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Cross Platform Flexible Online Learning

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Abstract: Education can be obtained by anyone, anywhere, and anytime without any difference in treatment.However,ineducationalinstitutions, students are required to study following thecurriculum that has been compiled and limited by time.By utilizing technologies such as apps, people can learn or search for information freelywithout being restricted.Flexone applicationgives users the freedom tolearn through discussions, classes, and consultations.This application was developed using*the Flutter framework*.Using this framework,it will make the applicationlookmore attractive. Theapplication performsthe same as the nativeapplication, and with only one codebase, it canrun the application on *Android* and *IOS* platforms. This Flex one application can help students ask questionsthat have not beenunderstood independently.*Experts* who open classes and consultations willalso be helped because they get additional income from it. That way, Flex one can be used as an alternative to learn or find information about a material.Hasil trialsof 20 users and 5 experts showed that 44% stronglyagreedand 40% agreed to the answers obtained as asked.In thesecondtrial, 48%stronglyagreed, and 40% agreed toease of learning.In thethirdtrial, 40% of experts strongly agreed, and 20%agreed that with this application, the expert earned additional income from consulting or classes.

Keywords: Learning, Discussion, Flexible Learnings, Flutter.

I. INTRODUCTION

In this digital erawhere technology is developing very rapidly, humans are facilitated in carrying out all daily activities.Everythingcan be done or searched through the internet. Many applications are developed on mobile platforms to do many things.The application can be used to help in various fields, one of which is thefield of education.

Education can be obtained by anyone, anywhere, and anytime without any difference in treatment. In fact, in educational institutes, students are required to study according to the curriculum that has been compiled and limited by time. However, please note that each person's level of understanding differs. Some people can absorb knowledge quickly, while others need more time to understand the material. Therefore, when receiving an education at an educational institution, students are required to ask questions if they feel they still lack understanding of the material the teacher has taught. Unfortunately, many students often hesitate to ask questions when they still do not understand the material being taught. These things can be caused by various factors, such as a lack of self-confidence, there is a feeling of fear that it will hinder the class due to limited time available, and it may also be due to fear of asking the teacher.

Because of this problem, the "Flexone" application was created tohelp students ask questionsaboutmaterials that have not been understood by anyone, anywhere, and at any time so that the material can be understood independently. With this application, it is hoped that anyone can ask questions and experts can share some of their knowledge by answering all the questions asked without feeling shame or fear. That way, people can better understand and understand the previously poorly understood material without restrictions on place, time, and curriculum.

Flexible learning in the classroom could help to advance learning in classroom. The study by [1] used the interview approach. The student provides the researcher with information regarding the flexible learning environment in the classroom. The study's final finding is that classroom flexibility helps to enhance quality education.

The study's mainobjectivesare toobtain answers from other users to answer thequestionsasked, provideflexible learning methods, provide media experts to earn additional income, and find the best answer.You can getanswers from other users and thebestanswers through the discussion feature. Users can learn flexiblythrough discussions, consultations, classes, and rooms. Experts get additional income from users who jointhe expert's consultationsand classes.

This article consists of five parts. The first part discusses the introduction and background. The second

part describes the literaturereview, andthe third is the methodology.

The fourth part describes theresults and discussion, and the last partdiscussesthe conclusions.

II. BIBLIOGRAPHY REVIEW

In this section, we will explain some of the basic theories that support the creation of the Flex one application.

A. Flexible Learning

Flexible learning Is learning that focuses on providing learners with additional options, convenience, and personalization to suit the learner. In particular, *flexible* learning provides learners with choices about where, when, and how learning occurs. These learning methods may occur over the internet, such as virtual learning *environments*, *chat rooms*, and remotely available content [1].

This learning method provides learners with complete control over their learning. Students can determine and allocate time to study. This control allows learners to coordinate education and ensures that learners learn at the best time.

B. Mobile Device Programming

Mobile Device Programming is programming that focuses on mobile platforms [2]. Mobile is a device that is easy to carry everywhere, such as cell phones, smart phones, tablets, etcetera. Popular mobile operating systems are *Google's Android*, *Apple's iOS*, and Microsoft's *Windows Mobile*.

C. Cross Platform Framework

Frameworks are frameworks used to make application development easier. A framework can also be interpreted as a collection of scripts (especially classes and functions) that can help developers deal with various programming problems, such as connections to databases, invoking variables, files, etcetera, so that developers are more focused and faster at building applications [3].

Flutter is an open framework created by Google to build good, natively compiled mobile and multi-platform applications from a single codebase alone [4]. Many Flutter packages have been created. Pub is a package manager for the Dart programming language, containing reusable libraries and packages for Flutter, AngularDart, and the Dart program [5].

D. Firebase

Firebase is a service from Google to make it easier and even easier for application developers to develop their applications. Using fire base, developers can focus on developing applications without putting much effort into back end matters.

E. Node js

Node js is a run time environment for Java Script that is open-source and cross-platform. With Node js, Java Script code can be run anywhere, not just limited to the browser environment. Node js itself is executed as a server application. In addition, node js runs the V8 JavaScript engine outside the browser .This allows Node js to have high performance.

F. OOP (Object Oriented Programming)

Object-oriented programming is a method for creating programs using classes and objects.OOP makes development and maintenance easier. OOP provides several concepts, such as in heritance, data binding, polymorphism, encapsulation, and others.

G. NoSQL databases

NoSQL databases are nonrelational databases and use key-value pair shortening types. No SQL databases are purpose-built for specific data models and have flexible schemas. This type of database is optimized specifically for applications that require large volumes of data, low latency, and flexible data models [6].

H. DBMS (Database Management System)

DBMS is a software system that allows database users to maintain, control, and access data practically and efficiently. This DBMS becomes the layer that connects the database with application programs to ensure

that the database remains consistently organized and easily accessible [7]. DBMS applications include My SQL, Postgre SQL, Maria DB, Microsoft SQL Server, Mongo DB, and others.

I. API (Application Programming Interface)

An Application Programming Interface or API is an interface that connects one application with another. APIs are used as a tool to communicate with developers using various types of programming languages. Developers do not need to provide their own data but simply retrieve data and information through APIs.

J. Web Service

Web service is a method of data exchange, regardless of where a database is embedded, created in what language an application consumes data, and on what platform data is consumed [8]. Web services use APIs, but not all types of APIs use web services.As a result, web services can support interoperability so that the web service can become a bridgebetween various existing systems.

K. Cloud Computing

Cloud computing is a computing model where resources such as processors, storage, networks, and software become abstract and are provided as internet services using remote access patterns [9]. On-demand availabilityas needed, easy to control, and nearly limitless scalability are some of the critical attributes of cloud computing. Examples of cloud computing are Google Cloud, AWS (Amazon Web Services), Firebase, and others.

III. RESEARCH METHODOLOGY

A. Application Development Methods

The method used in creating this application is thewaterfall method. Development is carried out starting from planning the design of the application creation, planning the design and flow of algorithms, writing code, testing programs, and product releases, then finally fixing if errors or bugs are found after the application is created. This method isused because it is suitable for small to medium-scale projects and does not require much cost or too large resources.

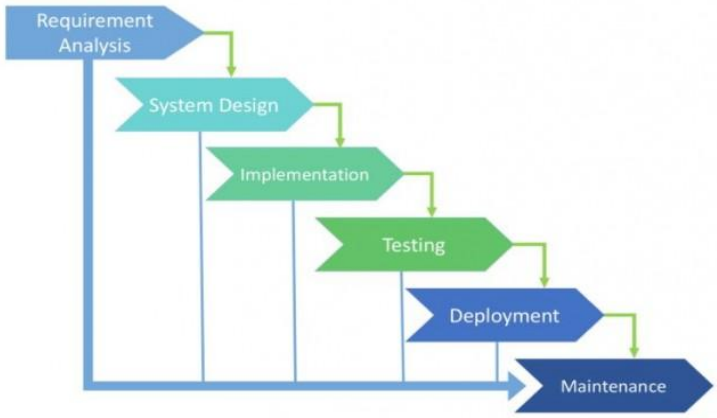

Figure 1 Waterfall Method

B. Problem Analysis

Problem analysis is carried out by conducting research on other similar applications.The applications takenas analysis material are Brainly and Dicoding.The discussion and points feature takes references from Brainly. Then for the class feature, reference is taken from Dicoding, where there are modules that can be learned in the class.

C. Needs Analysis

Need analysisis carried out to show the process flow, needs, and features contained inthe application. Thesteps needed are actor identification, data analysis, identification needs, and the creation of use case diagrams.

D. Design

After theneeds analysis is carried out, it is necessary to continue with the concept and system design. In this design process, architectural design, database design, DFD design, and interface design of the application are explained.

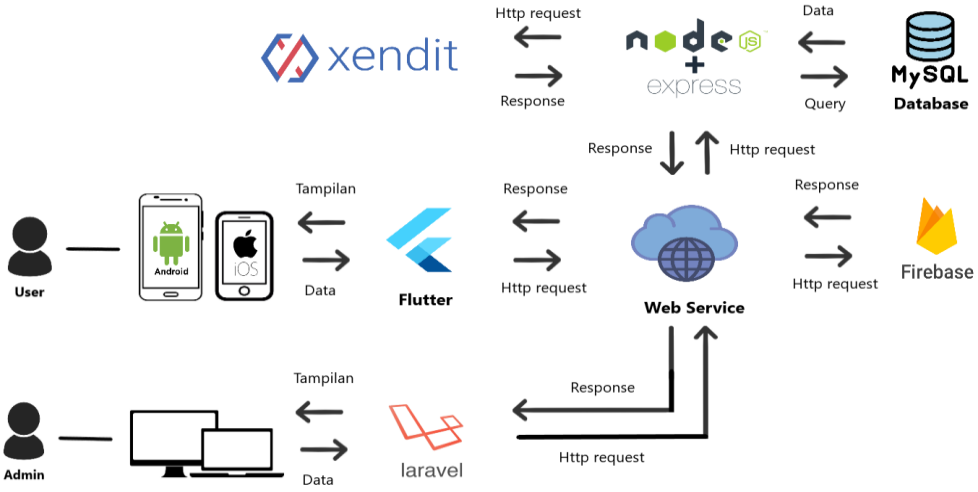

Figure 2 System Architecture

E. Implementation

Implementation is carried out by referring to the analysis and design of the system.The implementation uses several programming languages where Dart for mobile devices on the client side with Flutter framework and JavaScript for the server side with Node js and Express js framework. Then for thebackoffice, PHP with the Laravel framework is used.

F. Testing

Testing is carried out to find out whether the performance of the system is following the design results, where the test is carried out by the user with the black box testing method on the functionality of the application, while Developers do testing using the white box testing method.

IV. RESULTS AND DISCUSSION

In this section, we will discuss the features and trials of the application. The discussion of features will be divided into 2 parts, namely, the features owned by experts and the features owned by users.

A. Expert

The features that experts have, namely, open consultations, open classes, and withdraw balances.

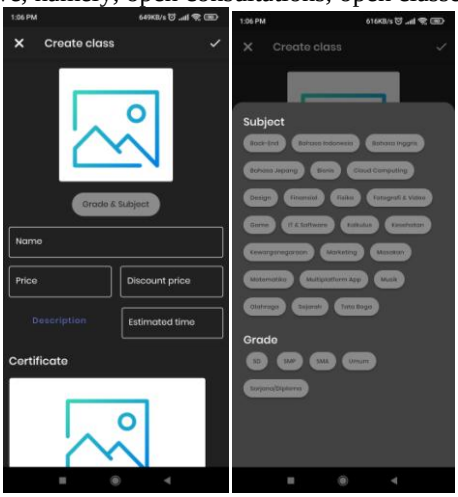

Figure 3 Buat Class Look

Figure 3 is the view to open the class. There are several inputs, namely class photos, subjects, levels, class names, prices, discounted prices, estimated completion, class descriptions, and certificates. For input, the price should not befilled because the class can be free.

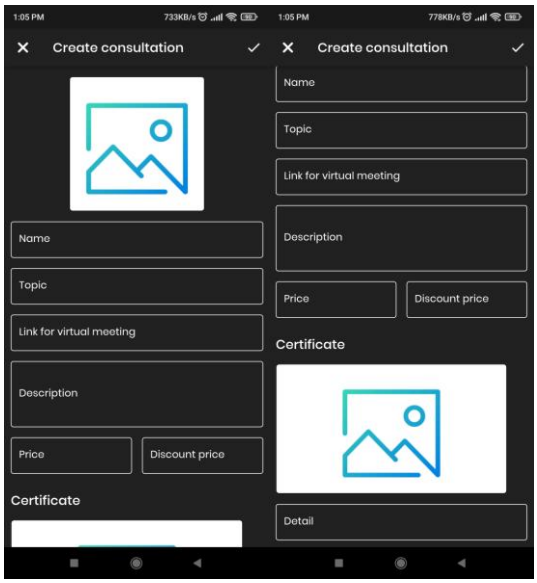

Figure 4 Create Consultation View

Figure 4 is the view for opening a consultation. There are several inputs, namely consultation photos, consultation names, topics, meeting links, descriptions, prices,discounted prices, and certificates.

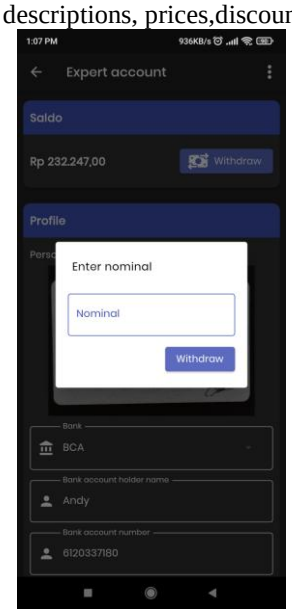

Figure 5 Balance Withdrawal Display

Figure 5 is a balance withdrawal where the expert can withdraw the balance obtained from classes and consultations. The minimum withdrawal is 10000. The withdrawn balance will be sent to the expert's account.

B. User

The features that users have, namely discussions, join consultations, and join classes. Discussions include questions, answers, and comments.

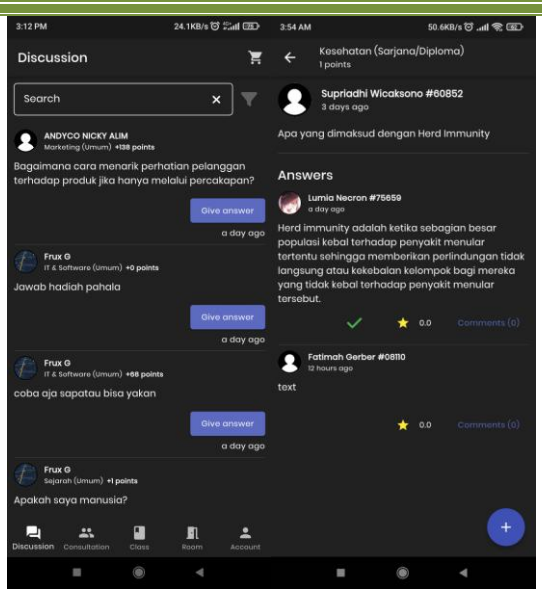

Figure 6 Discussion View

Figure 6 is a discussion view. In the left image, it displays themain page of the application. The main page is a discussion page that displays a list of questions from users. Then the figure on the left displays the details of the question, answers from other users, and buttons to provide answers.

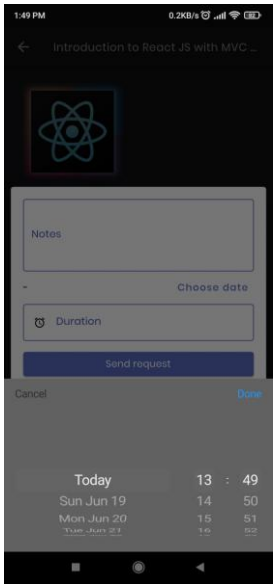

Figure 7 Join Consultation Display Page

Figure 7 shows a view of the consultation join request. There are input notes for the desired explanation, the consultation date, and the consultation's duration. If the consultation date collides with other consultation schedules owned by the expert, all schedules will collide.

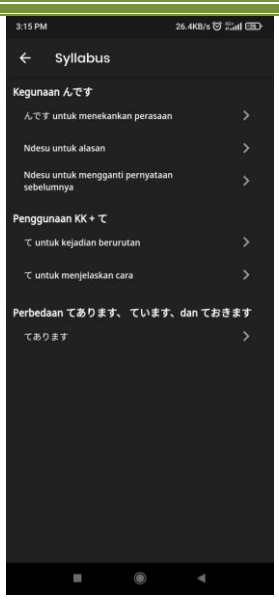

Figure 8 Class Syllabus Display

Figure 8 shows a view of the class syllabus. When the user has attended the class, the user can learn the syllabus in the class. The syllabus is divided intoseveralparts, and each section has several modules.

The trial was conducted on 25 people consisting of 20 ordinary users and 5 experts. The developer also conducted a test run with black box testing to make sure the functionality was running correctly. In addition, test runners are conducted to determine whether the application is working correctly and whether its features follow the original purpose. With this trial, it will be known the short comings of this application and these short comings will be further developed. Here are the results of the trials that have been carried out.

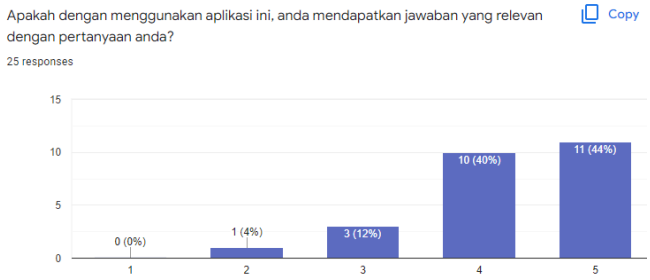

Figure 9 First Question

Figure 9 is a diagram of the question "Do you get an answer that is relevant to your question?" by using this application. Figure 7 is a representation of the answers collected through a questionnaire that has been distributed. There were a total of 24 people who filled out this questionnaire. A total of 11 people gave a value of 5 with apercentage of 44%, 10 people gave a value of 4with a percentage of 40%, 3 people gave a value of 3with a percentage of 12%, and 1 person gave a value of 2 with a percentage4%.

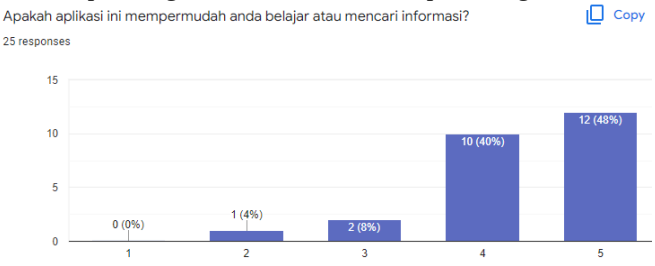

Figure 10 Second Question

Figure 10 is a diagram of the question, "Does this application make it easier for you to learn or find information?" A total of 12 people gave a score of 5 with a percentage of 48%, 10 people gave a value of 4 with a percentage of 4 0%, 2 people gave a value of 3 with a percentage of 8%, and 1 person gave a value of 2 with a percentage of 4%.

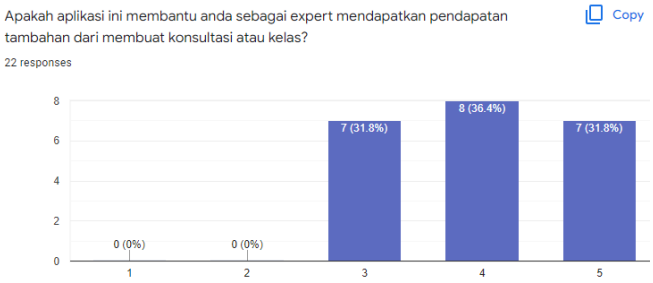

Figure 11 The Third Question

Figure 11 is a diagram of the question, "Does this application help you as an expert earn additional income from making consultations or classes?". There are a total of 22 people who answered this question. A total of 7 people gave a score of 5 with a percentage of 31.8%, 8 people gave a score of 4 witha percentage of 3 6.4%, and 7 people gave a score of 3 with a percentage of 31.8%.

Figure 12 Question Four

Figure 12 is a diagram of the question, "Is the application running properly?" A total of 2 3 people answered "yes" with a percentage of92%, 1 person answered "no" with a percentage of 4%, and 1 person answered "still needs minor improvement" with a percentage of 4%.

Figure 13 Question Five

Figure 13 is a diagram of the question, "Is this application worth developing in the future?" All respondents gave a "yes" answer.

Table 1 Device Test ResultsTable

Experiment	Expected Results	Result
Google sign-in	Successfully signed in with Google	Goes well
Dark Mode	The color of theapp themechanges according to the selected mode	Goes well
Change Language	The language of the application changes according to the selected language	Goes well
List View	Components in the list display wellatdifferent resolutions	Goes well
Text Editor	The content of the text editor appears according tothe	Goes well

	customizations made	
Chat	Chats are displayed in real time	Goes well
Loading	Loading successfullyappears and lazy loading is successfully displayed when discroll continuously	Goes well
Payment	Successfully redirected to the payment link	Goes well

Table 1 is a table of the results of application testingcarried out by developers with black box testing on the Xiaomi Mi 9T Pro device with the Android 10 version and the iPhone 7 with the iOS 12 version.

V. CONCLUSION

This section will discuss theconclusions and suggestions taken during thecreation of this study. The conclusions reached are as follows.

- Discussions, classes, and consultations are essential features oftheFlexone app. 48% strongly agree, and 40% agree that the Flexone application makes learning and finding information easier. So it can be concludedthat this application can be used as a medium for people to learn independently.
- Through discussion, 44%stronglyagreed, and 40% agreed to get an answer that was in accordance with what was asked.
- A total of 31.8% strongly agreed, and 36.4% agreed that thisapplication helps experts to earn additional income from consultations or classes.
- Flutter as a framework makes it easier tomake this application because of thehot reload feature, which hasthe same performanceas nativeperformance and many packages that can be used.

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