Development of Android Aplication for Online Training using Blended Learning System (Case Study of LPIK ITB)

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Abstract— Blended learning is a learning system that combines offline learning with e-learning, in order to maintain two-way communications between the teacher and their students resulting in a more maximum outcome. LPIK ITB is an institution which focuses on innovation and entrepreneurship development in purpose of building a development culture for the country. One of LPIK ITB program is an incubation program which is an accompaniment program for start-up to develop further. The online training application is used to help said accompaniment program to become more maximized using blended-learning system which supported by direct messaging features that makes two-way communications during learning session possible. The application was examined using the black box testing with a value of 100 which means the application can function properly according to the scenario and testing with the mean opinion score (MOS) method with a test result of 3.87 which means it is included in the Enough group.

Keywords— *blended learning, lpik itb, retrofit, firebase, android*

I. INTRODUCTION

Variations in learning methods that continue to develop following technological advances make the choice to learn not only following conventional systems such as face-to-face but also other variations that use technology as a medium. The process of using ICT as a learning system is usually called electronic learning or e-learning [1]. There are many definitions related to e-learning itself, but in general e-learning means an educational system or concept that utilizes information technology in the teaching and learning process [2].

The main weakness in the e-learning system actually lies in the lack of intensity of meetings between students and teachers [3]. This results in a lack of understanding of the existing material and also an interest in learning. The advantages of face-to-face learning here are important things that are not owned by e-learning systems. The general solution to this problem is to combine e-learning systems with direct communication so as to increase the number of meetings between students and teachers [4]. The system is known as blended learning where this system is a combination of face-to-face learning with e-learning. [1]. Technically, the face-to-face learning system can be done online or offline, while offline it can be done as usual in the classroom, while the online system can be done using applications that already exist or are provided such as Google Meet, Zoom, and other applications. other [5].

Lembangan Pengembangan Inovasi dan Kewirausahaan (LPIK) developed by Institut Teknologi Bandung (ITB) is an institution that focuses on developing innovation and entrepreneurship with the aim of building a culture of development for the progress of the nation [6]. Until 2019, LPIK ITB had 125 start-ups incubated. LPIK has a 2 to 2.5 year incubation program and offers several services for start-ups, namely funding, mentoring, and special assistance in making legalities such as patent registration and IPR. In its development, LPIK ITB has a website that functions as an intermediary media between LPIK ITB and other stakeholders [6]. However, the information displayed on the website is still limited to news and information about events at LPIK, not yet providing learning facilities and two-way communication in real time to strengthen mentoring services from LPIK ITB itself.

This application was created to run on the Android operating system, which is one of the most widely used operating systems today [7]. The programming language used is the Java programming language and using MySQL and Firebase Realtime Database for database management.

With this application, it is hoped that this application can maximize mentoring services at LPIK ITB with the blended learning method by using message features and forums for communication with mentors and other start-ups. This application also continues to provide the same information contained on the website so that this application can be useful for start-up incubation of LPIK ITB and the general public.

II. DESIGN AND IMPLEMENTATION

A. Application Design

In the design of this application using Unified Modeling Language (UML) diagram which consists of use case diagram. In addition, in this plan also explains about the use of databases. As a basis of application design Figure 2 shows how the system architecture of this application.
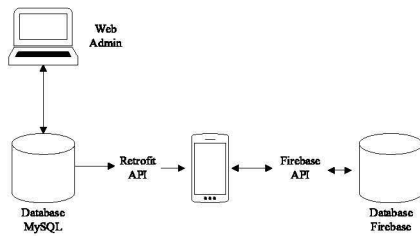
Fig 1. System Architecture

Figure 2 describes how the application can run from an existing database. The web admin will be useful for editing MySQL databases that will appear in the application via the Retrofit API. Databases in MySQL are useful for News, Tenant, and Module databases. Meanwhile, the Firebase database that will be used in this application is Firebase Authentication for managing accounts and Firebase Realtime Database for chat features in the application.

1) Actor Identification

Actor Identification describes the tasks of actors in the application as well as the web admin. The identification of actors is shown in Table 1.

TABLE 1. ACTOR IDENTIFICATION

No.	Name	Description
1.	Admin	Have access to the entire system and can also enter news data, delete, or edit news, tenant, and data in the web admin.
2.	Mentor	Mentor are material providers in the LPIK ITB application. Having a role to be able to enter video and text in the web admin can also be in direct contact with incubation participants through social features in the application.
3.	Incubation Participants	Incubation participants have access to be able to view video content and modules provided by mentors and also have direct contact with mentors in the application.
4.	Visitor	Visitors can only read news and tenant lists provided in the application.

2) Use Case Diagram

The Use Case Diagram contains details of access rights and what each actor can do in the web admin or application. Figure 3 describes the Use Case Diagram for designing this application.
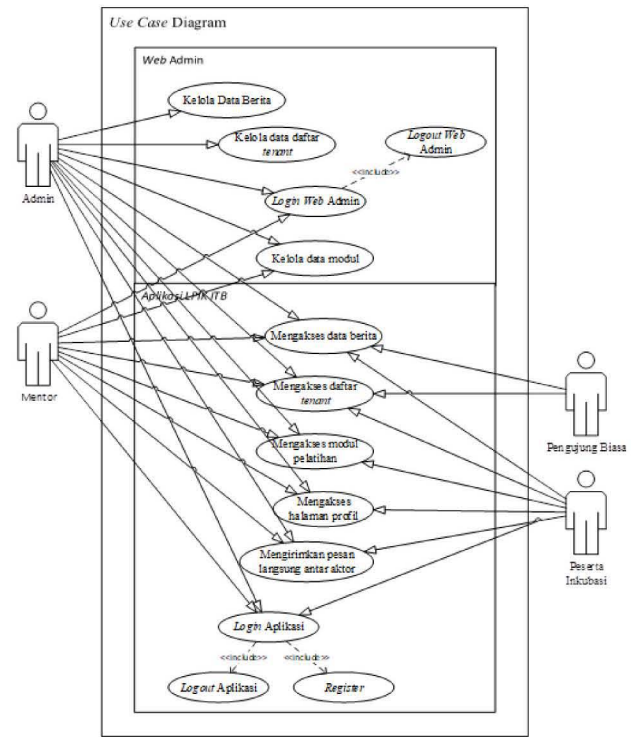

Fig 2. Use Case Diagram

3) Database Design

In making this application using two databases, namely SQL and NoSQL. SQL database created through MySQL with JSON format output, in this database serves to accommodate news data, tenant list data, and module data. Meanwhile, the NoSQL database was created using the Firebase Realtime Database, which functions to accommodate registration and account login data, as well as to exchange messages when sending direct messages.

a) News Database (MySQL)

TABLE 2. NEWS DATABASE

No.	Atribut	Type of Data	Null	Index	Description
1.	id	Int(11)	No	(PK)	Data sequence
2.	foto	Varchar(100)	No	-	Name of photo
3.	judul_berita	Varhar(255)	No	-	Title news data
4.	tanggal_posting	Text	No	-	Post date data
5.	isi_berita	Text	No	-	News data
6.	penulis	Varchar(100)	No	-	Author data

b) Tenant Database (MySQL)

TABLE 3. TENANT DATABASE

No.	Atribut	Type of Data	Null	Index	Description
1.	id	Int(11)	No	(PK)	Data sequence

2.	foto	Varchar(100)	No	-	Name of Photo
3.	nama	Varhar(200)	No	-	Tenant name
4.	owner	Varchar(100)	No	-	Owner/CEO from tenant data
5.	alamat	Varchar(200)	No	-	Tenant adress data
6.	telepon	Varchar(100)	No	-	Tenant phone number data
7.	isi	Text	No	-	Tenant description

c) Modul Database (MySQL)

TABLE 4. MODUL DATABASE

No.	Atribut	Type of Data	Null	Index	Description
1.	id	Int(11)	No	(PK)	Data sequence
2.	thumbnail	Varchar(100)	No	-	Name of thumbnail photo
3.	judul	Varhar(150)	No	-	Modul title data
4.	tanggal	Text	No	-	Post date data
5.	isi	Text	No	-	Modul data
6.	url_youtube	Text	No	-	Youtube URL data
7.	penulis	Varchar(100)	No	-	Author name data

d) Users Database (Firebase)

TABLE 5. USERS DATABASE

No.	Nodes Name	Description
1.	Id User	Primary key
2.	email	Email data from registration
3.	nama_lengkap	Full name data from registration
4.	no_hp	Phone number data from registration

e) Messages Database (Firebase)

TABLE 6. MESSAGES DATABASE

No.	Nama nodes	Keterangan
1.	Id User	Id User of receiver messages, primary key
2.	message	Messages data
3.	messageFrom	Id User of sender messages
4.	messageId	Messages id
5.	messageTime	Sending messages time
6.	messageType	Sending messages type

4) Implementation

After planning the design of the UML and also the interface design, then the implementation is carried out in the form of code generation so that the application can actually be used. In this study, it is divided into 2 applications, namely web admin applications and android applications..

a) Web Admin Design

In Web Admin, it can be used by admin actors as well as mentor actors, where each actor has certain rights which are described in actor identification. Figure 3 shows the Web Admin view.
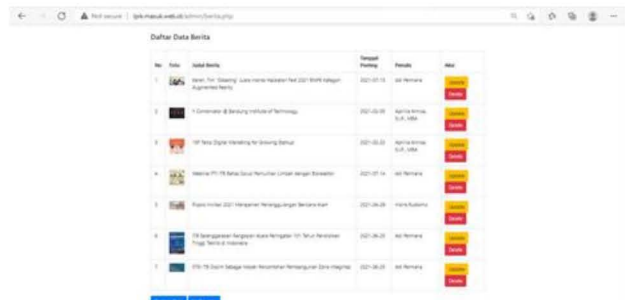

Fig 3. Web Admin Preview

There are several features in editing data in the web admin, namely update, delete, and create. All of these features will later affect the data displayed in the application.

b) Android Application Design

In the Android application there are several features that can be accessed according to the rights of the actor. Incubation participants can access all the features in the application, namely news features, module features, tenant features, and social features. Meanwhile, ordinary visitors only get access rights to open news features and tenant features. Figure 4 is a display of the LPIK ITB application
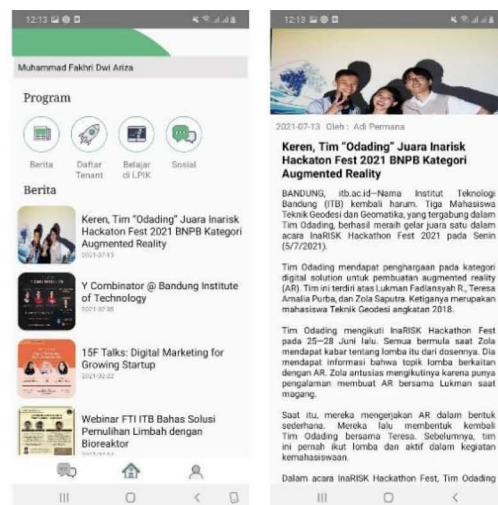

Fig 4. Application Preview

The blended learning system used in this application uses a module feature where incubation participants can watch video modules uploaded by mentors and also a chat feature that can connect incubation participants and mentors from within the application. Figure 5 is a display of the chat feature.
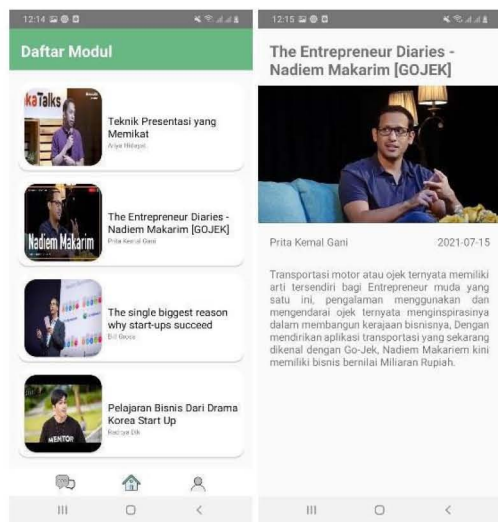

Fig 5. Modul Preview

Figure 6 is a social and chat feature that can be used to connect directly with mentors.
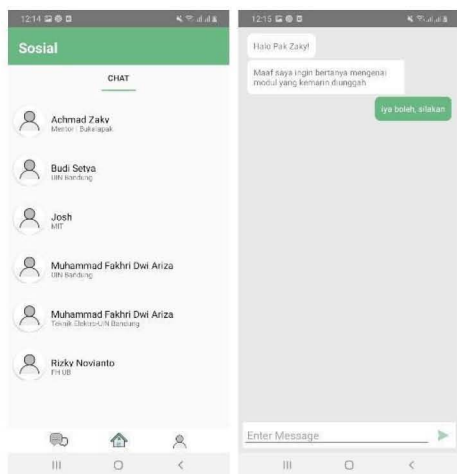

Fig 6. Sosial menu preview

III. TESTING AND ANALYSIS

The test is carried out using the black box testing system and the mean opinion score (MOS) testing method. In black box testing, it focuses more on testing functionality in the entire system in the application and web admin. This method is used to determine whether the application can run correctly or not according to the scenario given to the system. Meanwhile, for MOS, it aims to determine the usability and quality of the application on the user's side, this test is carried out by distributing questionnaires to administrators in the LPIK ITB environment. This method is used to determine whether the application can run correctly or not according to the scenario given to the system..

A. Black Box Testing Analysis

In testing using this black box testing system there is a scenario that describes the test class, test details, and also the type of test. Each test item that gets an accepted result is given a value of 100, which means that if all test items are accepted, the black box testing test will be worth 100.

TABLE 7. BLACK BOX TESTING

Kelas Uji	Butiran Uji	Hasil
Web admin login	Admin login checking	[x] Accepted [ ] Rejected
	Mentor login checking	[x] Accepted [ ] Rejected
Data Management	News data submit	[x] Accepted [ ] Rejected
	Tenant data submit	[x] Accepted [ ] Rejected
	Modul data submit	[x] Accepted [ ] Rejected
Application Login	Checking registered account	[x] Accepted [ ] Rejected
Application Register	Regsiter account	[x] Accepted [ ] Rejected
Show data testing	Show news data testing	[x] Accepted [ ] Rejected
	Show tenant data testing	[x] Accepted [ ] Rejected
	Show modul data testing	[x] Accepted [ ] Rejected
Show profil data testing	Show profil data testing	[x] Accepted [ ] Rejected
Direct messages testing	Send messages testing	[x] Accepted [ ] Rejected
	Receive messages testing	[x] Accepted [ ] Rejected

Based on the tests that have been carried out, the expected results are in accordance with the observations that occur in the application and web admin. If there is an error in data entry in the news, tenant, or module data input, a warning will be displayed which is also as expected when the system is running. Therefore, from testing the functionality with the black box testing system, it can be stated that all functions of the application and web admin can run smoothly in various scenarios with a value of 100.

B. Testing using Mean Opinion Score Method

Testing using the MOS method is done by filling out a questionnaire with several questions related to the application in several aspects, namely usability, ease of use, ease of learning the application, and satisfaction. The purpose of this test is to determine the quality of the application from the user's point of view [8]. Respondents from this test were 10 people from the management of LPIK ITB. The questionnaire is filled with the condition that all respondents have downloaded and run the application. The value filled in by the respondent is in the range of 5 (Strongly Agree) to 1 (Strongly Disagree) where 5 is the highest number. There are 14 statements submitted to the respondents. The results of the test using the MOS method are in Table 8.

TABLE 8. MOS TESTING

Statements	SS(5)	S(4)	KS(3)	TS(2)	STS(1)	Mean
1	3	6	1	0	0	4,2
2	2	7	1	0	0	4,1
3	1	6	3	0	0	3,8
4	1	8	0	1	0	3,9
5	2	6	1	0	1	3,8
6	1	6	3	0	0	3,8
7	3	3	4	0	0	3,9
8	3	3	4	0	0	3,9
9	0	6	4	0	0	3,6
10	3	6	1	0	0	4,2
11	2	3	5	0	0	3,7
12	1	4	4	1	0	3,5
13	1	6	2	1	0	3,7
14	3	6	1	0	0	4,2
MOS						3.87

Based on this value, it is then entered into the MOS parameter referred to in Table 9.

TABLE 9. MOS PARAMETER

MOS	Group
5	Very Good
4	Well
3	Enough
2	Bad
1	Poor

The results shown in table 8 state that the result of MOS is 3.87 and states that the result is Enough.

IV. CONCLUSION

The conclusions from the research that has been carried out on research on the Development of Android Aplication for Online Training using Blended Learning System are:

1. Development of Android Aplication for Online Training using Blended Learning System can be used for the development of the incubation program at LPIK ITB..
2. Tests carried out using the black box testing functionality test system produced test results with a value of 100, which means that all functions in the application can run correctly according to the scenarios that occur in the existing system..
3. The test was carried out using the mean opinion score (MOS) method which was carried out by distributing questionnaires filled out by 10 respondents from the LPIK ITB management stating the MOS result was 3.87 and included in the Enough group, which means this application is considered quite useful for use at LPIK ITB.

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