DEVELOPMENT OF MASSIVE OPEN ONLINE COURSES *E-LEARNING* SYSTEM FOR EQUITABLE ACCESS TO HIGHER EDUCATION IN INDONESIA

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Abstract

Access to education is a very important problem in development of human resources in Indonesia. The rapid progress in information and communication technology can be alternative to solve this problem. Massive open online courses is one form of e-learning, the utilization of information and communication in educational field. This research answers several research questions: 1) How is the design of massive open online courses e-learning system for equitable access to higher education in Indonesia? 2) How is the implementation of massive open online courses e-learning system for equitable access to higher education in Indonesia? 3) How does this massive open online courses e-learning system answer the equitable access problems in

higher education? This project uses research and development methods with these stages: 1) preliminary studies; 2) product development; and 3) product validation using expert judgement and product trials.

Keywords: E-learning, Massive open online courses, access, higher education

A. Preface

One main problem faced by Indonesian education system is access to education. The preliminary draft of National Medium Term Development Plan (RPJMN) 2015-2019 (BAPPENAS, 2014), states that access to higher education is not equitable yet, with financial problems as main reason. Economic problems make people prefer to work to fulfill their economic needs than to continue their studies to higher level. Another reason is geographic problems. Limited numbers and capacity of higher education institutions, uneven distribution of higher education institutions, and there are just a few universities with adequate and quality educational resources are several barriers to provide higher education access in Indonesia (Dirjen DIKTI, 2013). Cultural, social, and

physical problems are another barrier to higher education access (Prodan et al., 2013). Social views state that women don't need high education is one example of social barriers to higher education.

An alternative solution to solve this problem is to utilize rapid progress in information and communication technologies within educational field. Information and communication technology enables learning to happen not only in classrooms, in this case broadening educational services is the main priority. Information and communication technology is able to bridge gaps that exist between instructors or students with classrooms where learning takes place. In addition, information and communication technology is also able to bring learning more open to anyone, free, and flexible in space and time.

The numbers of internet users in Indonesia, from the date released by Internet World Stats (2015) in June 2014 is reaching 71,190,000 users, or 28.1% of the total population. This puts Indonesia as the fourth country with the highest number of internet users, under China, India, and Japan. Indonesian Internet Services Provider Association (Asosiasi Penyelenggara Jasa Internet Indonesia, 2013) projected that in 2013, the number of internet users in Indonesia will reach 83 million users, and in 2014

it is estimated to reach 107 million users. With this rapid increment of internet users, internet is very prospective technology that needs to be utilized in the field of education in Indonesia, particularly in the implementation of open and distance learning to answers equitable access problems in higher education.

Massive open online courses is one form of utilization of information and communication technology for learning needs (e-learning). In the beginning of its development, this system is intended to increase participation and openness of access through web technologies. MOOCs provide free access to high quality learning materials, where participants from around the world can create, research, and share open educational resources (Abeer and Miri, 2014). MOOCs have several important principles, such as transparency, participative, and distributive (Baturay, 2015).

As disclosed by Benny, et al (2014), that the potential benefits of massive open online courses e-learning system that can be adopted by Indonesia is to overcome geographic and demographic obstacles. This project attempts to answers several research problems:

1. How is the design of massive open online courses e-learning system for equitable access to higher education in Indonesia?
2. How is the implementation of massive open online courses e-learning system for equitable access to higher education in Indonesia?
3. How does this massive open online courses e-learning system answer the equitable access problems in higher education?

B. Methods

This project uses research and development methods to develop a massive open online courses e-learning system for equitable access to higher education in Indonesia. This research and development aims to find, develop, and validate a product. The stages of this research are as follows:
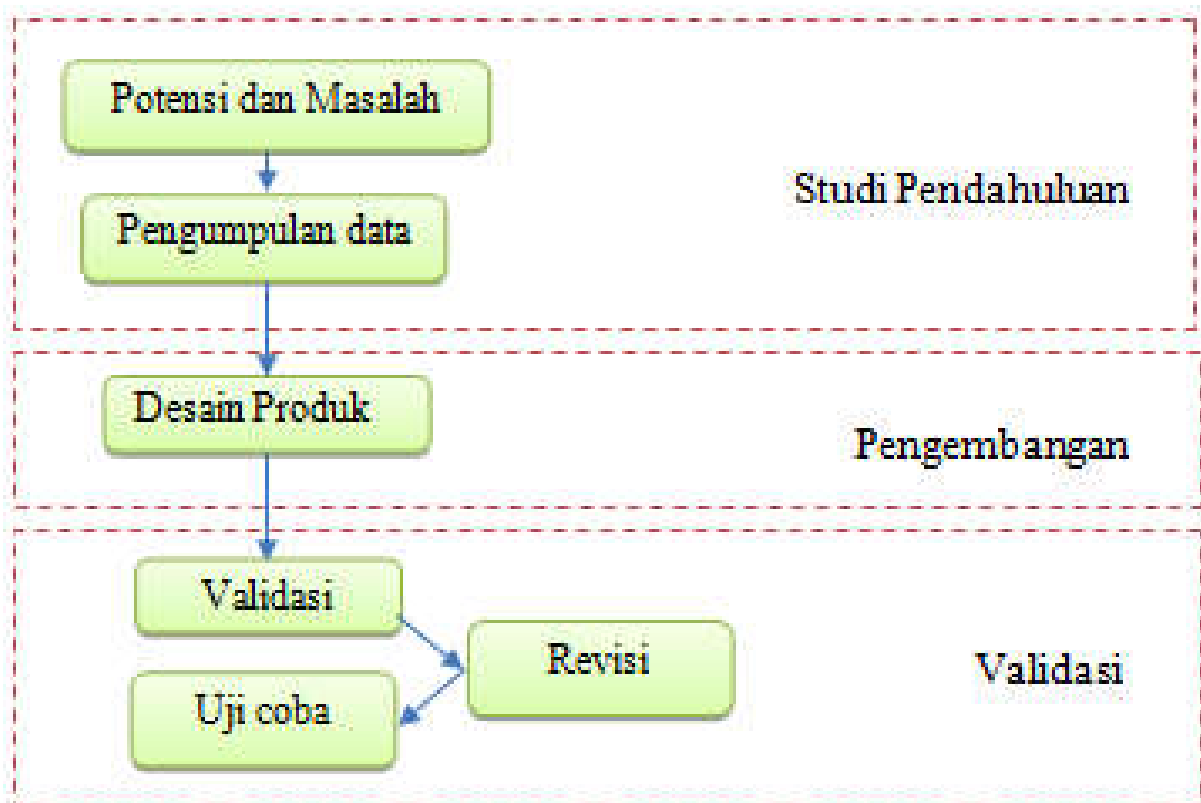
Picture 1. Research Step (Sugiyono, 2011)

In the preliminary study stage, potencies and problems analysis are performed to find problems and strengths which are needed in the development of massive open online courses e-learning system. The main problem in this research and development is the lack of equitable access to higher education in Indonesia, while the main strengths found is the rapid increment of internet users in Indonesia that shared several similarities with higher education student's characteristics, and the rapid development

of information and communication technologies in Indonesia.

The next stage is data collection stage. The collected data is needed as resources in the development process of massive open online courses e-learning system. This process is divided into two ways, literature study and field study. The field study is conducted by spreading a questionnaire to determine massive open online courses' users' responses towards their learning experiences in a massive open online courses environment.

After the data is obtained and analyzed, researchers then develop the product design based on the findings of the preliminary study. This design then developed into an e-learning system web application. Then, the product is examined and validated by an instructional media expert to avoid any bugs, errors, and ensure that the product is ready to be tested in a learning process. The result of this stage will be the basis for product revisions and improvement.

The population of this research are all Indonesian citizens whose their age belongs to the ideal age criteria for college/university students (between 18 – 30 years old) and having internet connection

access. The sample were taken using purposive sampling technique. The sample used in this research and development is all individuals that registered and involved in the learning process within the massive open online courses e-learning system that is being developed.

This research and development uses following instruments for data collection purposes:

1. Preliminary questionnaire to collect existing massive open online courses' users' responses towards their learning experiences in a MOOC system.
2. Validation sheet to determine validation criteria of massive open online courses e-learning system that is being developed. The aspects that examined are: 1) display aspect; 2) interactivity aspect; 3) accessibility aspect; and 4) enrichment aspect.

The data that have been collected then analyzed using following methods:

1. Validation sheet analysis using descriptive analysis to describe the result of media validation and suggestions for revision and improvement.

2. Users' profile analysis using descriptive analysis to determine whether the massive open online courses e-learning system that is developed is possible to answers equitable access to higher education. The aspects that is analyzed are 1) location, 2) gender; 3) educational background; and 4) occupation.

C. Findings and Discussion

1. Result of Potentials and Problems Analysis

Central Agency of Statistic (Badan Pusat Statistik, 2015) stated that the numbers of college/university student, both in public and private colleges, in 2013/2014 academic year is 6,444,252 persons or only by 2.56% of the total population. The amount of the gross enrollment rate obtained from the ratio between the number of college students by the total population by age 20 – 24 years is 34.26%. This value is still classified in a low category. Ministry of National Development Planning (BAPPENAS, 2014) also states that access to higher education is not yet equitable between the rich and the poor. The poor cannot access the higher education services because of economic problems.

The numbers of internet users in Indonesia, from the date released by Internet World Stats (2015) in June 2014 is reaching 71,190,000 users, or 28.1% of the total population. This puts Indonesia as the fourth country with the highest number of internet users, under China, India, and Japan. Indonesian Internet Services Provider Association (Asosiasi Penyelenggara Jasa Internet Indonesia, 2015) also stated that 64.7% of internet users are already finished senior high school/equivalent education level. In addition, the majority of internet users in Indonesia (49%) are users aged 18 – 25 years old (Asosiasi Penyelenggara Jasa Internet Indonesia, 2015).

The development of internet access facilities and infrastructures in Indonesia has been expanding with the availability of District Internet Access Center (Pusat Akses Internet Kecamatan), Mobile District Internet Access Center (Mobil Pusat Akses Internet Kecamatan), and Smart Village (Desa Pinter) from the Ministry of Communication and Information in 32 provinces in Indonesia. In 2014, there are 5,965 District Internet Access Center registered, 1,857 Mobile District Internet Access Center operates, and all district capitals in Indonesia has been connected to the national fiber optic backbone network

(Kementerian Komunikasi dan Informasi, 2014). Although not yet reached all regions in Indonesia, the availability of internet access infrastructures and facilities implies that internet users in Indonesia will always be growing each time.

Availability of internet access should also be balanced with the availability of useful content services. Massive open online courses e-learning system will be very useful to provide opportunities for the majority of internet users aged 18 – 25 years who have been finished senior high school/equivalent educational level to access lectures at a relatively affordable cost and time without geographical borders.

2. The Design of Massive Open Online Course E-learning System

a. *Results of Preliminary Study*

Based on the analysis of field study conducted, the result shows that obstacles often faced by participants in learning using existing MOOCs websites are the language where the learning materials delivered is often difficult to understand, accessibility when accessed using a mobile device,

unstable connectivity sometimes affects comfortability when loading video contents, and several websites still require users to pay in order to access contents provided. Another obstacle often encountered is the self-paced learning concept sometimes make participants less-motivated due to lack of external motivation. This makes many participants didn't finish the whole learning process.

The responses also revealed that existing massive open online courses e-learning providers give advantages in the flexibility of time and place of learning, as well as the good quality of learning materials provided by various leading universities that partnering with the massive open online courses service providers. The usage of web-based media also enables various contents, ranging from electronic books (e-books), instructional videos, podcasts, and interactive multimedia.

From the analysis of field study, the massive open online courses e-learning system developed should have following main criteria's: 1) content in Bahasa Indonesia that easy to understand by users from various cultural backgrounds and gender; 2) responsive web interface that accessible from various devices; 3) utilization of short videos to make the loading/buffering process faster; 4) utilization of

interactive multimedia content; 5) utilization of social learning principles through discussion forum feature; 6) the use of gamification principles by giving badges for participants with specific achievements; 7) provision of free contents; 8) partnership with leading universities to ensure content/learning materials qualities.

b. *Design of Massive Open Online Courses E-learning System*

The massive open online courses e-learning system developed should have the following functionality:

- The main page contains brief information of the website, a link to the log in page, registration, instructions for use, and a list of courses available;
- When a user logs in as a participant, then the system will display a dashboard page that contains the progress of lectures, news / messages from instructors of each course, as well as the list of courses where the participant enrolled;
- When a user logs in as an instructor, then the system will display a dashboard page that contains a list of courses taught by the instructor and a link to create a new lecture;

- When a user logs in as admin, then the system will display the interface for managing the system.
- The system can be accessed through various devices, such as desktop computers, laptops, cell phones, and tablet computers.

The process flow of this massive open online courses e-learning system is illustrated by the flow chart below:
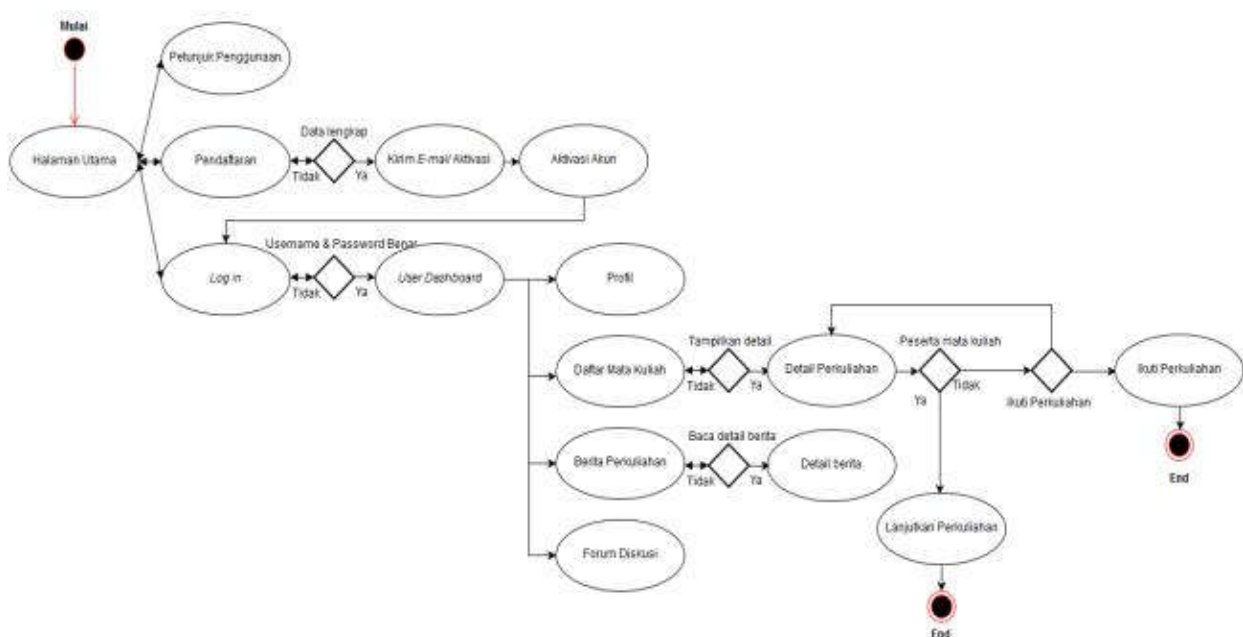
Picture 2. Scheme of MOOCS System

Based on the actors, the system features and functionalities are as follows:

1) **Participant/student**
   - New users need to sign up in so that his identity is registered as students,
   - Students who have been registered can log in and selects courses that will be followed or continue courses where the student has been enrolled,
   - Students can read messages/announcement from courses' instructors where the student enrolled,
   - Students can take quizzes / tests inside the courses,
   - Students can submit responses/questions to the learning material,
   - Students can follow the discussion forum available for each courses,
   - Students get badges for the courses that have been completed.

2) **Instructor**
   - Instructors can modify courses or create new course,
   - Instructors can create test/quiz for students,

- Instructors can view all students enrolled in the course,
- Instructors can submit courses related news/announcement to all students enrolled in the courses.

3) Administrator
- Administrator can manage the whole system, courses, instructors, and students.

The following use case diagram illustrates each actors' roles within the system:
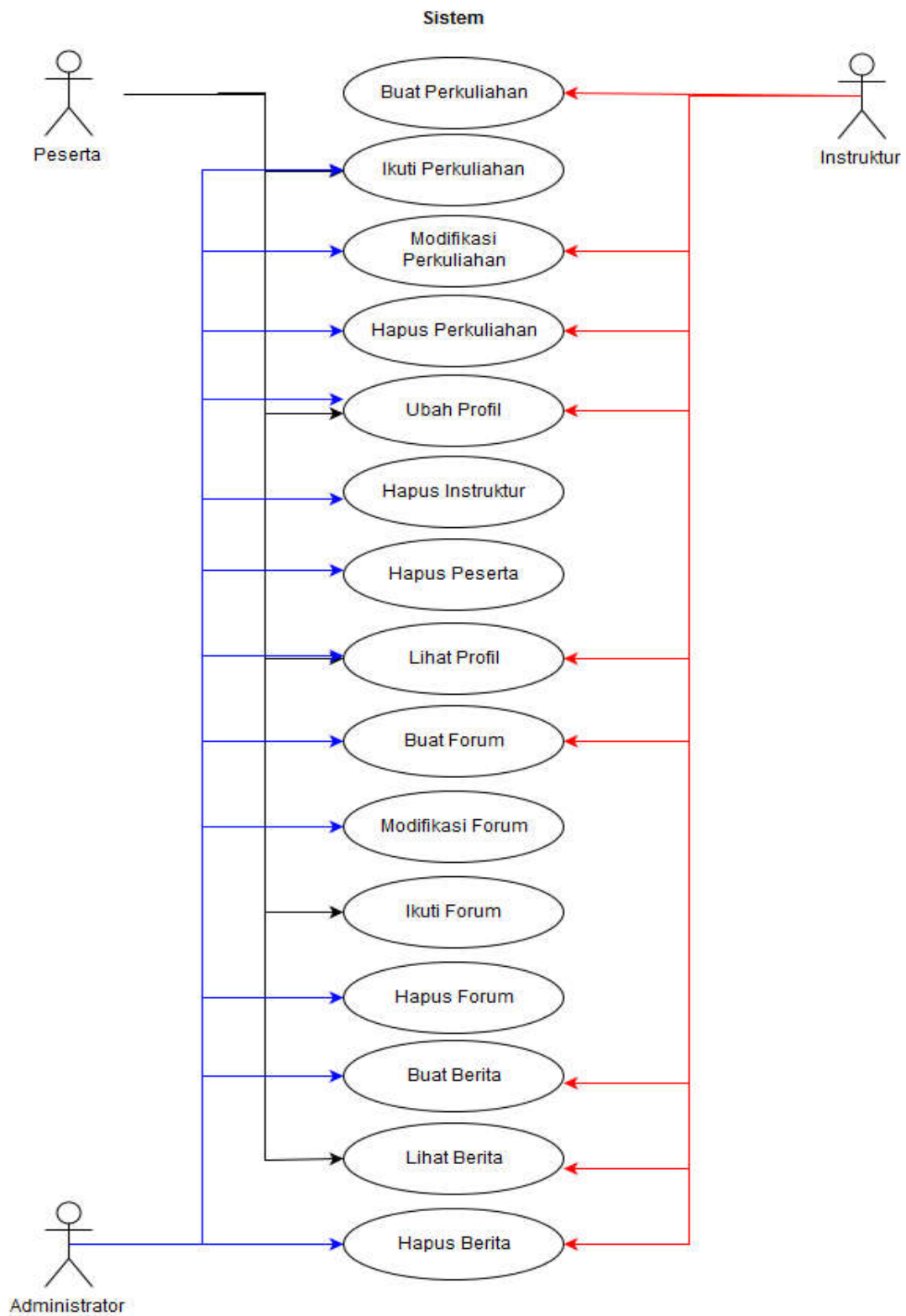
Picture 3. The use case diagram

3. The Implementation of Massive Open Online Courses E-learning System

After the system design already developed, then it is implemented into web application software through programming. This system is implemented with Wordpress content management system. Wordpress is a web based content management system with open source licenses where the source code is free to be seen, studied, developed, and redistributed on certain terms and conditions. It makes the development team easier to developed features needed. The feature that developed in the form of plugin and theme. The development in the form of plugin and theme is intended in order the massive open online courses e-learning system can be easily and flexibly installed another different system if needed.

This web based application needs hosting server and domain name in order to be accessed through internet connection. The domain and web hosting specification for this system is as follows:

- Domain name: www.indoversity.com
- Storage capacity: 10 GB

- Bandwidth transfer: unmetered (for Indonesia network access)
- Web server: Apache 2.4.17 (unix)
- PHP version: 5.5.30
- Database: MySQL 5.5-community
- Operating system: Linux

After the application installed in the hosting server and can be accessed through internet connection, the validation stage is performed. This validation performed by instructional media expert from Indonesia University of Education. From the validation sheet result, the total score for all aspects of the media is 52%. This means, the massive open online courses e-learning system developed is suitable to be tested after several revisions.

Validation score of each aspects
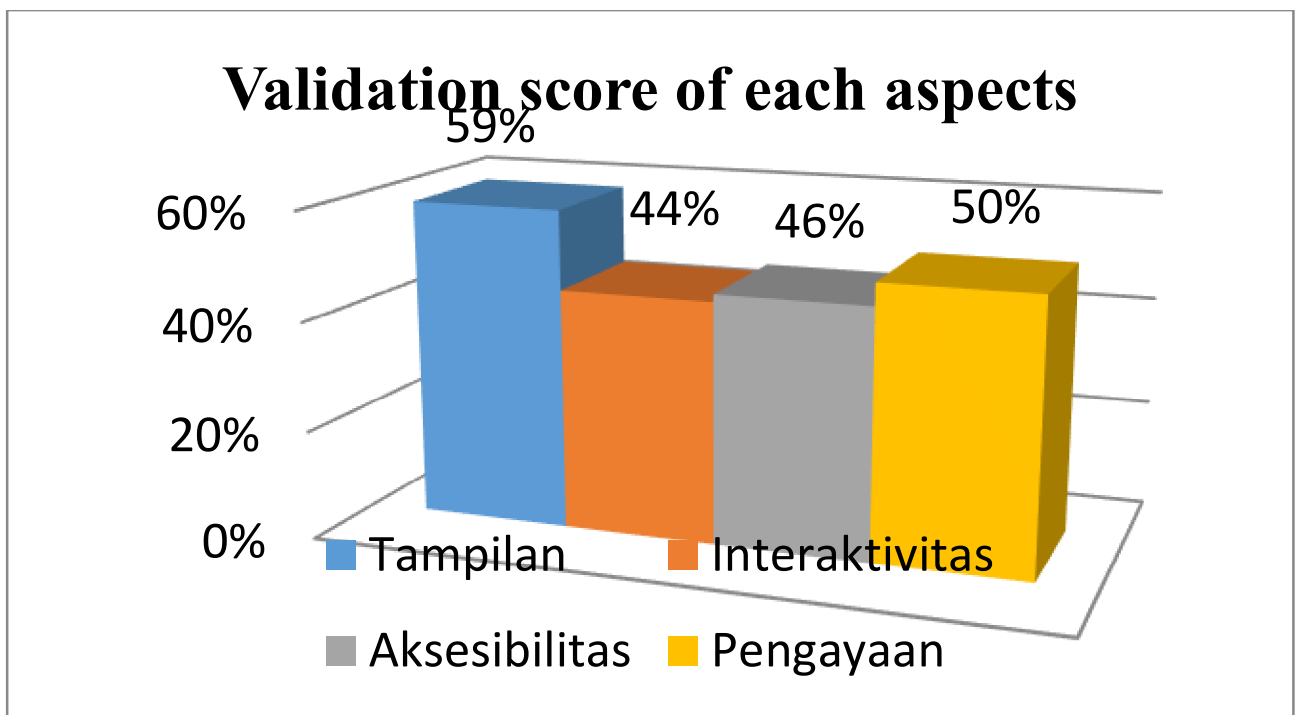
Picture 4. Validation score

The total score for the display aspect is 59%. According to validator, the media developed uses good color, fonts, language, layout, banner, and logo. The use of pictures and graphics are also considered as good. However, the use of video, categorization, and link are considered adequate.

The total score for the interactivity aspect is 44%. The availability of discussion forum considered as positive point in the media, while the video interactivity and collaboration in the learning process are considered adequate.

The total score for the accessibility aspect is 46%. Validator considers that the use of domain name is easy to remember, the website is enable to be accessed for every time and by everyone. However, validator considers that the access for the entire web site, log in process to the system, and quiz delivery is adequate. Validator also stated that the video buffering and site loading process is adequate.

The total score for the enrichment aspect is 50%. Validator considers that the massive open online courses e-learning system developed contains the knowledge that suitable with competence unit for

higher education, with language that easy to understood. However, the assignment and exercises given not really suitable with the higher education competence unit.

Validator suggests to provide license or certificate after the student completed each course for next improvement. It is intended to make students more committed in the learning process. Validator also suggests to provide more tutorial content, and for the display aspect, recommend to revise several color combinations.

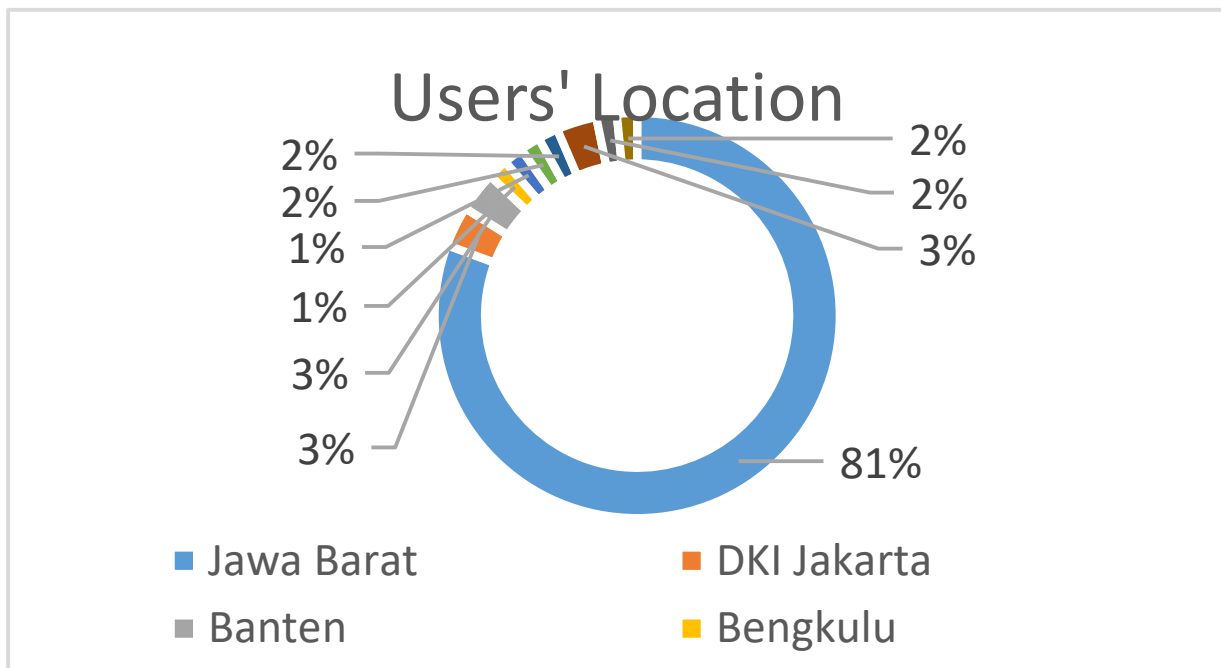3. Massive Open Online Courses E-learning System's User Analysis

The users' profile analysis is performed to test the system ability to provide solution for the equitable access to higher education in Indonesia. The indicators that analyzed are users' location, gender, latest educational background, and occupation.

a. Massive Open Online Courses E-learning System's Location

According to users profile analysis that registered in the massive open online courses e-learning system developed, the result shows that 81% of users are from West Java. Users from Jakarta, Banten, and South Sulawesi each is 3%.

Users from Bengkulu, South Sumatera, East Kalimantan, and South Kalimantan are 2%. Users from Bali and Yogyakarta each is 1%. The data shows that the system developed is already reach at least 10 from 34 provinces in the West and Central Indonesia, even the majority is concentrated in West Java. The main reason for this result is because of limited time, budget, and human resources available to do socialization in another area, especially to the area with higher education enrollment rate that is considered low. Alternatively, the researchers perform socialization just via social media sites, so that the majority of users is just people that can be reached via the social media sites.

The following chart is the data visualization for the users' location.

Users' Location

2%
2%
1%
1%
3%
3%

2%
2%
3%

81%

- Jawa Barat
- Banten

- DKI Jakarta
- Bengkulu

Picture 5. Users' location

b. The Massive Open Online Courses E-learning System's Users' Gender

According to users profile analysis that registered in the massive open online courses e-learning system developed, the result shows that 39% of users are men, while 61% of users are women.

The data visualization for users' gender is as follow.
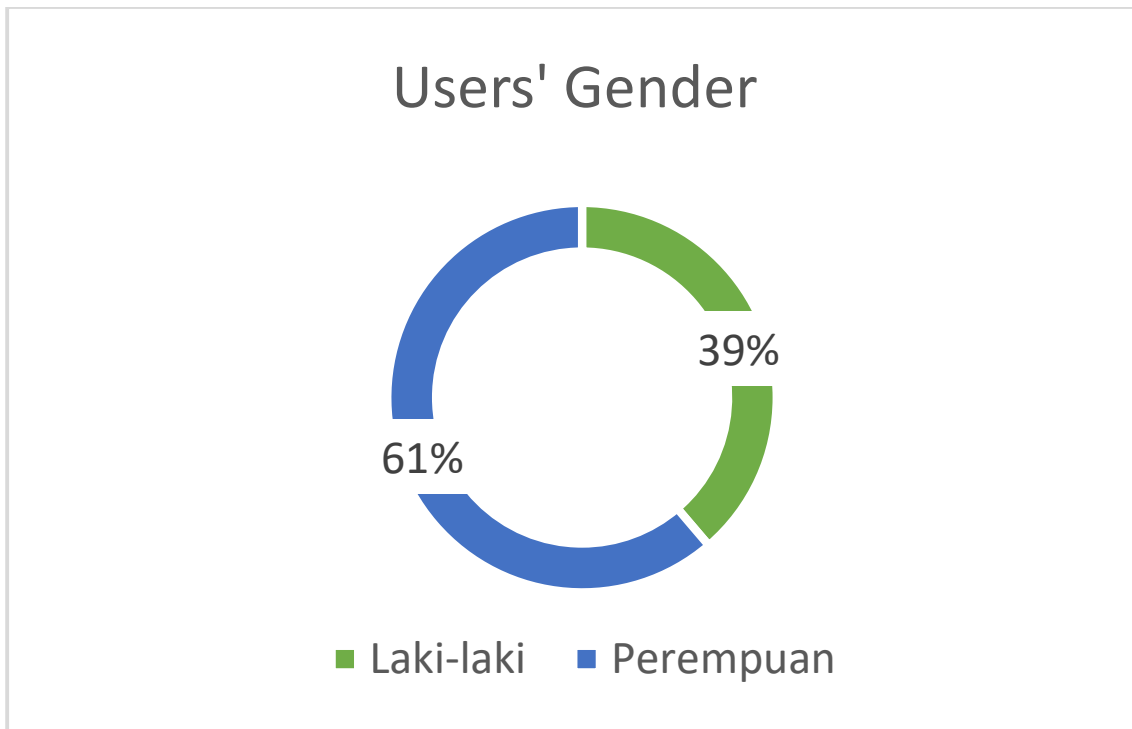
Picture 6. Users' gender

The data above shows that majority of users are female. This result shows that the massive open online courses e-learning system developed can attract women participations to access educational resources and information. OECD (2011) states that in many developing countries, girls still have poorer educational attainments, therefore gender equality in education will not only promote greater equality in employment, but also help postpone early marriages, reduce infant mortality rates, and improve health and education for future education (OECD, 2011).

c. The Massive Open Online Courses E-learning System's Users' Educational Background

According to the registered users' profile analysis, the result obtained shows that 52% of users have finished Vocational High School level/equivalent, 38% of users have finished Senior High School/equivalent, and 8% of users have finished Undergraduate level, and 2% of users have finished diploma level.

The pie diagram below is visualization of users' educational background.
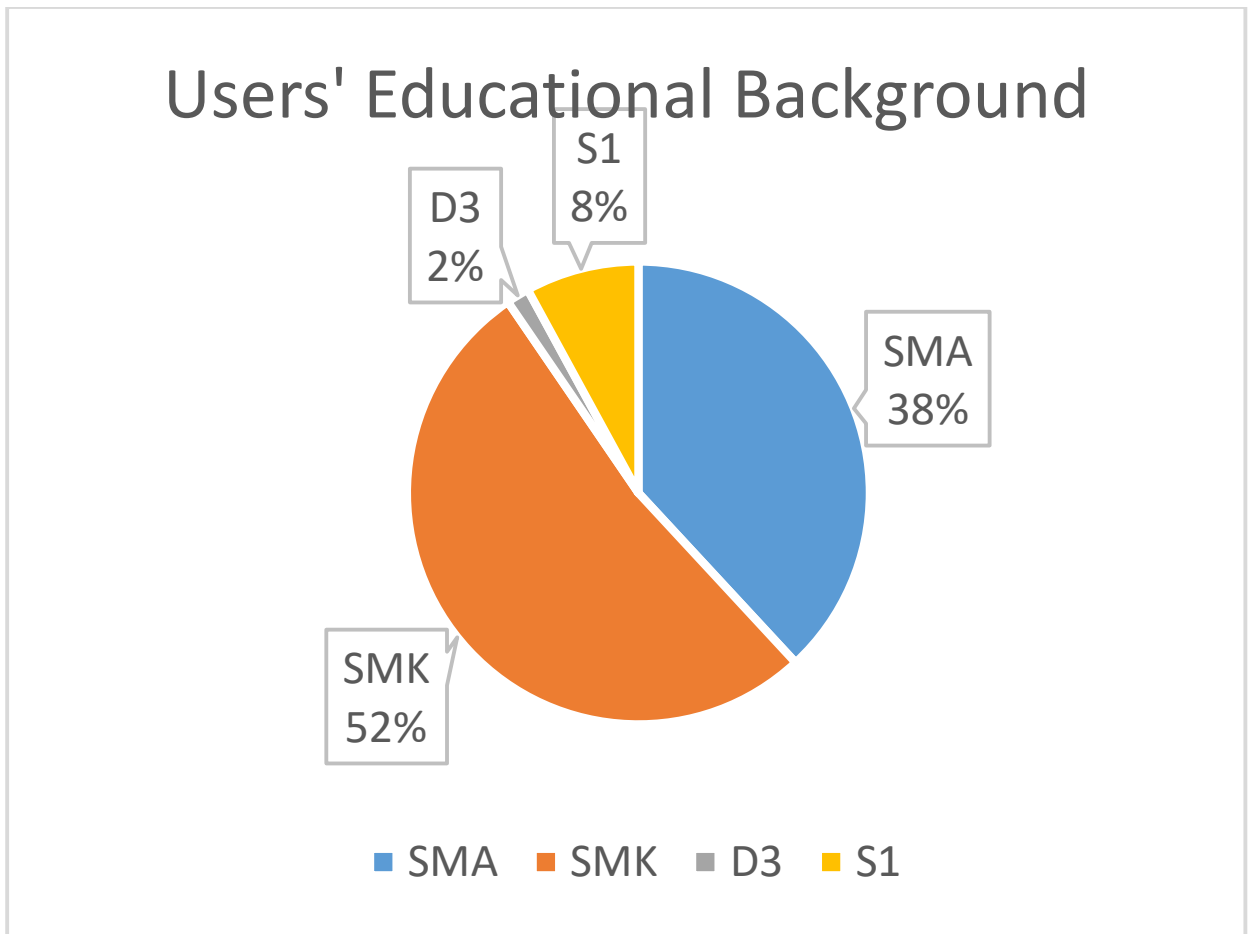
Picture 7. Users' Educational Background

The high numbers of users that have finished Vocational High School and Senior High School level are consistent with the data that stated by Central Agency of Statistic (Badan Pusat Statistik, 2013), that majority of internet users have finished the Senior High School and Vocational High School/equivalent (37,15%). Users in this category is the main target users of the massive open online courses e-learning system developed.
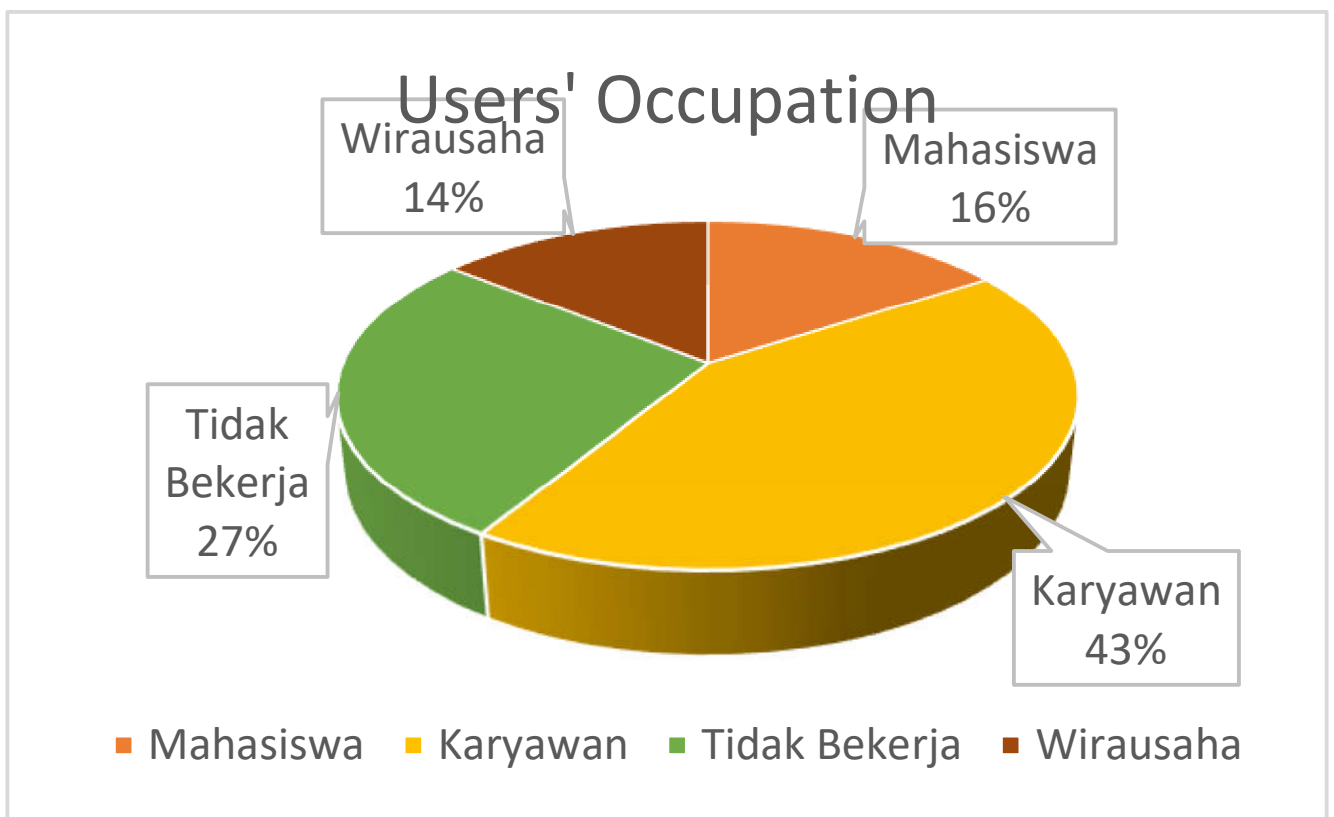
d. The Massive Open Online Courses E-learning System's Users' Occupation

Based on the analysis of user profiles that is registered in the massive open online courses e-learning system developed obtains data that 44% of users work as employees, 30% of users are housewives, 13% of users are entrepreneur, 4% are college students, while 5% of users are in another professions.

Here is the data visualization of users' occupation.

Picture 8. Users Occupation

As revealed by the National Development Planning Agency (BAPPENAS, 2014), access to higher education in Indonesia has not been evenly and equally distributed, with the financial barriers as the main reason. Economic problems make people prefer to work and fulfill their economic needs than continuing their education to higher level. The high

Users' Occupation

Wirausaha 14%

Mahasiswa 16%

Tidak Bekerja 27%

Karyawan 43%

■ Mahasiswa   ■ Karyawan   ■ Tidak Bekerja   ■ Wirausaha

level of users who work as employees also indicate opportunities and interests of users that have been already work to try another new things and continue their studies through this massive open online courses developed.

D. Conclusion and Suggestion

1. Conclusion

According to the result and discussion that have been described, it can be concluded as follows:

1. Design of the massive open online courses e-learning system for equitable access to higher education that developed has following features: a) content in Bahasa Indonesia that easy to understand by users with various cultural and gender background; b) the application interface is responsive and accessible from different devices; c) the use of video content with short duration for easy buffering and loading process; d) the use of interactive multimedia content for meaningful learning; e) the use of social learning principles through the availability of discussion forum feature; f) the use of gamification principle through badges feature for participant with certain achievements; g) the provision of free contents; h) partnership with leading universities to ensure learning materials/contents quality.

2. The implementation of massive open online courses e-learning system for equitable access

to higher education is performed with several phases: a) implementation the system design into application program; b) uploading and installing the application to the hosting server so that the system can be accessed through internet access.

3. The users' profiles in the trial phase of the massive open online courses e-learning system shows that the massive open online courses e-learning system developed is potential to provide access to higher education with several indicators, such as gender equality, the majority of users have finished vocational and senior high school/equivalent, and majority of users work as employees. However, from the geographical aspect, the analysis of the users shows that users is still concentrated in Java.

2. Suggestions

According to the research and development results that have been described, suggestions that can be formulated are as follows:

1. To ensure that the massive open online courses e-learning system has its effect to the improvement of access to higher education, it

needs more time available and more specific sample in certain area.

2. It needs content development through partnership with higher education institutions with various field of expertise, to attract more users with various interests.

3. Perception of users is an important aspect in development and implementation of every learning component in open and distance learning, it needs advanced researches that measure participants' perception towards the use of this massive open online courses e-learning system.

3. Follow Up

Follow ups that will be performed after this research and development of massive open online courses e-learning system are as follows:

1. Proposing partnership with higher education institutions to develop learning contents based on curriculum of the institutions, so that the quality of contents/learning materials is guaranteed.

2. Conducting further researches on participants' learning activities within the massive open online courses e-learning system developed.

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