

# PROCEEDINGS

## 2017 International Conference on Electrical Engineering and Informatics (ICELTICs)

October 18-20, 2017 - Banda Aceh, Indonesia

IEEE Catalog Number: CFP17M32-ART

ISBN: 978-1-5386-2934-5

*“Advancing Knowledge, Research, and  
Technology for Humanity”*



Technical Co-Sponsor:



## Table of Content

---

Conference Information.....	iii
Table of Content .....	iv
Advisory Board.....	xi
Organizing Committee .....	xii
Technical Program Committee (TPC) Member .....	xiii
Welcome Message from Rector of Syiah Kuala University .....	xv
Welcome Message from IEEE Indonesia Section Chair .....	xvii
Welcome Message from General Chair .....	xviii
Keynote Speaker 1# Prof. Dr. Hitoshi Kiya .....	xix
Keynote Speaker 2# Prof. Ir. Dr. Mohd. Rizal Bin Arshad .....	xxi
<b>Communications and Computer Systems 01</b>	
▪ Performance Comparative Analysis Between ARAN and SAODV on VANET Facing the Blackhole, <i>Dodi Wisaksono Sudiharto (Telkom University, Indonesia)</i> .....	1
▪ Performance of Consistency Parameters Analysis Using Fourier and Wavelet Transform on Multi Spectral Fluctuation Signal, <i>Melinda Melinda (UI, Indonesia), Agus Santoso Tamsir (Universitas Indonesia, Indonesia), Basari Basari (Universitas Indonesia, Indonesia), Dadang Gunawan (Universitas Indonesia, Indonesia)</i> .....	7
▪ Development of Submersible Electric Motor Propulsion to Support Maritime Sector in Indonesia, <i>Cuk Ali Nandar (Agency for the Assessment and Application of Technology, Indonesia), Asep Andi Suryandi (BPPT &amp; ITB, Indonesia), Katri Yulianto (BPPT, Indonesia), Dewi Mandasari (BPPT, Indonesia), Sumardi Sumardi (Risea Propulsion Pte Ltd, Indonesia)</i> .....	12
▪ Cooperative Compressive Power Spectrum Estimation in Wireless Fading Channels, <i>Dyonisius Dony Ariananda (Universitas Gadjah Mada, Indonesia), Daniel Romero (University of Agder, Norway), Geert Leus (Delft University of Technology, The Netherlands)</i> .....	18
▪ Rainfall Interception Calculation Modeling Using Parallel Computation Systems on NVIDIA CUDA, <i>Yudi Satria (Institut Teknologi Bandung, Indonesia), Mulkan Fadhli (School of Electrical Engineering and Informatics Institute Technology Bandung &amp; TaSharE Development, Indonesia)</i> .....	24
▪ Black Hole Attacks Analysis for AODV and AOMDV Routing Performance in VANETs, <i>Afdhal Afdhal (Syiah Kuala University, Indonesia), Sayed Muchallil (Syiah Kuala University, Indonesia), Hubbul Walidainy (Syiah Kuala University, Indonesia), Qodri Yuhardian (Syiah Kuala University, Indonesia)</i> .....	29

## Electronics and Control Systems 01

- Model Predictive Parking Control on Four Wheel Vehicle with Optimum Parking Space, *Muhammad Ikhwan (Institut Teknologi Sepuluh Nopember Indonesia, Indonesia), Mardlijah Mardlijah (Institut Teknologi Sepuluh Nopember Indonesia, Indonesia), Didik Khusnul Arif (Institut Teknologi Sepuluh Nopember Indonesia, Indonesia)*..... 35
- Design of Capacitive Sensor, Measurement and Data Acquisition System of ECVT, *Arbai Yusuf (Universitas Indonesia & C-Tech Labs Edwar Technology, Indonesia)* ..... 40
- Disaster Swarm Robot Development: On Going Project, *Son Kuswadi (Politeknik Elektronika Negeri Surabaya, Indonesia), Indra Adji Sulistijono (Politeknik Elektronika Negeri Surabaya (PENS) & Electronics Engineering Polytechnic Institute of Surabaya (EEPIS), Indonesia), Riyanto Sigit (Politeknik Elektronika Negeri Surabaya, Indonesia), Mohamad Nasyir Tamara (Politeknik Elektronika Negeri Surabaya, Indonesia), Mohammad Nuh (Institut Teknologi Sepuluh Nopember, Indonesia)* ..... 45
- Competitiveness Evaluation of Electricity Retailers, *Tingting Deng (Huazhong University of Science and Technology & School of Electrical and Electronic Engineering, P.R. China), Wei Zhang (State Grid Hubei Electric Power Company, P.R. China), Xiaobing Zhou (State Grid Hubei Electric Power Company, P.R. China), Yi Gao (Huazhong University of Science and Technology, P.R. China), Suhua Lou (Huazhong University of Science and Technology, P.R. China)* ..... 51
- Electrical Capacitance Volume Tomography Simulation on 64 Channel Capacitive Sensor by Comparing the Two Scanning Methods, *Arbai Yusuf (Universitas Indonesia & C-Tech Labs Edwar Technology, Indonesia)*..... 57
- Design of DC Light Bulb for DC Bus Application, *Ramdhan Halid Siregar (Universitas Syiah Kuala, Indonesia), Hafidh Hasan (Universitas Syiah Kuala & Universitat Duisburg-Essen, Indonesia), Muhammad Syamsu Rizal (University of Syiah Kuala, Indonesia)*..... 61

## Power Systems and Renewable Energy 01

- Review on Power Generation and Bidding Optimization of Virtual Power Plant, *Mengxuan Lv (Huazhong University of Science and Technology, P.R. China), Suhua Lou (Huazhong University of Science and Technology, P.R. China), Baolin Liu (Yunnan Electric Power Co. Ltd., P.R. China), Zhen Fan (Huazhong University of Science and Technology, P.R. China), Zhiming Wu (Huazhong University of Science and Technology, P.R. China)*..... 66
- Forecast on Vietnam Electricity Consumption to 2030, *VU Nguyen (University of Technology and Education HCMC, Vietnam), Khanh Nguyen (Global Electrical Technology Corp., Vietnam), Cuong Vo (University of Technology and Education HCMC, Vietnam), Binh Phan (University of Technology HCMC, Vietnam)*..... 72
- Automatic Solar Station for Ground-Based Measurement of Solar Energy Resource in Pekanbaru City Indonesia, *Iswadi Hasyim Rosma (Universitas Riau, Indonesia), Dian Yayan Sukma (Universitas Riau, Indonesia), Irsan Taufik Ali (Universitas Riau, Indonesia), Amanda Khaira Perdana (Universitas Riau, Indonesia)* ..... 78

- Research on Optimal Operation of Hybrid Power System with High-penetration Photovoltaics, *Zhiming Wu (Huazhong University of Science and Technology, P.R. China), Miao Miao (Qinghai Province Electric Power Company, P.R. China), Changshuang Wang (Huazhong University of Science and Technology, P.R. China), Mengxuan Lv (Huazhong University of Science and Technology, P.R. China), Zhen Fan (Huazhong University of Science and Technology, P.R. China)* ..... 82
- Neural Network-Based Solar Irradiance Forecast for Peak Load Management of Grid-Connected Microgrid with Photovoltaic Distributed Generation, *Hafidh Hasan (Universitas Syiah Kuala & Universitat Duisburg-Essen, Indonesia), Muhammad Ridha Munawar (Universitas Syiah Kuala, Indonesia), Ramdhan Halid Siregar (Universitas Syiah Kuala, Indonesia)* ..... 87

### **Informatics and Computer Sciences 01**

- EGT - PSO for Organized Distribution of Swarm Members in Crowd and Diverse Population, *Diah Arianti (Kalbis Institute, Indonesia), Tedi Lesmana (Kalbis Institute, Indonesia)* ..... 91
- Forecasting Household Electricity Consumption in the Province of Aceh Using Combination Time Series Model, *Fahmi Fahmi (Polytechnic State of Lhokseumawe, Indonesia), Hizir Sofyan (Syiah Kuala University, Indonesia)* ..... 97
- Recognition of Student Emotion Based on Matrix-1 Median Fisher's Face and Backpropagation Algorithm, *Slamet Wibawanto (Universitas Negeri Malang, Indonesia), Kartika Candra Kirana (Universitas Negeri Malang, Indonesia)* ..... 103
- An Android Agricultural Commodity Price Information Application by Utilizing RESTful Web Service, *Viska Mutiawani (Syiah Kuala University, Indonesia), Muhammad Subianto (Syiah Kuala University, Indonesia), Misbahul Makruf (Syiah Kuala University, Indonesia)* ..... 109

### **Electronics and Control Systems 02**

- Prediction of Soluble Solid Content in Averrhoa Carambola Based on Vis-NIR Image, *Maisyarah Rangkuti (Universitas Indonesia, Indonesia), Adhi Saputro (Universitas Indonesia, Indonesia), Cuk Imawan (Universitas Indonesia, Indonesia)* ..... 114
- Enhancing Soccer Robot Movement Accuracy Using Omnidirectional Wheel, *Arnold Aribowo (Universitas Pelita Harapan, Indonesia), Alfa Putra (Universitas Pelita Harapan, Indonesia), Samuel Lukas (Pelita Harapan University, Indonesia), Hendra Tjahyadi (Universitas Pelita Harapan, Indonesia)* ..... 119
- Three Element Control on Fuel Tank with Feedback - Feedforward Using Simulink, *Joke Pratilastiarso (Politeknik Elektronika Negeri Surabaya, Indonesia), Erik Tridianto (Politeknik Elektronika Negeri Surabaya, Indonesia), Hendrik Prasetya (Politeknik Elektronika Negeri Surabaya, Indonesia), Ratna Patmasari (Politeknik Elektronika Negeri Surabaya, Indonesia), Affan Romadhon (Politeknik Elektronika Negeri Surabaya, Indonesia)* ..... 124

- Cruise Missile Altitude Control System Design Using Phase-Lead Compensator, *Alfatirta Mufti (Syiah Kuala University, Indonesia), Sayed Muchallil (Syiah Kuala University, Indonesia)* ..... 129
- Theft Prevention System by Controlling Electrical Appliances to Imitate the Presence of Homeowners, *Zulhelmi Zulhelmi (Syiah Kuala University, Indonesia), Zulfikar Zulfikar (Syiah Kuala University, Indonesia), Afdhal Afdhal (Syiah Kuala University, Indonesia)* ..... 135

**Power Systems and Renewable Energy 02**

- Bi-level Model for Congestion Management with Large-Scale Wind Power Integration Considering Real-Time Operational Risks, *Zhen Fan (Huazhong University of Science and Technology, P.R. China), Xiran Wang (Huazhong University of Science and Technology, P.R. China), Suhua Lou (Huazhong University of Science and Technology, P.R. China), Hui Li (State Power Economic Research Institute, P.R. China), Zhidong Wang (State Power Economic Research Institute, P.R. China), Mengxuan Lv (Huazhong University of Science and Technology, P.R. China), Zhiming Wu (Huazhong University of Science and Technology, P.R. China)* ..... 141
- Transient Stability Improvement Using Allocation Power Generation Methods Based on Moment Inertia, *Indar Chaerah Gunadin (Hasanuddin University, Indonesia), Zaenab Muslimin (Hasanuddin University, Indonesia), Agus Siswanto, MT. (Hasanuddin University, Indonesia)* ..... 147
- Electric Propulsion System and Overhead Line Test Track Design for High Floor Trolley Bus, *Asep Andi Suryandi (BPPT & ITB, Indonesia), Cuk Ali Nandar (Agency for the Assessment and Application of Technology, Indonesia), Katri Yulianto (BPPT, Indonesia), Dewi Mandasari (BPPT, Indonesia), Budi Fadjarin (BPPT, Indonesia)* ..... 153
- Effects of Shunt and Series Resistances on the Performance of a Tandem Solar Cell, *Ira Sara (Syiah Kuala University & Syiah Kuala University, Indonesia)* ..... 159

**Communication and Computer System 02**

- How to Deal with Impulsive Noise in OFDM-based PLC : A Survey, *Prita Dewi Mariyam (Universitas Indonesia, Indonesia), Filbert H. Juwono (University of Indonesia, Indonesia), Panca Pamungkasari (Universitas Nasional, Indonesia), Dadang Gunawan (Universitas Indonesia, Indonesia)* ..... 160
- Suboptimal Power Splitting of Energy Harvesting in Cooperative Communication System, *Fikri Haikal (Syiah Kuala University, Indonesia), Nasaruddin Nasaruddin (Syiah Kuala University, Indonesia), Rusdha Muharar (Syiah Kuala University, Indonesia)* ..... 169
- The Analysis on White Space Coverage Area Radius to Find the Equilibrium Point Between DVB-T2 and IEEE 802.22 WRAN, *Lessy Sutyono Aji (Ministry of Communications, Indonesia), Gunawan Wibisono (University of Indonesia, Indonesia), Dadang Gunawan (Universitas Indonesia, Indonesia)* ..... 173
- Joint Cooperative Sensing and Scheduling in Cognitive Radio by Mechanism Design, *Jyu-Wei Wang (Asia University, Taiwan), Ramzi Adriman (Syiah Kuala University, Indonesia)* ..... 179



- Grouped Data Analysis of H2O and H2O Mixed with NaOH on Multi Spectral High Fluctuation Pattern, *Melinda Melinda (UI, Indonesia), Alfiqie Tanjung (Universitas Indonesia, Indonesia), Agus Santoso Tamsir (Universitas Indonesia, Indonesia), Basari Basari (Universitas Indonesia, Indonesia), Dadang Gunawan (Universitas Indonesia, Indonesia)* ..... 184
- Statistical Investigation of Skin Image for Disease Analyzing in Rural Area Using Matlab, *Zulfikar Zulfikar (Syiah Kuala University, Indonesia), Zulhelmi Zulhelmi (Syiah Kuala University, Indonesia)* ..... 189

### **Information Systems and Technologies 01**

- Online Social Media and Risks: An Exploration into Existing Children Practice, *Tahirah Mt Tahir (Universiti Sains Malaysia, Malaysia), Mohd Heikal Husin (Universiti Sains Malaysia, Malaysia)* ..... 195
- Development of RENAKSI Web-based Application to Support Open Government Anti-corruption Action Plan in Banda Aceh Municipality, *Zuhra Sofyan (Bappeda Kota Banda Aceh, Indonesia)* ..... 201
- A Review of Cloud Learning Management System (CLMS) Based on Software as a Service (SaaS), *Yahfizham Yahfizham (Padang State University, Indonesia), Fenny Purwani (Padang State University, Indonesia)* 205
- Implementing Problem-Solving Method in Learning Programming Application, *Viska Mutiawani (Syiah Kuala University, Indonesia), Juwita Juwita (University of syiah kuala, Indonesia), Razief Perucha Fauzie Afidh (Syiah Kuala University, Indonesia), Dwi Novitasari (Syiah Kuala University, Indonesia)* ..... 211
- The Impact of Cyberloafing Towards Malaysia Employees' Productivity: A Conceptual Framework, *Siti Salina Saidin (Universiti Sains Malaysia, Malaysia), Yulita Hanum P Iskandar (Universiti Sains Malaysia, Malaysia), Noornina Dahlan (Universiti Malaysia Pahang, Malaysia)* ..... 216
- Usability Testing of Chemistry Dictionary (ChemDic) Developed on Android Studio, *Muhammad Nazar (Syiah Kuala University, Indonesia), Zulfadli Zulfadli (Syiah Kuala University, Indonesia)* ..... 221

### **Informatics and Computer Sciences 02**

- Wavelength Selection in Hyperspectral Imaging for Prediction Banana (Musa Sp. Quality, *Adhi Saputro (Universitas Indonesia, Indonesia), Windri Handayani (Universitas Indonesia, Indonesia)* ..... 226
- Reconstructing Japanese Handwritten Images Using Auto-Encoder with Residual Block in Parallel Computing, *M Octaviano Pratama (Universitas Indonesia, Indonesia), Pamela Kareen (Universitas Indonesia, Indonesia)* ..... 231
- Chlorophylls Content Prediction of Green Amaranth (*Amaranthus Tricolor L.*) Leaves Using V-NIR Image, *Mardhiyatna Mardhiyatna (Universitas Indonesia, Indonesia), Adhi Saputro (Universitas Indonesia, Indonesia), Cuk Imawan (Universitas Indonesia, Indonesia)* ..... 235

- Clustering Articles in Bahasa Indonesia Using Self-Organizing Map, *Dani Gunawan (University of Sumatera Utara, Indonesia), Amalia Amalia (University of Sumatera Utara, Indonesia), Indra Charisma (University of Sumatera Utara, Indonesia)* ..... 239
- Multiple Attribute Decision Making with Simple Additive Weighting Approach for Selecting the Scholarship Recipients at Syiah Kuala University, *Irvanizam Irvanizam (Syiah Kuala University, Indonesia)* ..... 245

### **Communications and Computer Systems 03**

- Towards the Development of Intelligent Pedestrian Mobility Systems (IPMS), *George Papageorgiou (European University Cyprus, Cyprus), Athanasios Maimaris (Cyprus College & EUC Research Center, Cyprus)*..... 251
- Software Defined Routing Algorithm in LEO Satellite Networks, *Yonghu Zhu (Shanghai JiaoTong University, P.R. China), Liang Qian (Shanghai Jiao Tong University, P.R. China), Lianghai Ding (Shanghai Jiao Tong University, P.R. China), Feng Yang (Shanghai Jiaotong University, P.R. China), Cheng Zhi (Shanghai Jiao Tong University, P.R. China), Tao Song (Shanghai Institute of Satellite Engineering, P.R. China)* ..... 257
- Self Comparison Performance Analysis of H2O on Multi Spectral Fluctuation Pattern, *Agus Santoso Tamsir (Universitas Indonesia, Indonesia), Melinda Melinda (UI, Indonesia), Michael Hariadi (Universitas Indonesia, Indonesia), Basari Basari (Universitas Indonesia, Indonesia), Dadang Gunawan (Universitas Indonesia, Indonesia)* ..... 263
- Adaptive Topology Decomposition for Storm, *Cheng Xie (Shanghai Jiao Tong University, P.R. China), Liang Qian (Shanghai Jiao Tong University, P.R. China), Lianghai Ding (Shanghai Jiao Tong University, P.R. China), Feng Yang (Shanghai Jiaotong University, P.R. China)* ..... 269
- Secondary Market Analysis in Indonesia Television Private Broadcasting Institutions, *Gunawan Wibisono (University of Indonesia, Indonesia), Eko Hin Ari Pratama (Universitas Indonesia, Indonesia)* ..... 274
- Implementation and Experimental Results of Decentralized Coded Caching for Wireless Video Transmission, *Xin Guo (Shanghai Jiao Tong University, P.R. China), Naifu Zhang (Shanghai Jiao Tong University, P.R. China), Liang Qian (Shanghai Jiao Tong University, P.R. China)* ..... 280

### **Informatics and Computer Sciences 03**

- Document Clustering Optimization with Synonym Dictionary Check Function, *Amalia Amalia (University of Sumatera Utara, Indonesia), Maya Lydia (Universitas Sumatera Utara, Indonesia), Siti Fadilla (Universitas Sumatera Utara, Indonesia), Miftahul Huda (Universitas Sumatera Utara, Indonesia), Dani Gunawan (University of Sumatera Utara, Indonesia)* ..... 286

▪ DHJ: A Database of Handwritten Jawi for Recognition Research, <i>Khairun Saddami (Syiah Kuala University, Indonesia), Khairul Munadi (Syiah Kuala University, Faculty of Engineering, Indonesia), Yuwaldi Away (Syiah Kuala University, Indonesia), Fitri Arnia (Syiah Kuala University, Indonesia)</i> .....	292
▪ Performance Analysis of Zigzag Map and Hash Function to Generate Random Number, <i>Magfirawaty Philiank (Universitas Indonesia, Indonesia)</i> .....	297
▪ Identification of Bahasa Indonesia Official Computer Terms in Indonesian Government Websites, <i>Amalia Amalia (University of Sumatera Utara, Indonesia), Dani Gunawan (University of Sumatera Utara, Indonesia), Maya Lydia (Universitas Sumatera Utara, Indonesia), Daniel Bonoffi (Universitas Sumatera Utara, Indonesia), Tigor Hamonangan Nasution (Universitas Sumatera Utara, Indonesia)</i> .....	302
▪ N-grams Based Features for Indonesian Tweets Classification Problems, <i>Taufik F. Abidin (Syiah Kuala University, Indonesia), Mauliana Hasanuddin (Syiah Kuala University, Indonesia), Viska Mutiawani (Syiah Kuala University, Indonesia)</i> .....	307



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

Yahfizham, Fenny Purwani, Kasman Rukun, and Krismadinata  
Postgraduate Technical and Vocational Education and Training  
Faculty of Engineering, Padang State University  
Padang, Indonesia  
yahfizhammedan@gmail.com

**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 addition 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	<a href="http://library.collaborizeclassroom.com/">http://library.collaborizeclassroom.com/</a>	Democrasoft Holdings, Inc.	2010
2	CourseSites	<a href="https://www.coursesites.com/webapps/Bb-sites-course-creation-BBLEARN/pages/index.html">https://www.coursesites.com/webapps/Bb-sites-course-creation-BBLEARN/pages/index.html</a>	Blackboard Inc.	2011
3	Ecto	<a href="http://www.ectolearning.com/">http://www.ectolearning.com/</a>	Rackspace Hosting	2005

No	Name CLMS SaaS	Overview		
		Web Site	Vendor	Release
4	Edmodo	<a href="http://www.edmodo.com">http://www.edmodo.com</a>	Edmodo	2008
5	GoConqr	<a href="https://www.goconqr.com/">https://www.goconqr.com/</a>	Software Asset Management Ireland	2012
6	Google Classroom	<a href="https://edu.google.com/intl/en/products/productivity-tools/classroom/">https://edu.google.com/intl/en/products/productivity-tools/classroom/</a>	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

It 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.

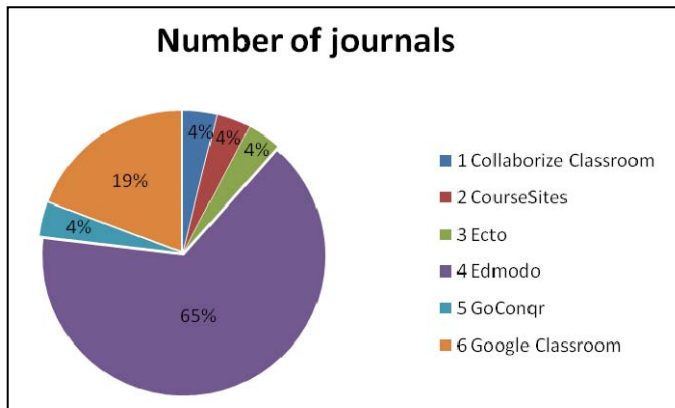


Fig. 2. Percentage number of documents

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:

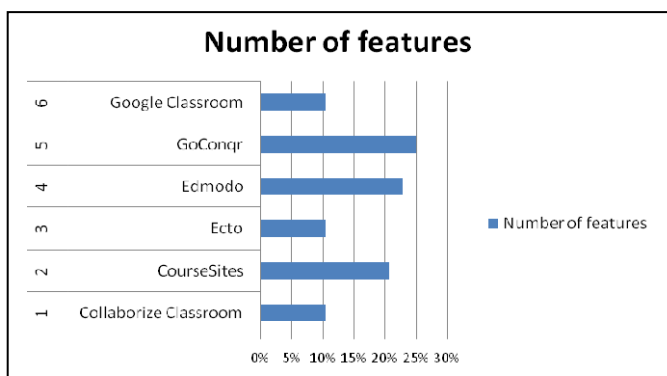


Fig. 3. Percentage number of features

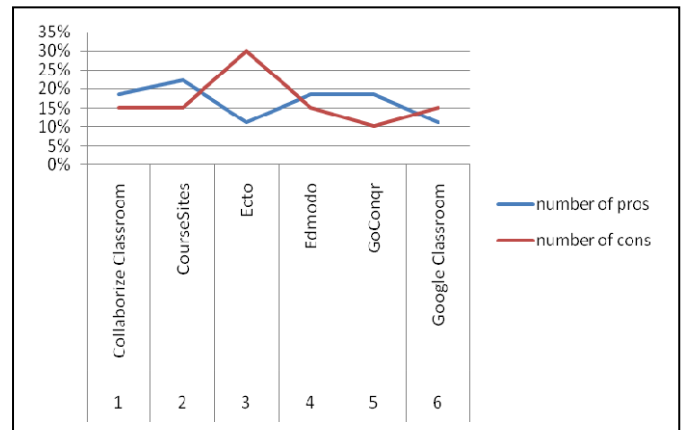


Fig. 4. Percentage number of pros and cons

##### 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.

#### ACKNOWLEDGMENT

The authors would like to thank to Padang State University for the permission to publish this paper and colleagues for their support in the process of writing.

## REFERENCES

- [1] B. D. A. Falvo and B. F. Johnson, "The Use of Learning Management Systems in the United States," vol. 51, no. 2, pp. 40–45, 2007.
- [2] M. Ketel, "E-learning in a Cloud Computing Environment," pp. 0–1, 2014.
- [3] A. G. R. F. Shereen, "Application Of Cloud Computing Based On E-Learning Teaching Tool," pp. 2319–2321, 2016.
- [4] T. Martín-blas and A. Serrano-fernández, "The role of new technologies in the learning process: Moodle as a teaching tool in Physics," *Comput. Educ.*, vol. 52, no. 1, pp. 35–44, 2009.
- [5] P. Mell, T. Grance, and T. Grance, "The NIST Definition of Cloud Computing Recommendations of the National Institute of Standards and Technology."
- [6] D. Ma and R. J. Kauffman, "Competition Between Software-as-a-Service Vendors," vol. 61, no. 4, pp. 717–729, 2014.
- [7] E. Leloglu, "A Review of Cloud Deployment Models for E-Learning Systems," pp. 4–5, 2013.
- [8] S. Sarkar, "The Role of Information and Communication Technology ( ICT ) in Higher Education for the 21st Century," vol. 1, no. 1, pp. 30–41, 2012.
- [9] N. V. Patel, "A Holistic Approach to Learning and Teaching Interaction : Factors in the Development of Critical Learners," vol. 17, pp. 272–284, 2003.
- [10] N. Cavus, "Selecting a learning management system ( LMS ) in developing countries : instructors ' evaluation," no. October, pp. 37–41, 2013.
- [11] N. Cavus and T. Zabadi, "A Comparison of Open Source Learning Management Systems," *Procedia - Soc. Behav. Sci.*, vol. 143, pp. 521–526, 2014.
- [12] I. Dobre, "Learning Management Systems for higher education - an overview of available options for Higher Education Organizations," *Procedia - Soc. Behav. Sci.*, vol. 180, no. November 2014, pp. 313–320, 2015.
- [13] B. N. Abdullateef, N. F. Elias, H. Mohamed, A. A. Zaidan, and B. B. Zaidan, "An evaluation and selection problems of OSS - LMS packages," *Springerplus*, 2016.
- [14] B. D. Mcintosh, D. Ph, and U. Mar, "Vendors of Learning Management and eLearning Products For Trimeritus eLearning Solutions Inc . Vendors of Learning Management and E-learning Products," no. 2016, 2017.
- [15] W. Paper, B. Catlin, and T. December, "Teaching to Common Core State Standards with Collaborize Classroom," pp. 1–16.
- [16] Wagner, T. 2014. Coursesites by Blackboard. ITBE Link. Quarterly Newsletter.
- [17] L. L. C. Whitepaper, S. W. Becker, D. Ph, and T. K. Henriksen, "In search of the next generation online learning environment In search of the next generation online learning environment," 2006
- [18] C. Kongchan, "How a Non-Digital-Native Teacher Makes Use of Edmodo," 2008.
- [19] M. A. S. Enriquez, "Students ' Perceptions on the Effectiveness of the Use of Edmodo as a Supplementary Tool for Learning," pp. 6–11, 2014.
- [20] A. Ain, "One Size Does Not Fit All: Students' Perceptions about Edmodo at Al Ain University of Science & Technology Mohammad Bassam Mustafa," vol. 13, no. 2, pp. 135–160, 2015.
- [21] Erman Uzun, "Students' Attitude Towards Edmodo as a Supplementary Tool f or Higher Education", pp. 78–83, 2015.
- [22] F. Al-kathiri, "Beyond the Classroom Walls: Edmodo in Saudi Secondary School EFL Instruction , Attitudes and Challenges," vol. 8, no. 1, 2015.
- [23] B. B. Shams-abadi, S. D. Ahmadi, and A. G. Mehrdad, "The Effect of Edmodo on EFL Learners ' Writing Performance," vol. 2, no. 2, pp. 88–97, 2015.
- [24] F. A. Mokhtar and H. Dzakiria, "Illuminating the Potential of Edmodo as an Interactive Virtual Learning Platform for English Language Learning and Teaching," vol. 17, no. 1, pp. 83–98, 2015.
- [25] D. Edmodo, "Prosiding Seminar Nasional 9 Mei 2015 Memanfaatkan Edmodo Sebagai Media Pembelajaran Akuntansi Laksmi Mahendradi Dwiharja," pp. 332–344, 2015.
- [26] H. Bicen, "The Role of Social Learning Networks in Mobile Assisted Language Learning : Edmodo as a Case Study," vol. 21, no. 10, pp. 1297–1306, 2015.
- [27] C. McClain, "Characterization Personified: Using Edmodo to Strengthen Student Interaction with Literature Alan Brown," vol. 18, pp. 1–19, 2015.
- [28] H. U. Qingqing, "Research on Flipped Classroom Design and Implication Based on Edmodo Platform," pp. 528–532, 2016.
- [29] R. Gitonga, M. Muuro, and G. Onyango, "Technology Integration in the Classroom: A Case of Students Experiences in Using Edmodo to Support Learning in a Blended Classroom in a Kenyan University," pp. 1–8, 2016.
- [30] P. Purnawarman and W. Sundayana, "The Use Of Edmodo In Teaching Writing In A Blended Learning Setting," pp. 242–252, 2016.
- [31] K. Bayburtsyan, "The Use Of Edmodo , Virtual Learning Management Platform , In The Context Of Promoting Mobile," vol. 4, no. 535, pp. 75–84, 2016.
- [32] S. Charoenwet and A. Christensen, "The Effect of Edmodo Learning Network on Students ' Perception , Self-Regulated Learning Behaviors and Learning Performance," no. Imsci, pp. 297–300, 2016.
- [33] T. Hastomo, "The Effectiveness Of Edmodo To Teach Writing Viewed From Students ' Motivation," vol. 1, pp. 580–585, 2016.
- [34] O. I. Shaykina, "Blended Learning in English Language Teaching : Open Educational Resources Used for Academic Purposes in Tomsk Polytechnic University," vol. 6, no. 3, pp. 255–260, 2015.
- [35] M. A. Forment, M. J. Casañ, J. P. Poch, N. Galanis, E. Mayol, M. A. Conde, and F. G. Peñalvo, "Integration of Google Docs as a collaborative activity within the LMS using IMS BasicLTI," pp. 677–683, 2013.
- [36] J. Manuel and M. Ferreira, "Flipped classrooms: From concept to reality using Google Apps," no. February, pp. 204–208, 2014.
- [37] I. Nizal, M. Sharanee, J. M. Jamil, S. Syamimi, and M. Rodzi, "The Application of Google Classroom as a Tool for Teaching and Learning," vol. 8, no. 10, pp. 8–11, 1843.
- [38] S. Iftakhar, "Google classroom: what works and how?," vol. 3, pp. 12–18, 2016.
- [39] P. Jakkaw, "The Use of UTAUT2 Model for Understanding Student Perceptions Using Google Classroom: A Case Study of Introduction to Information Technology Course," 2017.



ATTACHMENT

The next table that is a checklist of 6 LMS features

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

Note \*

CourseSites has unique feature likely: SafeAssign, Softchalk and Respondus