilities that can be useful to support learning activities.

The facilities available at Moodle include assignments, chat, forums, quizzes, and surveys. The explanation for each facility according to.

a. Assignments are used to provide assignments to students online. Students can access assignment materials and submit assignments by sending files of their work results.
b. Chat is used by teachers and students to interact with each other online by means of text dialogue (online conversation).
c. The forum is an online discussion forum between teachers and students that discusses topics related to learning materials.
d. Quizzes are used by teachers to do online test exams.
e. Survey is used to conduct polls. Electronic Learning or what is often called e-learning is a learning model or media using electronic devices as the main means. In addition, e-learning also allows students to carry out long distance learning activities (long-distance learning).

Moodle is an e-learning application that is widely used in educational institutions, both for the purpose of being a medium to help smooth learning, improve learning outcomes, improve the quality of the learning process or in managing learning. Moodle-based e-learning has complete features and is very flexible, so that almost anything and everything users need can be done in this e-learning. Including arranging it as a medium for managing learning ...

2.4 Model

A model is a form of accurate representation, as an actual process that allows someone or a group of people to try to act on the model. It is an interpretation of the results of observations and measurements obtained from several systems". The formulation of the model has three main objectives, namely (Inayatulloh,2016);

1) Provide a working description or description of the system for a certain period, in which there is implicitly a set of rules for implementing changes, or predicting how the system will operate in the future.
2) Provide a description of certain phenomena according to time differentiation or produce a set of rules that are valuable for the order of a system.
3) Producing models that present data and a short format with low complexity

Some studies use models to explain research objects such as block chain models for regional head elections(Inayatulloh,2020), CSF UKM models(Inayatulloh, 2020) new business models(Inayatulloh, 2016), IT governance models for SMEs(Inayatulloh, 2020) and Model for TAM SMEs (Inayatulloh, 2020).

3. Methods

The research method was carried out by making observations at several universities located in Jakarta. Only a small proportion have implemented e-learning. The constraints in implementing e-learning are the costs of building systems and supporting infrastructure for e-learning.

4. Data Collection

Based on interviews with several educational institution officials, several obstacles were found in implementing e-learning as follows:

1. Lack of information technology readiness, especially e-learning systems that are not yet owned by these educational institutions. E-learning system requires a software system that virtualizes conventional teaching and learning processes. How is class management, material or content creation, discussion forums, assessment systems, online exam systems and all features related to teaching and learning process management. This software system is often referred to as a Learning Management System (LMS). LMS is widely available in open source so you can use it easily and cheaply.
2. Lack of technological infrastructure readiness to support e-learning. Infrastructure is a physical asset that is designed in the system, so that it provides important public services. Infrastructure provides support and services that will later be used and utilized for the continuity of a system. E-learning infrastructure can be in

the form of personal computers (PCs), computer networks, internet and multimedia equipment. This includes teleconferencing equipment when we provide synchronous learning services via teleconference.

3. Another obstacle is the limited computer equipment for students to be able to access the e-learning system

4. Results and Discussion

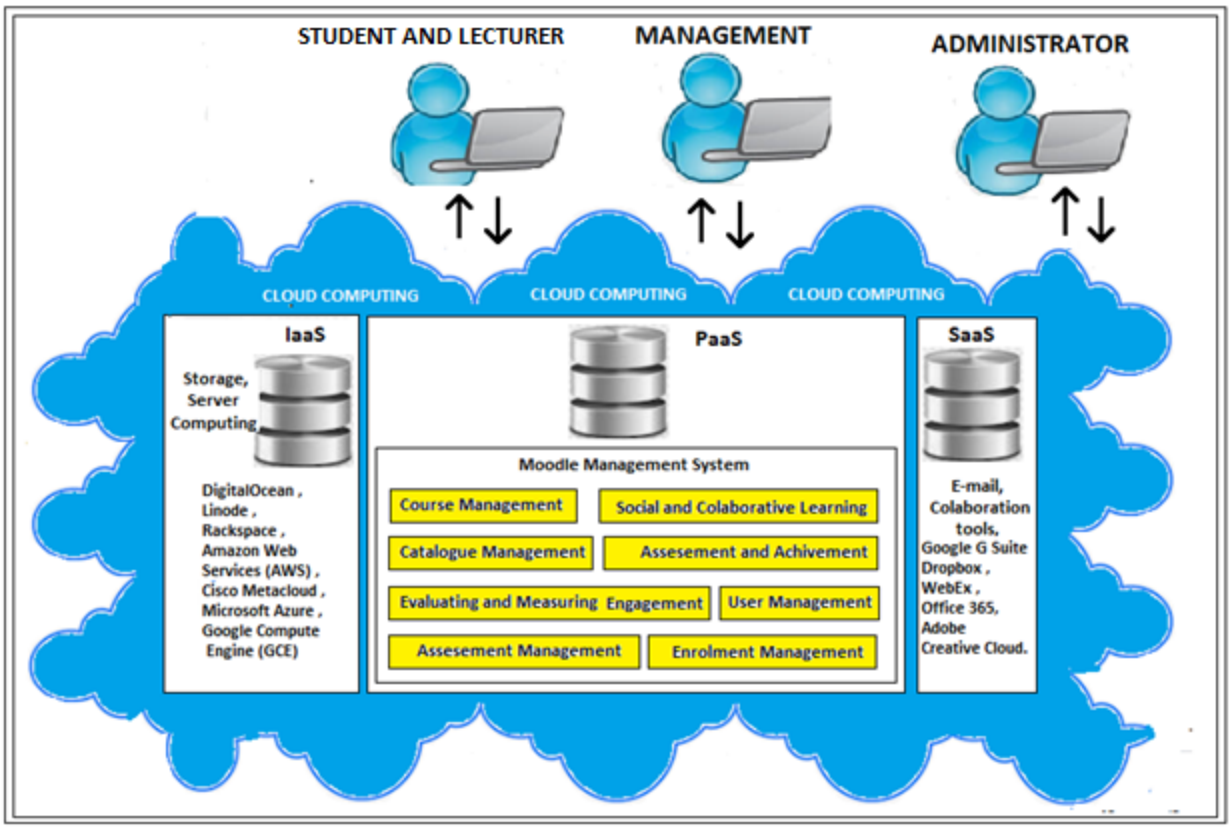

Figure 1. The proposed model

Figure 1 describes the proposed model with the following explanation:

1. The proposed e-learning model uses Moodle open source with the following several features
    1) A course in Moodle is a part wherever a instructor will enhance properties and actions for their learners to widespread. It might be a humble page with download able papers or it might be a multipart set of jobs where education improvements through communication.
    The course sheet is completed up of dominant slices which have the jobs. The course instructor has switch over the plan of the course site and can modification it at some time. Growth can be followed in a amount of methods. Name of Students can be registered manually by the instructor, automatically by the officer, or they can be allowable to register themselves. Learners can also be additional to clusters if they necessity to be parted from classes distribution the similar course or if jobs necessity to be discriminate
    2) Social and collaborative learning
    A provision tool for the onsite events, permitting communiqué at any time, and dissemination of education resources that central to the alliance and extending of what is educated in the classroom. Therefore, LMS are, progressively, becoming fine know situations to learners and instructors
    3) Catalogue Management
    Offers a graphic and essential place for a instructor to admittance all he can usage in his course Often used substances can be noticeable as favorites for rapid access. Except the instructor needs to erase or change an action, he infrequently wants to change to excision mode. Learners can likewise usage the Catalogue to admission the tools they're allowable to. No necessity, to absorb a

first way to enhance an action, then a dissimilar one to enhance a block, then a third one to usage registration systems, and so on, examining the four angles of the UI. By Catalogue, it's the similar technique for entirely of these tools and they all can be establish at the similar room.

4) Assessment management
Moodle-enabled electronic Assessment offers learners with electronic submission facility; decreases carbon footmark and furthers assignment reappearance procedure with well-timed feedback.

2. E-learning that is built using the PaaS or Platform as Service feature, which is one of the features provided in cloud computing. Administrators as actors who manage open source e-learning into PaaS provided in cloud computing.
3. Educational institutions can use IaaS or Infrastructure as Service facilities to support infrastructure for e-learning that are built such as web servers and others. Likewise, SaaS or Software as Service services can be used by educational institutions to support e-learning services such as drop boxes and others
4. Users are generally grouped into 3: students and lecturers, management and administrators. Students and lecturers are end users who only use all of Moodle's features. Management is the structurally educational university manager such as university leaders and all their subordinates as well as college owners. While the administrator is the party who manages all the parts related to the implementation of the Moodle LMS such as installing Moodle in cloud computing, setting up a web server to support Moodle, managing LMS content, user accounts and others.

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Biography

Inayatulloh is a candidate doctor at Bina Nusanatara University's Doctor of Computer Science. Since 2000, Inayatulloh has been a lecturer at several universities and colleges in Indonesia such as Bina Nusnantara University, Indonusa University, State Islamic University, Archipelago Economics College and is currently a lecturer at Bina Nusantara University in the school of information system. Scopus indexed publications have been produced with topics related to information systems such as e-learning, e-SCM, e-CRM. E-government and others