# APPLICATION USING ANDROID-BASED FIREBASE AND JETPACK SERVICES FOR THESIS GUIDANCE

[1*] **I Putu Gede Abdi Sudiatmika**, [2]**Komang Hari Santhi Dewi**
[3]**A.A. Raka Jayaningsih**, [4]**Wayan Widya Artana**

[1]*Computer System, Informatic and Computer ,ITB Stikom Bali, Denpasar*
[2] *Computer System, Informatic and Computer ,ITB Stikom Bali, Denpasar*
[3] *Information System, Informatic and Computer ,ITB Stikom Bali, Denpasar*
[4] *Computer System, Informatic and Computer ,ITB Stikom Bali, Denpasar*

*Author's email: gede_abdi@stikom-bali.ac.id; santhi.dewi@stikom-
bali.ac.id;raka_jayaningsih@stikom-bali.ac.id
Widyaartana@stikom-bali.ac.id;
*Corresponding author: gede_abdi@stikom-bali.ac.id;*

## Abstract
*The final project or thesis is a scientific work compiled by a student at each university. The STIKOM Bali Institute of Technology and Business in the lecture process also requires students to make a final project as one of the requirements for student graduation. In the face-to-face guidance process, students take notes using a progress guidance card from the guidance carried out. The COVID-19 pandemic has caused a change in the learning paradigm in all fields, one of which is the thesis guidance process. In practice, this final project guidance activity is carried out by discussing, asking questions, providing input and other activities. However, the lecturer as a one-time supervisor does not only guide one student. Thesis guidance which was initially carried out face-to-face had to be done online either by using an online meeting platform or by using the existing system at ITB Stikom Bali, but the system was built using the website at the link http://sid.stikom-bali.ac. id/guidance.aspx is only limited to supervising lecturers and part of the Study Program, not accessible to students. In face-to-face guidance and online media students will take notes using a guidance card manually, from that problem the researcher intends to create a guidance card application that can be accessed online and in real time. With Firebase, application developers can focus on developing applications without having to buy a server that is quite expensive. Firebase has conveniences such as google authentication, realtime database, push notification, and cloud computing services. Based on the results of calculations from the Likert scale, the authors conclude that the level of user satisfaction in terms of benefits ranges from 88.5% which is categorized as satisfied, in terms of effectiveness, it is obtained 91.1% which is categorized as very satisfied, in terms of interface, it is obtained 86.5% which is categorized as very satisfied and in terms of content, 89% were categorized as very satisfied*

**Keywords:** *Android,Firebase,Jetpack,Thesis_guidance,ITB_stikom_bali*

## 1. INTRODUCTION

The final project or thesis is a scientific work compiled by a student at each university (Simatupang & Muhammad, 2019). The STIKOM Bali Institute of Technology and Business in the lecture process also requires students to make a final project as one of the requirements for student graduation (Putu Gede Putra Pertama et al., 2015) The Thesis or Final Project is also required to comply with scientific rules and methods which are made systematically in accordance with scientific autonomy and academic culture (Putra & Arkan, 2017). The weight of the Final Project is determined based on the curriculum and refers to the applicable provisions at ITB STIKOM Bali, which is 4 credits for the Strata One (S1) level in the TA ITB STIKOM Bali guidelines

In the preparation of student final assignments, students experience several stages starting from consultation with consulting lecturers for the title submission process, followed by the guidance stage, proposal exams, open seminars and Final Assignment Sessions(Putra & Arkan, 2017) .In practice, this final project guidance activity is carried out by discussing, asking questions, providing input and other activities. However, the lecturer as a one-time supervisor does not only guide one student. In addition, the teaching activities of the supervising lecturers must also be carried out, even some lecturers teach more than two different courses. Most of the lecturers who guide theses also hold concurrent positions as head of study programs, deans, vice deans, and coordinators of certain fields, almost every month they have to attend meetings, coupled with the COVID-19 pandemic(Pascarella et al., 2020), which makes face-to-face guidance difficult, sometimes the results of guidance when there are several revision students tend to ask other people because the guidance time is quite short.

In the guidance process at ITB Stikom Bali face-to-face students recorded using a progress guidance card from the guidance carried out(Sudiatmika, 2017). The COVID-19 pandemic has caused a change in the learning paradigm in all fields, one of which is the thesis guidance process. Thesis guidance which was initially carried out faceto-face must be done online either by using an online meeting platform. ITB Stikom Bali itself already has a system using a website that can be accessed at https://sion.stikom-bali.ac.id, but the system is made only between supervisors and the Study Program section so students cannot access to see the progress of guidance. In face-to-face guidance and online media, students will take notes using a guidance card manually.

Technological developments have provided benefits to society. Various conveniences can be felt by the community such as the ease of storing data, organizing, and retrieving data (Simatupang & Muhammad, 2019). With the support of software that is constantly evolving, combined with the right hardware configuration, a more reliable information system will be created, a university can build a system that can be used easily, and easily reach all potential users of the system.

In this paper, researchers will build a digital-based guidance card application to be used by users or students to conduct thesis guidance that can be assessed in real time. The system that will be built will give the advantage that the user will log in easily, can view the history of the guidance, and can add guidance (text, images, audio)(Serrano et al., 2016). This system is built using the Android programming language, where active users to date are 90% of the total smartphone users(DiMarzio, 2016).

This application development uses the firebase platform. Firebase is a service from Google that is used to make it easier for application developers to develop applications(Google Developer, 2020) . With Firebase, application developers can focus on developing applications without having to buy a server that is quite expensive. Firebase has conveniences such as google authentication, realtime database, push notification, and cloud computing services (Paraya & Tanone, 2018)

The development of this application will also use a library from the Android programming language, namely Jetpack. Jetpack itself is a series of libraries available to help developers / developers to build applications to overcome code writing errors and bugs during the application development process. (Esakia, 2020)

## 2.   LITERATURE REVIEW

### 2.1. *State of the art*

State of the Art is research that takes several references from previous research that has relevance to the system that will be made by the researcher. Several previous studies were used as a guide and as a reference for future research. Based on the previous discussion, there are several research journals related to the research that will be carried out by the author which can be seen in the following table Paraya GTanone R Journal of Informatics Engineering and Information Systems (2018) 4(3) 397-406 Application of Firebase Realtime Database on Prototype of Food Ordering Applications Based on Android 2018 From this research, an application was produced that can make it easier for Android smartphone users to get realtime orders. Sastypratiwi HDwiyani A Journal of Informatics Education and Research (JEPIN) (2016) 2(1) Online Application Design for Guidance Final Project 2016 The results of this study make it easy for the two supervisors to communicate about their mentoring students in the supervisor forum because the guidance process can be done online and is equipped with real-time notification via electronic message or email Son of GArkan F E-Issn:2541-2361, Implementation of Web Server And Android-Based Student Final Guidance System 2017 The result of this research is the website that is used for final project guidance SIGCSE '20: Proceedings of the 51st ACM Technical Symposium on Computer Science Education Transitioning to teaching android with kotlin and jetpack components 2020 In this study, jetpack became an option for making android applications.

### 2.2. *Firebase*

Firebase is considered a web application platform. It helps developers create high quality apps. It stores data in JavaScript Object Notation (JSON) Format which requests do not use to insert, update, delete or append data to it. This backend of the system is used as a database to store data [4]. Available services are:

1. Firebase Analytics This provides insight into app usage. This is a paid app measurement solution which also provides user engagement This unique feature allows app developers to understand how users use this app. The SDK has its own event and property capturing feature and also allows getting custom data.

2. Firebase Cloud Messaging (FCM) Previously known as Google Clouds Messaging (GCM), FCM is a paid service that is a cross-platform solution for messaging and notifications for Android, Web Apps, and iOS.

3. Firebase Auth Firebase Auth supports social login providers such as Facebook, Google GitHub, and Twitter. This is a service that can authenticate users using only client-side code and is a paid service. It also includes a user management system where developers can enable user authentication with email and login passwords stored with Firebase.

4. Real-time Database Firebase provides services such as real-time database and backend. An API is provided to app developers that allows app data to be client synced and stored in Cloud Firebase. The client library is provided by the company which allows integration with Android, iOS, and JavaScript Apps.

5. Firebase Storage It facilitates easy and secure file transfer regardless of quality network for Firebase applications. It is powered by Google Cloud Storage which is a cost-effective object storage service. The developers can use it to store images, audio, video, or other user-generated content.

6. Firebase Test Lab for Android It provides a cloud-based infrastructure to test Android applications. With a single operation, developers can start testing their apps across multiple devices and device configurations. Various test results such as screenshots, videos and logs are

available in the Firebase console. Even if the developer hasn't written any test code for their app, Test Lab can exercise the app automatically, looking for crashes.

7. Firebase Crash Reporting Detailed reports of errors made in the app. The errors are grouped into similar stack trace groups and triaged by severity. Another feature is: developers can log special events to help catch steps to a fall.

8. Firebase Notifications It enables targeted user notifications for developer mobile apps and services to be freely available

*2.3.  Android*

Android is a modified Linux-based operating system for mobile devices consisting of an operating system, middleware, and main applications. Initially, Android was developed by Android Inc. This company was later purchased by Google in 2005. The Android operating system was then launched simultaneously with the formation of the Open Handset Alliance organization in 2007. Apart from Google, several big names also participated in the Open Handset Alliance, including Motorola, Samsung, LG, Sony. Ericsson, T-Mobile, Vodafone, Toshiba, and Intel [19].

*2.4.  Jetpack*

Jetpack is a set of libraries, tools, and guides to help developers write high-quality apps with ease. These components help reduce boilerplate code, and simplify complex work, so developers only need to focus on the code that matters. Jetpack consists of androidx library packages which are not bound by platform APIs. Jetpack offers backward compatibility and is updated more frequently than the Android platform. Android Jetpack components are a collection of libraries that can be individually adopted and built to work together while taking advantage of the features of the Kotlin programming language. Jetpack components are grouped into four component categories, namely:

1. Foundation component, providing cross-cutting functionality such as backward compatibility, testing and Kotlin language support.

2. Component Architecture, helps developers design robust, testable, and maintainable applications.

3. Behavior component, helps developers to integrate with standard Android services such as notifications, permissions, sharing and assistants.

4. User Interface Components, providing widgets and helpers to make applications not only easy, but fun to use. (Android Developers, 2019)

## 3.    RESEARCH METHODS

The method used in the development of this system is the Waterfall method. The Waterfall method is used because this method takes a systematic and sequential approach in building a system. This method is known as the waterfall method, where the process flows downward like a waterfall, passing through the phases of analysis, planning, modeling, implementation, testing, and maintenance.
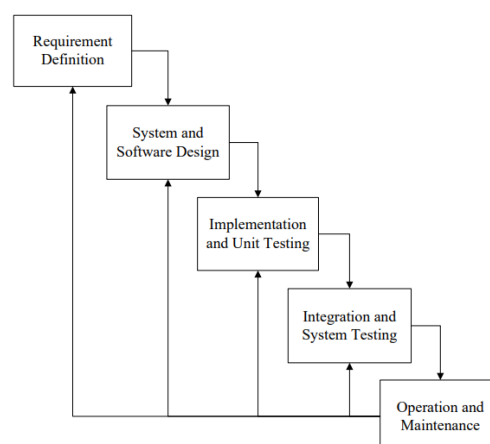


*Figure 1* Waterfall Model Ian Summerville

### 3.1. Requirement Definition

Requirement Definition is the stage of collecting requirements in the form of data and information in order to obtain the main ideas and needs of the entire system that is designed so that it can then be applied in the form of software. The analysis carried out is an analysis of functional and non-functional requirements

### 3.2. Sistem and Software Design

System and Software Design or design is the process of converting the requirements in the analysis stage into a representation in the form of data diagrams. In this study, the determination of the design flow and the details of the algorithm was carried out using UML (Unified Modeling Language), ERD (Entity Relationship Diagram).

### 3.3. Implementation and Unit Testing

The design that has been made in the previous process must be converted into a programming language that can be understood by the machine through the coding process. Here the programming language used is the Java programming language for the Android operating system platform.

### 3.4. Integration and Sistem Testing

Applications that have been generated from the coding process must go through an intensive testing process so that the resulting software is free from glitches, errors, bugs, and other problems. Tests carried out to ensure the stability and feasibility of this application are run using the black box testing method

### 3.5. Operation and Maintenance

Operation and maintenance, at this stage the finished software is operated by the user and maintenance is carried out. Maintenance allows developers to make improvements to errors that were not detected in the earlier stages. Maintenance includes error fixes, feature enhancements and system adjustments according to the needs and research road map.

### 3.6. Data Collection

Data collection is an attempt to obtain data which will later be processed in the framework of system development. There are three data collection methods applied in this study, namely observation techniques, interview techniques, and library techniques.

### 3.7. Observation Technique

Observation technique is done by observing and collecting data directly on. Guidance students and supervisors at ITB Stikom Bali Campus Jimbaran which is the main target of developing this application.

### 3.8. Library Engineering

The library technique is a technique carried out by collecting data and information from various written media, such as books, journals, previous research, or other written materials that contain elements of relevance to the development of this application.

### 3.9. System Requirements Analysis
#### 3.9.1 Functional Needs

Functional requirements analysis describes the process of activities that will be implemented in a system and explains the requirements needed so that the system can run properly and according to needs. This functional requirements analysis includes data requirements analysis and system modeling. The system modeling is modeled using Unified Modeling Language (UML) and Entity Relationship Diagram (ERD).

#### Non-Functional Needs

Analysis of non-functional requirements describes system requirements that focus on behavioral properties owned by the system, including software requirements, hardware, and

system users (users) as material for analyzing deficiencies and needs that must be met in the design of the system to be implemented.

1. Software Analysis (Software)

The software used in the development of this application is

a) Android Studio as an IDE.
b) Sublime Text Editor as a text editor.
c) Apache Web Service as a virtual web service.
d) PHPMyAdmin as a virtual database.

2. Hardware Analysis (Hardware)

The hardware used in the development of this application is a laptop, android and supporting peripheral devices.

**System planning**

At the design stage of the Android-Based English Pronunciation Learning Application, the Unified Modeling Language (UML) is used which consists of Use Case Diagrams, Activity Diagrams, Sequence Diagrams and class diagrams to describe and represent the system in detail in the form of modeling.
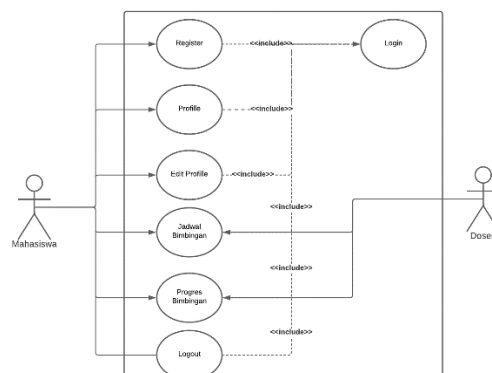
### 1.1. Use Case Diagram



*Figure 2* Use Case Diagram

### 1.2. *Perancangan Basis Data*

Entity Relationship The following diagram illustrates five entities, namely users, lecturers, guidance, along with their supporting attributes in interrelationships between one entity and other entities.
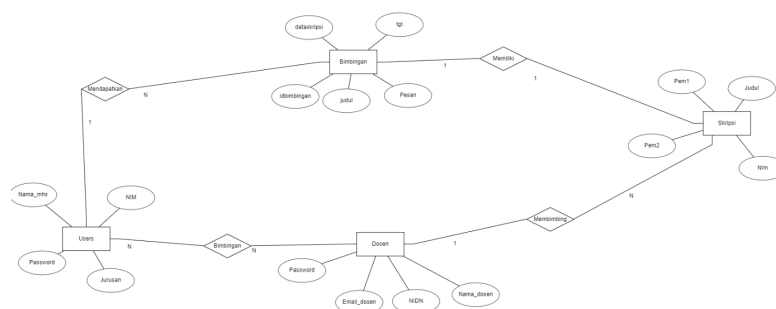


*Figure 3* ERD

**Research sites**

The research was conducted at the STKOM Bali Mobile Programming Lab, Jimbaran Campus

## 4. RESULTS AND DISCUSSION

System implementation is the implementation stage of the system based on the results of the analysis and design that have been carried out in the previous chapter. This chapter will explain the results that have been achieved in making the Student Guidance Card Application Using Android-Based Firebase and Jetpack Services

*4.1 Interface Design Design and Implementation Database Firebase*



*Figure 4 Login page interface design .*

On this login page , a form is provided for the user to input personal data in the form of a username and password in order to enter the application.Desain antarmuka halaman login.



*Figure 5 Design and Implementation Login page*

*4.2 Login page interface design .*

The main menu page contains menus and features that can be accessed by the user in using this application

*Figure 6 Design and Implementation Menu*

### 4.3 Profile Page Interface Design

This profile page displays user data and statistics from the user's application usage.



*Figure 7 Design and Implementation Profile  page*

### 4.4 Guidence Interface Design.

On this page, the user will see the progress of the guidance entered by the supervisor.



*Figure 8 Rancangan dan Implementasi  Halaman bimbingan.*

### 4.5 Black Box Test

In this system using Black Box testing. Black Box testing focuses on testing the evaluation of the interface and functional appearance without the need to know the processes that occur in the software system. The testing of the Student Guidance Card Application Utilizing Android-Based Firebase and Jetpack Services was carried out as follows:

**Table** 1 **Tabel Skenario Ujian Pada interface Android**

| No | Kelas Uji | Butir Uji | Jenis Pengujian |
|----|-----------|-----------|-----------------|
| 1 | Login Display | • Display the Login Page before entering the Menu | Black Box |
| 2 | User Profile | • Displaying User Profile | Black Box |
| 3 | Guidance | • Displays the Guidance List | Black Box |
| 3 | logout | • Logout Button | Black Box |

*5*      **Testing Result**

**Table 2 Testing Back End Web Service**

| Test Items | Expected Result | Observation Result | Conclusion |
|---|---|---|---|
| Admin login display page | Display the login page and enter the menu | The user has successfully entered the Menu if the correct username and password are entered | Accept |
| User Profile | Showing Profile Page | User selects profile menu | Accept |
| Guidance | Displays a list of input guidance from lecturers | User selects the Guidance Menu | Accept |
| Logout | The system will close the login session and display the login page | Super Admin or Admin selects the LogOut menu | Accept |

System implementation is the implementation stage of the system based on the results of the analysis and design that have been carried out in the previous chapter. This chapter will explain the results that have been achieved in making the Student Guidance Card Application Using Android-Based Firebase and Jetpack Services

*6*      **Detail testing**

The following is a test carried out by users of the Student Guidance Card Application Using Android-Based Firebase And Jetpack Services. Table 4.8 is a breakdown of the respondents who responded to the questionnaire that had been given.  The following is the range of values ( interval ) used as a reference in performing the percentage scale, which can be seen in table 4.9.

Information:

TS : Do not agree

S : Agree

SS: Very Agree

**Table 3 Interval Presentase**

| Presentase (%) | Catagory |
|---|---|
| 0 – 30% | No satisfied |
| 31 – 70% | Satisfied |
| 71 – 100% | Very satisfied |

The following is the result of the calculation of the questionnaire which can be seen in table 3.

**Table 4 Testing Result**

| Question  No. | Number of Respondents | Score | |
|---|---|---|---|

| A. Benefit | TS (1) | S (2) | SS (3) | | Percentage (%) |
|---|---|---|---|---|---|
| 1 | 0 | 11 | 19 | 79 | 87,8% |
| 2 | 0 | 9 | 21 | 81 | 90% |
| Average Percentage (%) | | | | | 88,5% |
| B. Efektifitas | TS (1) | S (2) | SS (3) | Score | Percentage (%) |
| 1 | 0 | 8 | 22 | 82 | 91.1% |
| 2 | 0 | 8 | 22 | 82 | 91,1% |
| Average Percentage (%) | | | | | 91,1% |

| Question No. | Number of Respondents | | | Score | Percentage (%) |
|---|---|---|---|---|---|
| C. Interface | TS (1) | S (2) | SS (3) | | |
| 1 | 0 | 13 | 17 | 77 | 85,5% |
| 2 | 0 | 10 | 20 | 80 | 88,9% |
| Average Percentage (%) | | | | | 86,5% |
| D. Content | TS (1) | S (2) | SS (3) | Score | Percentage (%) |
| 1 | 0 | 8 | 22 | 82 | 91,1% |
| 2 | 0 | 11 | 19 | 79 | 87,8% |
| Average Percentage (%) | | | | | 89% |

$$Percentage\ (\%) = \frac{Score \times 100\%}{High\ Score}$$

Score = skala likert x responden (n)

Based on the results of calculations from the Likert scale , the authors conclude that the level of user satisfaction in terms of benefits ranges from 88.5% which is categorized as satisfied, in terms of effectiveness, it is obtained 91.1% which is categorized as very satisfied, in terms of interface, it is obtained 86.5% which is categorized as very satisfied and in terms of content, 89% were categorized as very satisfied.

**CONCLUSION**

Based on the results of the analysis and implementation of the system in the discussion of the previous chapter, several conclusions can be drawn as follows: Has successfully built and implemented a Student Guidance Card Application Utilizing Android-Based Firebase and Jetpack Services, where in the application the user can see the progress of the guidance and attachments provided by the supervisor . Of the 30 system users who were asked to fill out a questionnaire, the satisfaction results were obtained from the respondents. Among them 88.5% are very satisfied with the benefits, 91.1% are very satisfied in

terms of effectiveness, 86.5% are very satisfied with the interface and 89% are very satisfied with the content of the system. It should be emphasized that the conclusion is not a summary of the entire article content or abstract repetition. Conclusions are the results of research that illustrates the opinions of researchers. Conclusions written in a paragraph do not use serial numbers or are quoted.

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