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A Review of Cloud Learning Management System (CLMS) Based on Software as a Service (SaaS)

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***Abstract*—Cloud computing technology is growing rapidly, attracting great attention of educational institutions as it is believed to improved learning efficiency. There are many Cloud Learning Management System (CLMS) based on Software as a Service (SaaS) available and offered for free in the market. However, selecting the one that fit to purpose for educational institution or educators are still challenging. This paper seeks to provide a comparative guideline for educational institution and educators in selecting the best LMS's to be used based on the provided features. The study reviewed and analytically compared 6 major CLMS base on SaaS such as Collaborize Classroom, CourseSites, Ecto, Edmodo, GoConqr and Google Classroom.**

Keywords—CLMS; SaaS; criteria setting

I. INTRODUCTION

Cloud computing technology is growing rapidly, attracting great attention educational institutions. We are on the brink of a revolution in education that integrates web-based technology into learning. Internet technology in learning provides valuable resources for the classroom [1], where cloud computing has emerged as one of the fastest growing segments of the information technology industry [2]. In additon to that e-learning cloud is the cloud computing technology, where future learning infrastructure including all hardware and software computing resources to engage in e-learning [3].

This paper seeks to make it easier for educational institution or especially educators that want to make the best choice when choosing LMSs. It focuses on the review 6 CLMS based on SaaS, Collaborize Classroom, CourseSites, Ecto, Edmodo, GoConqr and Google Classroom. A qualitative descriptive analysis with criteria setting was used in the different way. The results showed based on popularities, features and advantage or disadvantage. Additionally, directions for some future works are also outlined.

This work is structured as follows: the next section is related work, includes the terminology and background. Section III is the method. Section IV results and discussion. Section V is the future work and conclusion.

II. RELATED WORK

A. Terminology

- A Virtual Learning Environment (VLE) is a computer program that facilitates the so-called e-learning (electronic learning). Such e-learning systems are sometimes also called learning management system (LMS), course management system (CMS), learning content management system (LCMS), managed learning environment (MLE), learning support system (LSS) or learning platform (LP); it is education via computer-mediated communication (CMC) or online education[4].
- Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction[5].
- SaaS is a cloud computing service in which information technology resources, including computing power, data storage, software applications, and technical infrastructure, are delivered to users through a network[6].

B. Background

The popularity of LMS software in education has been going on for a long time. Many organizations, both non profit and for profit, create, develop, and utilize LMS software maked anxiety, confusion, and challenge to set an approach. One way to establish that approach is to do a review literature of the LMS software. E-learning is a promising application area since its typical requirements such as dynamically allocation of computation and storage resources, coincide well

with cloud characteristics [7]. The phenomenon of the abundance of e-learning software based applications such as the available LMS, causing confusion to choose the right system that suits the needs of the institution or educator [8]–[12]. Selection of inappropriate open source software in learning management system (OSS-LMS) packages adversely affect the business processes and functions of an organization [13].

III. METHOD

A. Setting

According to[14], there are so many LMS software products and e-learning applications that are created and developed specifically for the corporate environment although some of these products can also be used in educational institutions. Corporate LMS usually include registration and management of classroom instruction as well as e-learning management and delivery. Educational institutions are usually already well equipped for registration and management of classroom instruction.

After searching 1004 LMS based on the explanation[14], it is necessary to filter by the setting criteria as follows:

- The LMS software should be free
- Includes online applications that can only be accessed via the Internet
- Category of cloud computing technology in the software as a service
- Can be utilized by single user and single sign on, technology that allows network users who can access resources using one account only.
- Server is available as a cloud hosted without having to prepare local infrastructure such as data storage and without software installation process.
- A platform-free operating system (cross platform), live use only, anywhere and anytime
- Exclude the aspects of care and security of the system because it is entirely the responsibility of the software vendor.

The results obtained the six appropriate CLMS based on SaaS such as Collaborize Classroom, CourseSites, Ecto, Edmodo, GoConqr, and Google Classroom.

TABLE I. DETAILED INFORMATION

No	Name *CLMS SaaS*	Overview		
		Web Site	Vendor	Release
1	Collaborize Classroom	http://library.collaborizeclassroom.com/	Democrasoft Holdings, Inc.	2010
2	CourseSites	https://www.coursesites.com/webapps/Bb-sites-course-creation-BBLEARN/pages/index.html	Blackboard Inc.	2011
3	Ecto	http://www.ectolearning.com/	Rackspace Hosting	2005
4	Edmodo	http://www.edmodo.com	Edmodo	2008
5	GoConqr	https://www.goconqr.com/	Software Asset Management Ireland	2012
6	Google Classroom	https://edu.google.com/intl/en/products/productivity-tools/classroom/	Google Inc	2014

B. Popularities

To find the documents popularities for this review, the google chrome search engine were used to search for CLMS based on SaaS. The keywords are used: Collaborize Classroom, CourseSites, Ecto, Edmodo, GoConqr and Google Classroom with add word “pdf”. The documents finding could be download it. The goals are to select the most popular systems based on the available data on the global google search engine usage.

TABLE II. POPULARITIES CLMS BASED ON SAAS

Name *CLMS SaaS*	References
Collaborize Classroom	[15]
CourseSites	[16]
Ecto	[17]
Edmodo	[18][19][20][21][22][23][24][25][26][27][28][29][30][31][32][33]
GoConqr	[34]
Google Classroom	[35][36][37][38][39]

C. Features

There are lots of features offer by the six CLMS based on SaaS. The goals are to provided explanation and explore a number of features available. For detail information see attachment.

D. Advantage and Disadvantage

There are lots of advantage and disadvantage of the six CLMS based on SaaS. The goals are to provided explanation and explore a number of advantage and disadvantage.

1) Collaborize Classroom

a) Advantage

- Educator can see the progress of learning from the participation of learners in more details
- Educator can conduct the assessment process more quickly
- Educator can create forums and group topics of discussion according to the interests of learners and conduct monitoring
- Educator can easily collect learners' data
- Communication takes place asynchronously via email and online conversations

b) Disadvantage

- Educators do not get progress reports of learners from iPhone devices

- Server is sometimes slow and can not provide information visually
- Communication can not take place in synchronous

2) *CourseSites*

a) Advantage

- Sign in from blackboard account, facebook, twitter, gmail, ymail and windows life
- Link externally from Dropbox, Youtube and Google Drive
- Can be migrate to BlackBoard with great ease
- Language support available in English, Deutsch, Espanol, Francais, Nederlands and Portugues
- Educators can see the duration of time the learners spend in learning as an indicator of involvement to master the teaching materials.
- Learners easily communicate, collaborate and discussion

b) Disadvantage

- File storage space provided maximum of 500MB
- Maximum students who can join in one subject as many as 50 people and if more then will be charged
- Only for educator not for institution

3) *Ecto*

a) Advantage

- Educator, parents, administrators and learners can create groups private and join certain groups
- Can collaborate, create, edit, track and share content with flexibility
- Report attendance of learners can be seen in detail

b) Disadvantage

- Hosted or servers often experience slow performance
- The available tools are limited and hidden on the buttons in the main menu
- There is no notice to educators on the activities of learners who do post tasks
- Posts on display on the blog page has a limited screen size so that the size of the letters look smaller
- There is no tool to increase the font size on the go to Blog feature
- There is no guide or help how to post imported posts from external media

4) *Edmodo*

a) Advantage

- Language support is available in various languages including Indonesian
- There are 3 interfaces that distinguish between educators, learners and parents, similar to facebook and twitter
- Ease of registration process by providing many alternatives
- Provide collaborative support with other educators and institution in collaboration on a network
- The storage space of documents and internal files is unlimited

b) Disadvantage

- Hosted or servers often experience slowness
- There is no attendance tracking
- Quiz can not be edited and re-imported, must be retyped

5) *GoConqr*

a) Advantage

- Make it easy to set up a slide like working on a microsoft power point
- Easy to take notes, create quizzes and flowcharts
- User interface similar to facebook and twitter
- Easy integration with google and microsoft office applications
- Easily share content from other sources

b) Disadvantage

- Notes tool can only be uploaded maximum 3 subjects
- Hosted or servers often experience slow performance

6) *Google Classroom*

a) Advantage

- Easier integration with getting services from all products offered by google.
- Support of course materials can be displayed in various formats, such as office packages, pdf, youtube videos and more.
- The process of assigning tasks is faster and more effective. The tasks can be directly resolved by learners online with the help of google doc. The educators can easily check on who has submitted the task and who is still doing it because all directly use google doc and stored on google drive.

b) Disadvantage

- Until now there is no features making quizzes and tests
- When giving assignments and distributing them to learners, learners become "owners" of the document and they can edit it.
- There is no tool notification so that learners should be diligent to always do the manual update so as not to miss the latest announcement

IV. RESULTS AND DISCUSSION

A. Results

After exploring the 6 CLMS based on SaaS, we sum up the documents, number of feature items, number of advantages and disadvantages. As in the following table:

TABLE III. NUMBER OF ITEMS PER CRITERIA

Name *CLMS SaaS*	Number of items			
	Document	Feature	Advantage	Disadvantage
Collaborize Classroom	1	5	5	3
CourseSites	1	10	6	3
Ecto	1	5	3	6
Edmodo	17	11	5	3
GoConqr	1	12	5	2
Google Classroom	5	5	3	3

Wit is clear Edmodo has the largest number of documents collected. This suggests that It notifies or informs that Edmodo is the most widely used or most popularity CLMS based on SaaS in compare with others. Here is the percentage of the criteria the number of documents.

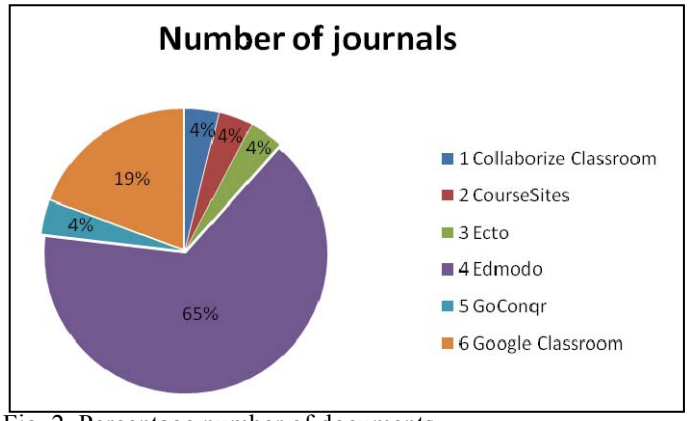

Fig. 2. Percentage number of documents

Still based on the data in table 3, we do a percentage of the criteria number of feature items, pros and cons. The results as follows:

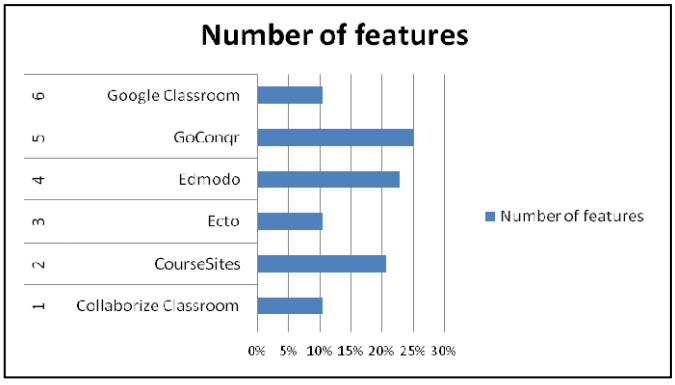

Fig. 3. Percentage number of features

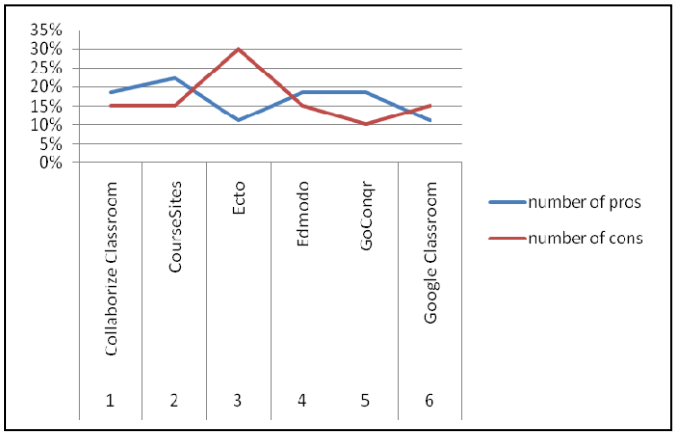

Fig. 4. Percentage number of pros and cons

B. Discussion

Collaborize Classroom has a complete feature to create questions and quizzes that can be used easily. CourseSite has a SafeAssign feature that can be used to check the authenticity of the tasks and work of the learner, not to plagiarism. Ecto has an easy-to-use presence feature and does well to track learners' activeness. Out of the six options, Edmodo is the most widely discussed, based on the journals obtained from the google search engine. Edmodo also has excellent features for communicating asynchronous or publicly discussing or having a chat. GoConqr features concept maps (mind maps) and flowcharts that are easy to use. Google Classroom features google apps and drives that are easy to use and integrate very well, plus server performance on hosted rarely declines.

V. FUTURE WORK AND CONCLUSION

CLMS based on SaaS, in the future will grow very rapidly. Enthusiastic educational institutions to use and utilize CLMS based on SaaS will also increase. In particular for educators, it will further increase the ability literacy of information and communication technology in the age of 21st century. Further investigation or future work is required to compare study with the architecture environment, technical characteristics, security, adaptivity, interactivity, customizability, interaction, collaboration, interoperability, communication tools, user interface, easy of use, interface, the stability of server and user/developer support.

From the evaluation, it is clear that each CLMS based on SaaS has different popularities, feature characteristics and advantage or disadvantage. But to determine the best among, we think its depends on what you need, that is the best. Selection suitable CLMS based on SaaS has to be tailored to the needs of individual/personal learners, educators or educational institution pending on the curriculum, content and course characteristics.

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ATTACHMENT

The next table that is a checklist of 6 LMS features

Name CLMS based on SaaS	**FEATURES**											
	Mind Maps	***Flash chard***	***Slides***	***Flow charts***	***Quizzes -Test (Q&A)***	***Notes and calender***	***Assignments***	***Communications***	***Video***	***Course tools***	***Social media***	***Disscussion***
Collaborize Classroom					√	√	√		√	√		√
CourseSites*		√	√		√	√	√	√	√	√		√
Ecto					√	√	√	√				√
Edmodo		√	√		√	√	√	√	√	√	√	√
GoConqr	√	√	√	√	√	√	√	√	√	√	√	√
Google Classroom						√	√		√	√		√

Note *.
CourseSites has unique feature likely: SafeAssign, Softchalk and Respondus