

Developing An LMS-Based Cross-Platform Web Application For Improving Vocational High School Students' Competitiveness In ASEAN Economic Community

Hary Suswanto¹⁾, Ahmad Mursyidun Nidhom¹⁾, Andika Bagus Nur Rahma Putra²⁾,
Jehad A.H. Hammad³⁾

¹⁾Electrical Engineering, Faculty of Engineering–Universitas Negeri Malang, Indonesia

²⁾Mechanical Engineering, Faculty of Engineering–Universitas Negeri Malang, Indonesia

³⁾Computer Information Systems, Faculty of Technology and Applied Sciences–Al-Quds Open University, Palestine
Jl. Semarang 5 Malang. E-mail: hary.suswanto.ft@um.ac.id

Abstract: This study aimed at developing a cross-platform (CPL) web application of Learning Management System (LMS) for English lessons in vocational high school. The development was also an attempt to overcome students' problems such as lack of independence and low achievement in English lesson, contrast with ASEAN Economic Community (AEC) expectation. The developed LMS-based web application could be accessed using computers or mobile devices running different operating systems (BlackBerry OS, Android, IOS). The LMS portal used artificial intelligence to detect the type of device accessing the web app and automatically adapt screen parameters of the device used. This research adapted the 10-step R&D model proposed by Dick and Carey. The research participants were two educational media experts, one subject-matter expert, and students. The data was collected through observation and closed-ended questionnaire. After the data was obtained, it was analysed, and the product was revised to comply with the criteria of acceptability for an effective learning platform.

Key Words: cross, platform, AEC

Abstrak: Penelitian ini bertujuan untuk mengembangkan aplikasi web *Learning Management System* (LMS) lintas *platform* untuk pembelajaran Bahasa Inggris di Sekolah Menengah Kejuruan. Pengembangan media juga bertujuan mengatasi masalah siswa yang berkaitan dengan rendahnya kemandirian belajar serta pencapaiannya yang rendah dalam pembelajaran Bahasa Inggris, yang berseberangan dengan harapan Masyarakat Ekonomi ASEAN (MEA). Aplikasi LMS berbasis *web* yang dikembangkan dapat diakses melalui perangkat komputer atau telepon genggam dengan sistem operasi yang berbeda (BlackBerry OS, Android, IOS). Portal LMS menggunakan kecerdasan buatan untuk mendeteksi tipe perangkat yang mengakses aplikasi *web* tersebut yang dapat secara otomatis beradaptasi dengan parameter layar perangkat yang digunakan. Penelitian pengembangan ini menggunakan 10 langkah model R&D yang disarankan oleh Dick dan Carey. Dua ahli media pendidikan, ahli pembelajaran, dan siswa mengambil bagian dalam penelitian ini. Data penelitian didapatkan melalui observasi dan kuesioner pertanyaan tertutup. Setelah data didapatkan, data dianalisis dan produk direvisi berdasarkan kriteria *platform* pembelajaran yang efektif.

Kata kunci: lintas, *platform*, AEC

Vocational high schools (SMK) are the major suppliers of workers to accommodate the demand of the labour market in Indonesia. In fact, the development of vocational high schools is the top priority of the Indonesian government. The vocational high schools in Indonesia have a diversity of skill competency areas tailored to the needs of small,

medium and large scale industries. The rapid development of vocational high schools gives a positive indication that students prefer specific skills to support their competitiveness in the future. However, this rapid development poses new problems, including a lack of effective learning methods and strategies.

Education is of vital importance for everyone. It can change one's attitude for the better. In other words, education is the key to creating noble and dignified beings, as mandated in the 1945 Constitution and the National Education System Law. Thus, issues concerning education are collective problems, the impacts of which have been felt nationally and eventually shape the future of our nation (Nidhom, 2015). Upon this ground, our education system should be continuously improved.

Educational improvement is required to prepare students to be able to compete in the era of globalization. The establishment of ASEAN Economic Community (AEC) is one of the real examples of globalization, particularly in economic affairs. AEC is an agreement on the realisation of the ASEAN Vision 2020 between the ten participating countries, namely Brunei, the Philippines, Indonesia, Cambodia, Laos, Malaysia, Myanmar, Singapore, Thailand, and Vietnam. These countries have agreed on the implementation of a single market and cooperation among countries for a stronger economy in ASEAN. In fact, ASEAN is a region of a highly competitive economy and thus the tightening of regulations and competition policy, including consumer protection, Intellectual Property Rights (IPR), taxation, e-Commerce activities, and infrastructure development. However, with the advent of this economic integration, students may struggle to find jobs due to the tightening job market. Therefore, students have to be prepared to face the challenge of a dynamic global society and continually keep up with the latest educational technology. For instance, the use of school-based resources which can be accessed by students studying outside the school environment, such as joining work-related activities in the business and industry world, e.g. internship and apprenticeship (Konstanidis, 2011).

The developed resources feature Cross-Platform Media (CPLM), with which the learning resources can be converted into different formats compatible with different operating systems (Android, BlackBerry OS, and iOS) and uploaded on various application marketplaces (Google Play, BlackBerry World, and App Store). The ease of access to the learning media can facilitate students in learning more flexibly; the learning process can be done anywhere and anytime, not necessarily in the classroom with conventional face-to-face instruction. In addition to the flexibility of use, the major advantage of this product lies in the central control system—the teacher has absolute control over the materials needed (in accordance with students' class and semester). This is an attempt to

satisfy the ever-increasing demand from AEC which may require skilled human resources with high competitiveness.

The development of this cross-platform product is an attempt to address the problems often encountered in the learning process (Wilcox, 2017). One of the common problems is limited access for communication with students outside the school, and thus students cannot be disciplined for their off-school behaviour and learning. Upon this ground, this product was rigorously developed as a plausible solution to improve students' English skills, with which increase students' competitiveness towards the ASEAN Economic Community.

ASEAN Economic Community

The ultimate goal of ASEAN Economic Community (AEC) is to integrate South-East Asia's economies by establishing a free-trade zone among the ASEAN members. The members of ASEAN, including Indonesia, have reached an agreement on the ASEAN Economic Community. AEC is a realisation of the ASEAN Vision 2020 in economic integration based on a convergence of interests of ASEAN member countries to expand and deepen economic integration through existing and new initiatives with clear timelines. In establishing AEC, ASEAN must act by the principles of an open, outward-looking, and market-driven consistent with multilateral rules as well as adherence to systems under the rules for implementation and effective compliance of economic commitments.

Learning Management System (LMS)

Learning Management System (LMS) is software for administration, documentation, event reporting, delivery of instruction and training programmes—all done online (Miao, 2017).

LMS is used to make web-based learning materials, manage classroom courses (with all results of assignments and assessments), and other features to meet all the needs of users in terms of instructional process. Nowadays, there have been many types of LMS available, each of which has its own features depending on the function, as shown in Figure 1. In its relation to the challenges of AEC, this form of technological advance can be used to improve student competitiveness. Also, LMS can stimulate students to create innovative ideas and keep up to date with the latest developments.

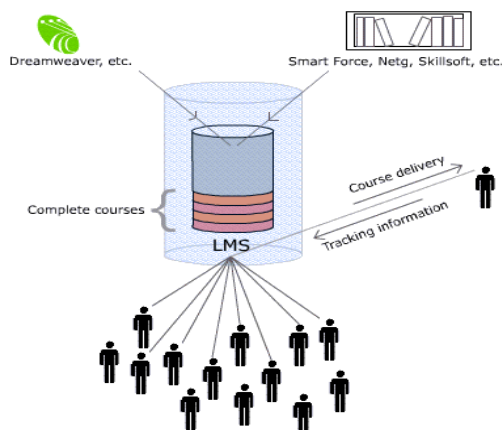


Figure 1. Internet Penetration Using Mobile in Southeast Asia (Nielsen, 2011)

There have been several studies on the development of Learning Management System, one of which was done by Liebowitz. Liebowitz conducted research on the ease of learning with the use of LMS; the study took place in several rural areas in the US. The result showed that the students rarely made use of it. Liebowitz (2016) stated that “As far as technology is concerned, there are challenges and pitfalls. This is a teaching method that relies heavily on the means used, as we have seen above. The internet, it and many technological breakthroughs will pave the way for the broadening of possibilities and new prospects. On the other hand, course administrators, teachers and educators in general must be reminded of the dangers inherent in any teaching method being too resource-centered in this vein.”

In other words, teachers should be able to take advantage of today’s modern technology, so that they can provide learning resources that can be easily accessed at any time and on any device. Learning Management System is one of such technology. Not only that, this technology can contribute to the construct of a global mindset, which is crucial in the era of AEC.

Another study was conducted by Tsai. Tsai (2012) researches how to develop e-learning design with appropriate and appropriate website media to improve the skill of computer vocational students. The results of the study conclude that a good e-learning design should have the compatibility and efficiency with an average value of 72% of the overall value of validation. Tsai also emphasized that the application of Learning Management System needs to use Blended Learning, resulting in synchronous and asynchronous learning settings that ultimately increase the competitiveness of students facing AEC.



Figure 2. Cross Platform Development

Cross Platform

Platform is a foundation or a place where the operating system works, or it is the foundation in which processes run, while the term ‘cross’ means literally. Cross platform is a term in the technology of information about software or application that can be executed in a variety of operating systems and hardware types, i.e. smartphones, standalone PCs and other gadgets (See Figure 2). The development of cross-platform software consists of several cycles, one of which is system validation done by users who do not have an interest in the development of the application (Frederick, 2013).

METHOD

This study aimed at developing a cross-platform (CPL) web application of Learning Management System (LMS) for English lessons in vocational high schools. This research adapted the R&D model proposed by Dick and Carey (2001). This model is suitable for solving classroom problems through systematic procedures or steps. The steps include identifying instructional goals, conducting instructional analysis, analysing learner and context, writing performance objectives, developing assessment instrument, developing instructional strategy, developing and selecting instructional materials, designing and conducting a formative evaluation of instruction, revising instruction, and designing and conducting a summative evaluation.

In this paper, the researchers made a minor modification and conducted the research only in nine steps. Therefore, the research and development process was done up to the tryout of the prototype of the product. The R&D model of Instructional Systems Development (ISD) proposed by Dick, Carey, and Carey (2001) consists of 10 steps as shown in Figure 3.

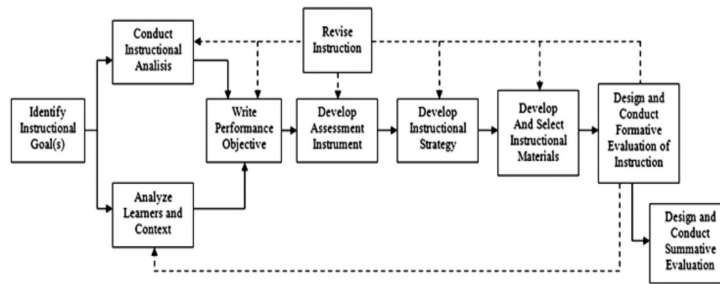


Figure 3. Development Procedure by Dick, Carey, and Carey (2001)

In this study, the learning strategies were grouped into 4 domains. The first one was live synchronous learning; this learning was done in the classroom when students were about to start their apprenticeship (Truong, 2016). The three other learning strategies, namely virtual synchronous, self-paced asynchronous and collaborative asynchronous learning, were implemented online and developed in the Learning Management System.

After completing the product development and validation process, the researchers conducted a quasi-experimental study. The experiment involved the students of class X AK. It was done to investigate the effectiveness of the developed product. The experimental study was conducted by assigning the students into two groups, i.e. control class (29 students) and experimental class (29 students). The initial condition of students was identified using a pre-test. Then, the students' ability after utilising the LMS-based cross-platform application was tested using the t-test.

RESULTS AND DISCUSSION

The result of this study was an LMS-based cross-platform web application for vocational high school

students (Figure 4.) which was designed to support English lessons.

Figure 4 shows the start page or the first page the users see when they open the web application. The start page was designed in such a way as to ease access for the users. The user interface consists of several menus which are easy to navigate.

As shown in Figure 5, there are three main menus, i.e. “Forum Diskusi dan Chatting” (discussion and chat forum), “Penugasan dan Kuis” (assignments and quizzes), and “Materi” (materials). The discussion and chat forum is a page for users to interact. There is also an option to start a private conversation. The assignments and quizzes are presented to complete the evaluation process on learning. Students can try to work on them for practising and assessing their ability. In the “Materi” section, glossary and lecture notes from the course are provided, and they can be downloaded as well.

Figure 6 shows the page of discussion forum for active users as a means to discuss problems that may occur during the learning process. There is also a feature where users (students) can have private conversations; students interact with individuals personally in one-to-one conversations.



Figure 4. Main Menu of The Desktop Version

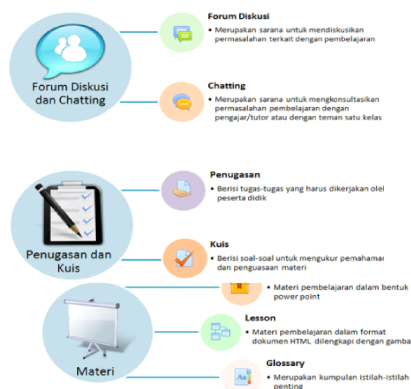


Figure 5. Navigation Menu of The Discussion Forum

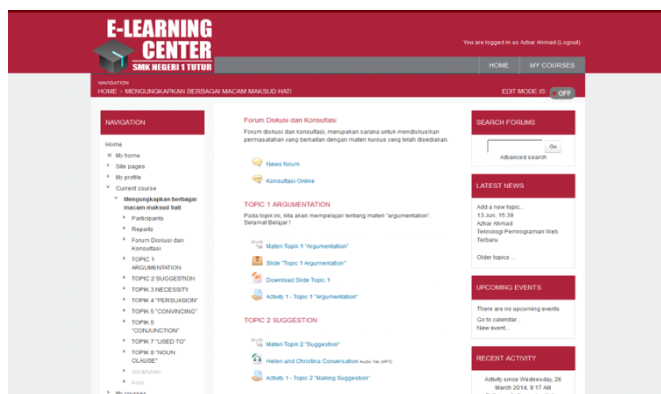


Figure 6. Home Page of The Discussion and Chat Forum

Results of Media Validation

The media validation involved two postgraduate lecturers whose expertise in educational media, multimedia, and web programming. The validation results are presented in Table 1.

Table 1 shows the judgments of two educational media experts regarding the acceptability of the product as a learning resource. The average score of all aspects assessed was 98.5%, indicating that the developed product has excellently complied with the criteria of acceptability for effective learning aid for English lessons in vocational high schools and thus revision was not needed.

Results of Subject-Matter Expert Validation

The subject-matter expert validating the product was a lecturer of Informatics Education whose expertise in web programming. The results of validation are shown in Table 2.

Based on Table 2, that refers to Table 1 about the criteria for eligibility levels, the results obtained from the subject-matter expert indicate that the developed product, i.e. an LMS-based cross-platform web application intended for vocational high school students in learning English was excellent. The overall average score from the subject-matter experts was 92.5%. In other words, the product has complied with the stand-

ard of dynamic web programming, and no revision was needed.

Effectiveness of the Learning Management System (LMS)-Based Cross-Platform (CPL) Media

After completing the product development and validation process, the researchers conducted a quasi-experimental study to investigate the effectiveness of the product. This follow-up research involved students assigned to two groups, i.e. experimental and control group.

The results of the preliminary assessment showed the students’ initial conditions in terms of their ability before utilising the LMS-based cross-platform application. The test was performed to test the hypotheses according to the pre-test situation.

The summary of the results shows that t value was 1.171 with a level of significance of 0.246, indicating no significant difference in initial condition between the experimental class and the control class (Table 3). Next, the data were analysed using t-test.

The results of the final assessment showed the students’ conditions in terms of their ability after utilising the LMS-based cross-platform application. The test was performed to test the hypotheses according to the post-test situation.

Table 1. Results of Media Validation

No.	Indicator	Total	Average Percentage
1.	Effectiveness of the product	8 aspects	100 %
2.	Attractiveness of the product	5 aspects	97,5 %
3.	Efficiency of the product	4 aspects	96,9 %
	Total	17 aspects	98,5 %

Table 2. Results of Subject-Matter Expert Validation

No	Indicator	Percentage (%)
Content		
1.	Relevance of contents to learning objectives	100
2.	Relevance of learning objectives to standard competencies and basic competencies	100
3.	Suitability between learning media and learning objectives	100
4.	Content coverage	87.5
5.	Clarity of content	100
6.	Level of understandability	87.5
7.	Systematic and logical presentation	100
8.	Accuracy of language use	87.5
9.	Completeness of content	87.5
10.	Suitability between figures and content	75
Evaluation		
11.	Consistency of quizzes with learning objectives	87.5
12.	Clarity of sentence structure	87.5
13.	Provision of feedback	100
Efficiency and Effectiveness		
14.	Effectiveness of the learning strategy used	87.5
15.	Suitability between product and students' characteristics	100
16.	Use of product as a motivation booster	87.5
17.	Use of product in autonomous learning	100
18.	Completeness and quality	87.5
19.	Effectiveness of product used in apprenticeship training	87.5
20.	Efficiency of product used in apprenticeship training	100
TOTAL		92.5

The summary of the results shows that *t* value was 2.66 with a level of significance of 0.01, indicating a significant difference in ability level between students in the experimental class and those in the control class (Table 4).

Virtues of The Developed Product Towards The Competitiveness in AEC

The results of the entire validation processes showed that the product obtained a score of above 90% in each aspect being assessed. The average score achieved in the validation by media experts was 98.5%, indicating a high level of effectiveness and efficiency. In fact, it is necessary to upgrade the instructional

process in our education to face the ASEAN Economic Society. To accommodate the demand from AEC, the LMS-based cross-platform web application has been developed to help students increase their competitiveness and develop a global mind set.

Moreover, based on the quality of materials presented in the product, the expert gave a score of 92.5%. The aspects assessed included evaluation, content, and effectiveness. The developed product has been proven to be able to encourage students to think innovatively about every global development. Students with innovative thinking skills are more ready to compete in a tight job market. In the era of AEC, there will be more great employment opportunities in a wide range of sectors for job seekers. Access to go abroad to find a job

Table 3. Summary of The Pre-Test Results

t-test for Equality of Means				
t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
1.171	56	.246	2.690	2.296
1.171	55.587	.246	2.690	2.296

Table 4. Summary of The Post-Test Results

t-test for Equality of Means				
t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
2.666	56	.010	5.241	1.966
2.666	53.457	.010	5.241	1.966

becomes easier or even without any particular obstacles. Also, AEC is a good start for entrepreneurs to find the best workers out there. Due to the free labour market, Indonesian employees can also work freely in other ASEAN member countries.

Description of the Effectiveness of The Learning Management System (LMS)-Based Cross-Platform (CPL) Media

The t-test with the assistance of SPSS 20.0 for Windows showed a considerable difference between the result of the experimental and control class. In the experimental class, the average score of the final assessment on student performance was 81.00, whereas the students in the control group obtained an average score of 75.76. Based on this result, the H_0 was rejected, meaning that there was a significant difference between the post-test result of the experimental class and that of the control class. In other words, the learning achievement of students using and not using the LMS-based cross-platform web application differed significantly. This is in line with Laflen (2017) stating that the use of Learning Management System can develop the skills needed to compete in today's job search. Furthermore, Siagian (2017) who researched the development of interactive e-learning model for the Instructional Design course found that almost all students gave a positive response about learning using the developed product. The product was proven to be beneficial, interesting, and able to improve students' learning motivation. Research on an LMS-based e-learning has also been done by Yunis (2017) who concluded that LMS could give significant influence to student learning achievement and motivation. Yunis further pointed out that e-learning was an effective medium to support the instructional process which could increase the learning achievement by 65%.

The effectiveness of the developed product was supported by the fact that the average post-test score of students in the experimental group was higher than that of students in the control group. It indicates that there is a significant advantage in using the LMS-based cross-platform learning media. Since there was a significant difference in the final test result between the students in the control and experimental class, H_a was accepted. This concurs well with Sari (2017) who stated that the effectiveness of LMS-based learning could be determined by the learning achievement of the users. Furthermore, Dewi (2017) suggested that LMS should be carefully designed to prepare students

to be able to participate in the ASEAN Economic Community (AEC) actively.

CONCLUSIONS

The research findings and discussion have led us to the following conclusions. (1) The developed product, an LMS-based cross-platform web application, has satisfied the requirements for effective and efficient learning aid, which can be seen from the judgment of the educational media experts (average score=98.5%). Also, the product was considered to have an attractive design and high efficiency by obtaining a score of 97.5% and 96.9% respectively. (2) Regarding the content of materials, the product obtained a score of 92.5%. (3) The LMS-based cross-platform learning media offers substantial benefits to the improvement of competitiveness in AEC. The research results showed a significant difference in learning achievement of the control group and the experimental group. In the experimental group, the average score of the final assessment on student performance was 81.00, whereas the students in the control group obtained an average score of 75.76.

This research also offers suggestions for further development in this area. Firstly, future researchers should devote more attention to the responsiveness of the cross-platform product because several operating systems have different resolution settings, such as iOS and Android KitKat. Moreover, media developers should consider the ease of use of their products. The finished products should have a simple and user-friendly display design to facilitate ordinary users.

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