PENA TEKNIK
JURNAL ILMIAH ILMU - ILMU TEKNIK

Vol. 7, No.1, Maret 2022
p-ISSN 2502-8952
e-ISSN 2623-2197
https://ojs.unanda.ac.id/index.php/jiit/index

Implementation of Flutter-based Learning Management System (LMS) at Universitas Andi Djemma Palopo

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Keywords: Learning Management System, LMS, Flutter, Firebase, Android.

Abstract

Learning Management System (LMS) is a tool that is essential to redound an interaction between instructor and the learners and considering the technology headway nowadays (gadget). Therefore, research has been made to develop an LMS application for mobile devices in Universitas Andi Djemma Palopo, especially in the informatics engineering department using the Flutter framework. The method used for this research is R&D which stands for Research and Development with ADDIE Development Model, Analysis, Design, Development, Implementation, and Evaluation. The result of this research is known: 1) This application (LMS) made using the Flutter framework and Firebase database simplifies the development process; 2) This application was made for the informatics engineering department, Universitas Andi Djemma Palopo. This mobile app has several useful features, including making a class, class discussion, making subjects, assignments, and attendance; 3) The LMS implementation uses a questionnaire based on usability and has been obtained with an eligibility percentage of 83.03%. The app has been declared as very feasible based on the eligibility percentage.

1. INTRODUCTION

Since 1945, the national education curriculum has changed in history, namely in 1947, 1952, 1964, 1968, 1975, 1984, 1994, 2004, and the 2006 curriculum. All national curricula are designed based on the same foundation, namely Pancasila and the Constitution. 1945, the difference is in the main emphasis of the goals of education and the approach to realizing it. The curriculum changes are, of course, accompanied by different educational purposes because, in each of these changes, there is a certain goal to be achieved to advance our national education (Wirianto, 2014).

In line with these developments, information technology has also developed at a very high speed, changing society's paradigm in seeking and obtaining information, which is no longer limited to newspaper, audio-visual, and electronic information but also information technology. Other sources of information, one of which is through the Internet (Elyas, 2018), especially smartphone devices, and especially in education, are used as a learning medium. Learning Media, in general, are teaching and learning process tools (Mutia et al., 2019).

Education is a process of communication from educators to students that contain educational information, which has elements of educators as sources of information, media as a means of presenting ideas and educational materials, and students themselves. Some aspects of This approach get a touch of information technology media, thus sparking the birth of the concept of e-learning (Utomo, 2001).

E-learning is a teaching and learning tool that uses electronic circuits (LAN, WAN, or internet) to deliver learning content, interaction, or guidance (Koran, 2001). E-learning certainly refers to internet technology to provide a series of solutions that can improve knowledge and skills (Rosenberg, 2003). The term "e" or the abbreviation of electronics in e-learning is used for all technologies used to support teaching efforts through internet electronic technology. (Purbo and Hartanto, 2002). E-learning itself is a method in general, and of course, it has many implementations in different devices or conditions, one of which is the Learning Management System or LMS. These devices are very useful considering that humans are currently in the

Coronavirus Disease (Covid-19) pandemic. The Ministry of Education and Culture (Kemendikbud) has asked all universities to provide learning facilities during the Covid-19 emergency at the university level. Helping the government and the community to learn from home, work from home, and carry out social restrictions to break the chain of the spread of Covid-19 (Wijaya et al., 2020).

Based on regulations issued by the local government, Universitas Andi Djemma Palopo itself has also implemented social restrictions in the teaching and learning process, so lecturers and students must use electronic learning media available on the internet. However, learning platforms tend not to have full features following the needs of lecturers in general at Universitas Andi Djemma Palopo. They had an internal LMS that has added value in increasing university credibility. Based on that, e-learning management (LMS) is needed to meet the needs of teaching staff and students at Universitas Andi Djemma Palopo.

2. METHOD

2.1 Research Procedure

The method used in this research uses the ADDIE development model popularized by Robert Maribe Branch, a development research model consisting of five stages: Analysis, Design, Development, Implementation, and Evaluating (Branch, 2009). The description of each step is (Sugiyono, 2013):

a. Analysis
In analyzing, researchers need two things: problems and needs. Problems obtained from the data collection results will then produce requirements, and these needs will later become the basis for making the system. Data collection will be carried out through literature studies, interviews, and observations to obtain the necessary information. Of course, the information is used as a reference used in subsequent stages.

b. Design
After getting the information needs, the next stage is making a prototype or the application design process, which will be displayed in the form of black lines and writing on a white background and will later resemble the appearance of a smartphone application.

c. Development
Development is the core stage of making the system or application itself. It can be called the realization process of the design results that have been made or is commonly referred to as coding. Coding is done to produce a program or application in the form of a solution to existing problems and the requested needs. The IDE used is Visual Studio Code, Flutter as a development framework, and Firebase Services as a DBMS.

d. Implementation
Implementation is the stage where the application that has been built will be used directly by the user according to the original function or purpose, but only for limited trials.

e. Evaluating
The evaluation stage is the process of correcting the shortcomings of the application made after being tested. Because the trials are limited, the improvements made are also minor.

2.2 Data Analysis

Data analysis conducted results from a questionnaire where each question has its weight. Of course, the questions refer to the usability context of the e-learning application or in the sense that the test is carried out with a usability format questionnaire. Testing the questionnaire with usability format using descriptive analysis data techniques with the following calculations:

$$Eligibility\ Percentage = \frac{Score\ Obtained}{Maximum\ Score} \times 100\% \qquad (1)$$

After getting the score data from the test results, the percentage is calculated using the formula. After that, the results rate is converted into a statement according to the following interval percentage table (Sudaryono, 2015).

Table 1. Interval Percentage

No.	Percentage	Criteria
1	0% - 25%	Extremely not feasible
2	26% - 50%	Not feasible
3	51% - 75%	Feasible
4	76% - 100%	Very feasible

3. RESULT AND DISCUSSION

3.1 Analysis

After interviewing several sources, the conclusions drawn from these activities are: 1) The learning management system in Informatics Engineering Department at Universitas Andi Djemma Palopo uses several online platforms provided on the internet, which means it does not yet have a learning platform. 2) The platforms used also tend not to have some of the desired features; for example, attendance is done on different applications, or other platforms are only asynchronous, so they must use another platform again. 3) The device chosen to conduct online learning is a smartphone because it is easier to use and is mobile. Therefore, creating a learning platform that can back up several features in one application/platform is necessary.

The observation phase was carried out at the research site to observe how the conventional (face-to-face) learning process took place and online learning. During this pandemic, education tends to be done online to reduce the risk of spreading the virus so that conventional learning processes are rarely carried out anymore. However, learning procedures must comply with health protocols. In online learning, the platforms often used are Google Classroom, Zoom, Zoho (attendance), Microsoft Teams, and other media that can obtain on the internet for free or paid.

3.2 Design

A system overview in the form of a use case diagram is made from this stage, which will be developed later (Figure 1). The activity diagram will be described per user, namely lecturers and students (Figure 2) and (Figure 3). At the endpoint of the activity diagram of lecturers and students, there is a "melakukan kegiatan pembelajaran" activity, and the intended actions are illustrated in the generalization of the use case (Figure 1).

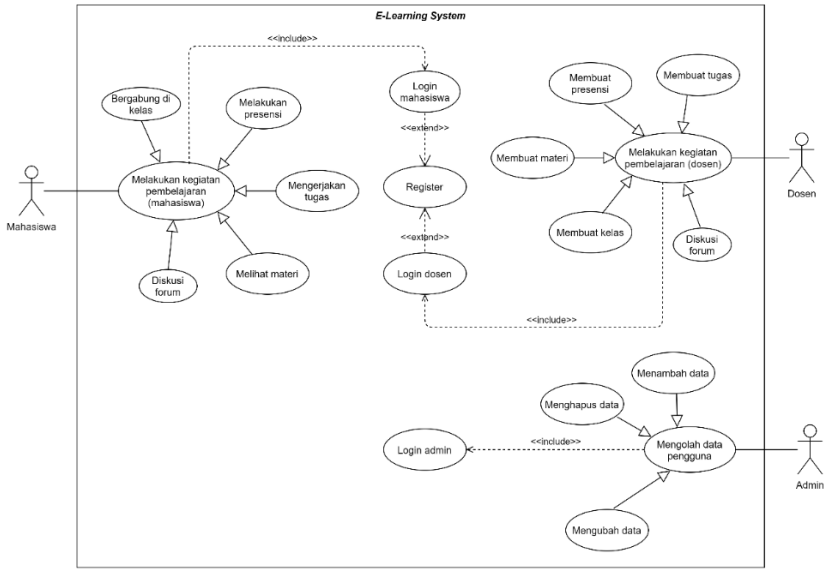


Figure 1. *Use case Diagram LMS*

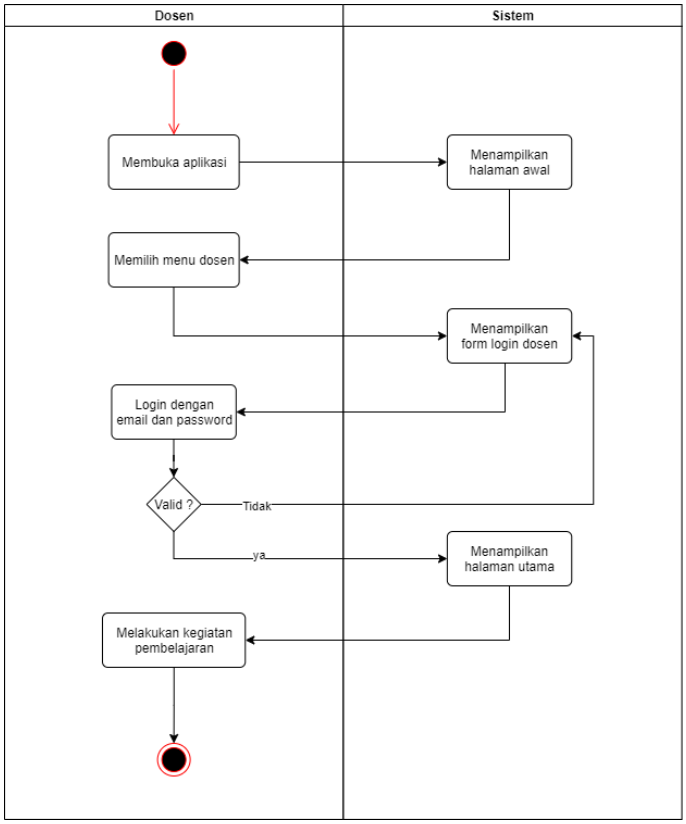


Figure 2. Lecturers' Diagram Activity

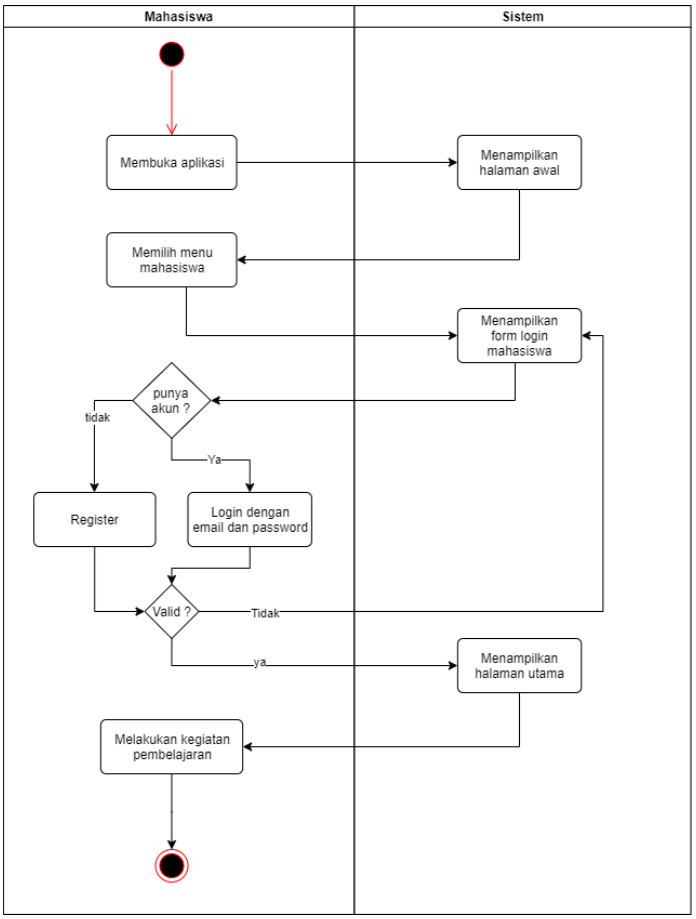


Figure 3. Students' activity diagram

After finding problems from interviews and observations and describing solutions to problems using use case diagrams and activity diagrams. Then the initial design of the system display will be made, which can be seen in the following figure:



Figure 4. Splash screen

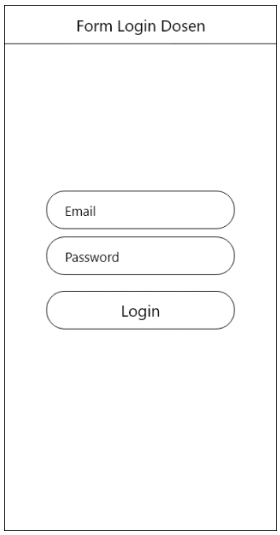


Figure 5. Lecturers' login form

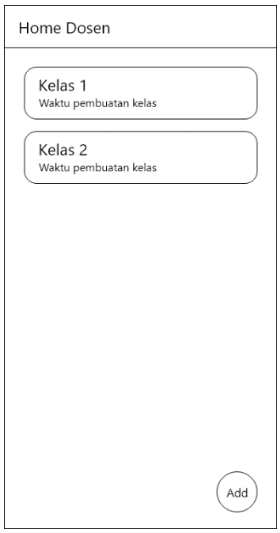


Figure 6. Lecturers' Home screen

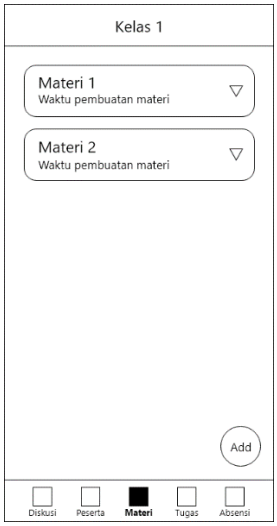


Figure 7. Class details tabs (lecturers)

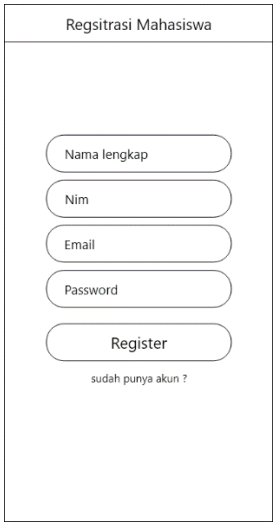


Figure 8. Students' registration form



Figure 9. Class discussion tabs

3.3 Development

The system is developed using Flutter, an open-source SDK or framework developed by Google to create applications that can run on Android and iOS operating systems (Dian, 2018). Using Flutter is fairly easy to create user interfaces because Flutter uses the concept of widgets to create text, forms, and buttons. A widget is needed for each component; here are the results of the realization of the design phase using the Flutter:

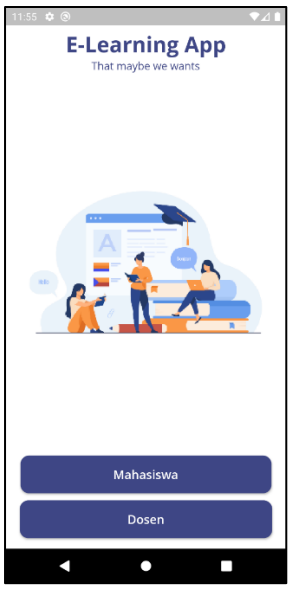


Figure 10. Initial view

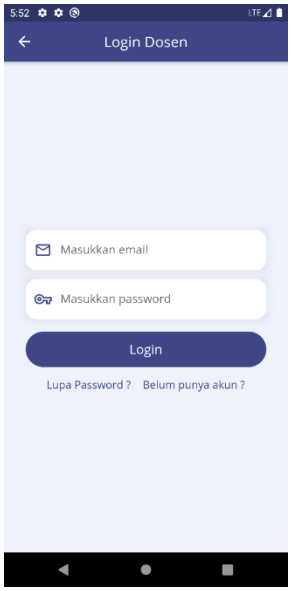


Figure 11. Lecturers' login form



Figure 12. Lecturers' Home screen

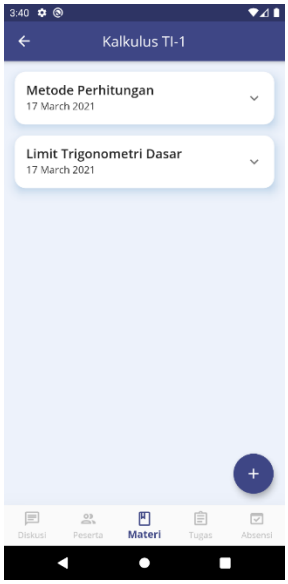


Figure 13. Lecturers' class detail

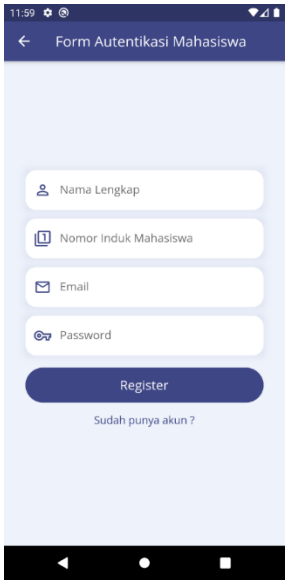


Figure 14. Students' registration form

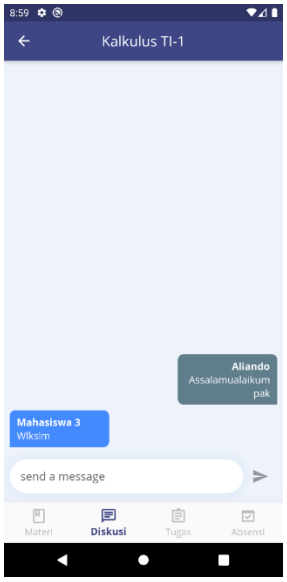


Figure 15. Class discussion

The database system used as data storage for the application is Firebase. Firebase is a platform for real-time applications. When the data changes, the application connected to Firebase (website or mobile app) will update it directly (Sanad et al., 2018). Firebase has a complete library for most web and mobile platforms and can be combined with other frameworks such as node, java, javascript, and others (Dinesh, 2017). The services used in Firebase are:

a. Authentication

Authentication is used to store credential data by users who log into the application. This service is equipped with complete methods to simplify the development process, especially in the back-end. The methods used in this application are login, register, and forget the password.

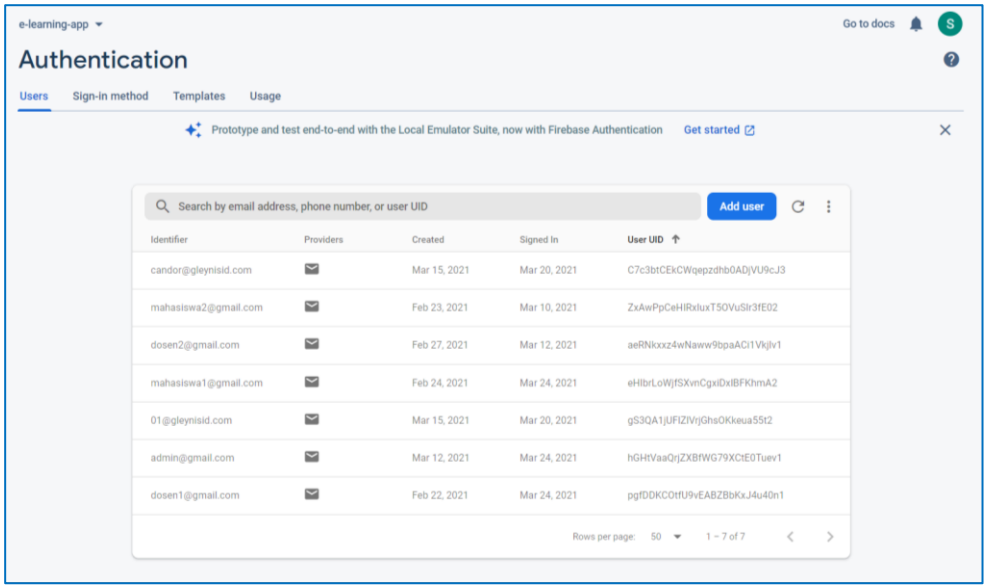


Figure 16. Firebase Authentication

b. Firestore

Cloud Firestore is a flexible and scalable database for mobile, web, and server development (Firebase, 2018). Firestore is used to store data in text or information that is later displayed in the application later in real-time. The user does not need to refresh/reload the application to get the latest data, which is one of the advantages of Firebase Firestore.

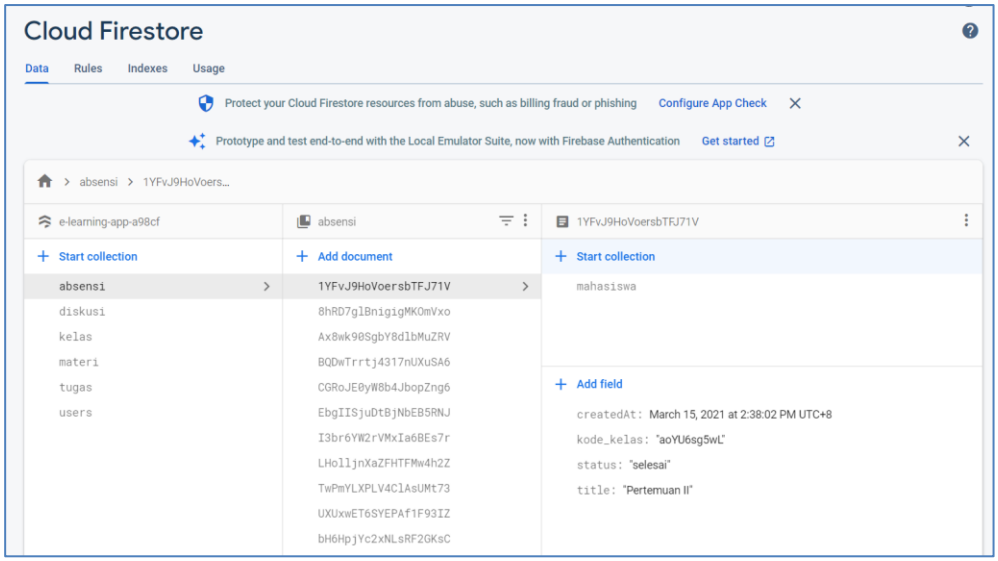


Figure 17. Firebase Firestore

c. Storage

Storage is used to store files that have been uploaded into the application in the form of snapshots of attendance signatures, lecturer material files, and student assignments. The data is stored in a bucket (directory) in storage named according to the class's class code created by the lecturer.

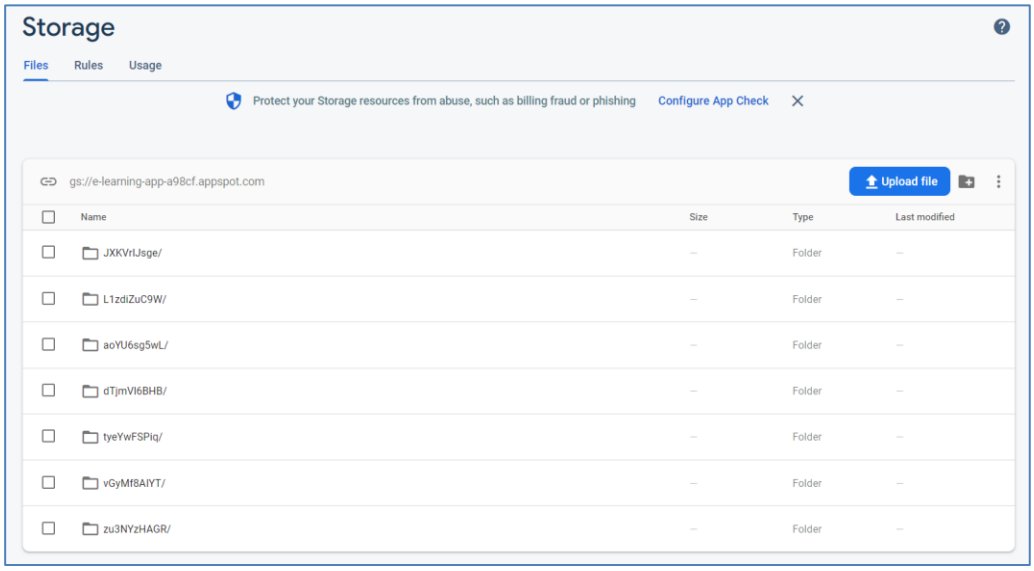


Figure 18. Firebase Storage

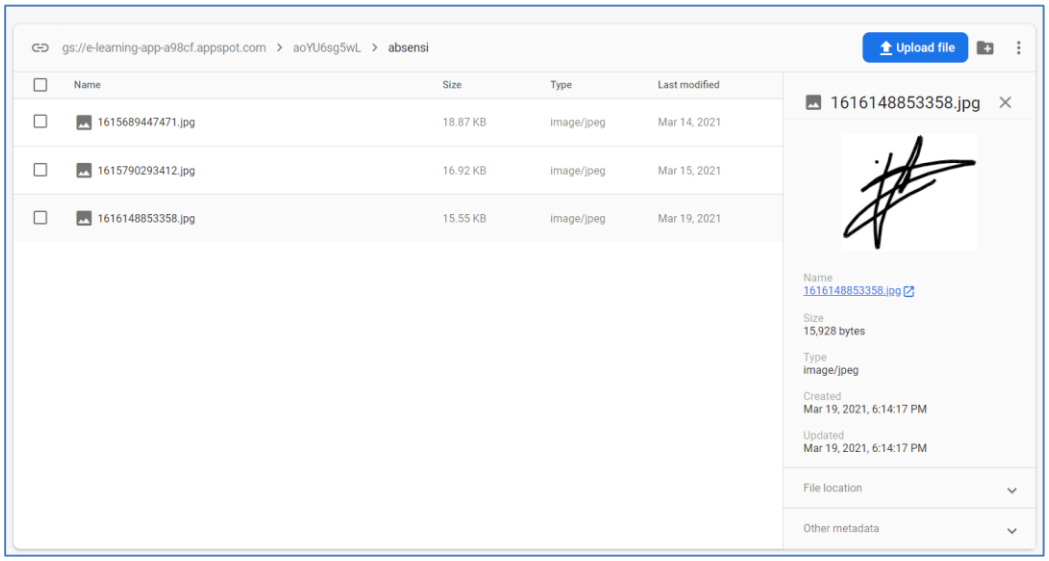


Figure 19. Firebase Storage Bucket

3.4 Implementation

The implementation/testing was carried out on a limited basis due to the COVID-19 pandemic to minimize virus spreads. In this testing, one user was selected as a lecturer to log in according to his role, and the rest became students who would join the class created by the lecturer. Students then carry out learning activities using the features provided in the LMS application.

3.5 Evaluation

The evaluation stage uses the formula described before. The results of the tabulation scores from the questionnaire data are in the following table:

Table 2. Questionnaire data tabulation

Responden	*Usefullness*						*Easy to Use*								*Easy to Learn*				*Satisfaction*						Skor yang didaptkan	Skor maksimal
	p1	p2	p3	p4	p5	p6	p7	p8	p9	p10	p11	p12	p13	p14	p15	p16	p17	p18	p19	p20	p21	p22	p23	p24		
1	3	3	4	4	4	4	3	3	3	4	3	3	3	3	3	3	3	4	4	4	3	4	4	4	83	96
2	3	3	3	3	3	4	4	4	4	3	3	3	4	4	4	3	3	3	3	2	3	3	3	3	78	96
3	3	3	4	4	3	3	3	3	4	3	3	3	3	3	3	3	3	3	4	4	3	3	3	3	77	96
4	4	4	4	4	4	3	3	3	4	3	3	4	4	4	4	3	4	3	3	4	4	4	3	4	87	96
5	3	3	4	3	3	3	3	3	2	2	3	3	3	2	3	3	4	4	2	3	2	3	3	3	70	96
6	3	3	4	3	4	4	3	3	3	3	3	4	4	4	4	4	4	4	4	4	3	4	4	3	86	96
7	4	3	4	3	4	4	3	3	3	4	2	3	2	4	3	3	3	2	4	4	4	4	4	4	81	96
8	3	2	4	4	3	3	3	4	3	3	3	4	4	4	3	4	4	4	3	4	4	3	4	4	84	96
9	4	3	3	3	3	3	3	3	3	3	4	4	4	4	3	4	3	3	4	4	3	3	4	4	82	96
10	3	3	4	3	3	4	3	3	4	4	3	3	3	4	3	3	3	3	3	3	3	4	3	4	79	96
11	4	3	3	3	3	3	3	3	2	4	2	3	3	4	3	3	4	3	3	4	3	3	4	3	76	96
12	3	3	3	3	3	3	3	3	3	3	3	3	3	4	3	4	3	2	3	3	3	3	3	3	73	96
13	3	4	3	4	2	2	3	3	4	4	3	4	4	3	4	3	4	3	3	4	4	4	3	3	81	96
14	4	4	4	3	3	3	4	3	3	4	3	3	2	3	4	4	3	3	3	2	3	3	4	4	79	96
Total																									1116	1344

$$Eligibility\ Percentage = \frac{1116}{1344} \times 100\%$$

$$= 83.03\%$$

From these calculations, according to the interval percentage table, the LMS application is categorized at a very feasible percentage with a percentage score of 83.03%.

4. CONCLUSION

Based on the results and discussions that have been carried out. The LMS development process using the flutter framework, which is implemented in the Informatics Engineering Study Program, Universitas Andi Djemma Palopo, it can be concluded that: 1) The Learning Management System built has three core users, namely lecturers, students, and admins. Each user has features capable of conducting online learning, including creating/viewing materials, assignments, attendance, and discussing in a class forum; 2) The combination of the Flutter Framework and Firebase Database is beneficial in developing this application because the services provided by both Flutter and Firebase are complete and according to needs; 3) The data obtained from the questionnaires have been analyzed and resulted in a eligibility percentage level reaching 83.03%, which means that this e-learning application is suitable for use on a particular scale and has stable performance.

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