DESIGN AND DEVELOPMENT OF AN ANDROID-BASED APPLICATION FOR INSPECTING GROUND AND AIR FACILITIES AT BETOAMBARI AIRPORT IN BAUBAU, SOUTHERN SULAWESI

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ABSTRACT

Airports play a vital role in the mobility of people and goods, making flight safety highly dependent on the condition of landside (FSD) and airside (FSU) facilities. Therefore, Betoambari Airport in Baubau requires an integrated inspection mechanism. This study aims to design and develop an Android application to support the inspection process using a Research and Development (R&D) approach combined with the 4D model (Define, Design, Develop, Disseminate). The Define stage involved field observations and interviews to identify user needs. The Design stage produced a client-server system architecture, a minimalist user interface, and a database schema. In the Develop stage, a prototype was built using Flutter and Firebase. Testing showed that all functions operated as intended. During the Disseminate stage, the application was implemented at Betoambari Airport. The application supports daily and monthly inspections and features damage recording, photo uploads, status updates, and automatic reporting. Data is stored in JSON format within Firebase and is compatible with Android 10 and above.

Keywords: application, Android, airport, inspection, airside, landside, form

1. INTRODUCTION

Airports are important facilities that support air transportation activities, such as landing, passenger and cargo transportation, maintenance, and refueling. Airports are crucial for transforming regions into tourist destinations, providing international visibility and accessibility (Fernandes et al., 2018). In Indonesia, airport management falls under the Ministry of Transportation through the Airport Management Unit (UPBU), which classifies airports into five categories. One of them is the Class III Betoambari UPBU in Baubau, Southeast Sulawesi, which currently serves ATR 72-500 aircraft and is being developed to be able to serve Airbus 320. It is considered necessary to improve its service capabilities in order to meet public demand and support the growth and development of the city (Mantouw et al., 2018).

In providing facilities and infrastructure to support flight operations and the comfort of airport users, there are various facilities provided, consisting of airside facilities and landside facilities (Isa, 2021).

To ensure safety, the Building and Runway Unit conducts routine inspections of the airside and landside. However, the inspection process is still carried out manually using paper, which is prone to damage, loss, and data integration difficulties. Therefore, the use of information technology is necessary. Mobile devices are small devices that can be carried around every day, work independently, and be used for various forms of learning (Trianziani, 2020). For mobile devices, applications were chosen because they are more practical to use. This application supports devices with the Android operating system, which is currently a popular operating system. For PC devices, a web-based system in the form of Firebase was chosen to facilitate data management and calculation.

This Android-based inspection application was developed to support digitization and facilitate data recording, reporting, and analysis. This application refers to regulations KP 220 of 2017, KP 94 of 2015, and PR 11 of 2023.

2. METHOD

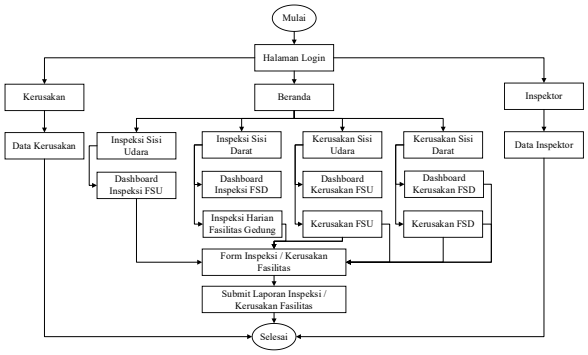
This study uses the research and development (R&D) method with the 4D development model. According to Thiagarajan, there are four stages of development. The

first stage is define, often referred to as the needs analysis stage. The second stage is design, which involves preparing a conceptual framework for the model and learning tools. The third stage is develop, which involves validation testing or assessing the feasibility of the media. Finally, the fourth stage is disseminate, which involves implementation on the actual target, namely the research subjects (Pratama & Nirwan Hilmy, 2019).

In preparing the research report, data is needed to support the creation of the application. To obtain this data, the steps taken in developing the 4D method are as follows:

1. The Define stage is the first stage in development. Simply put, this stage is the requirements analysis process. The Define stage identifies user requirements through field observations and interviews with airport officials.
2. The Design stage is the process of designing or formulating solutions based on the needs identified in the Define stage. The purpose of this stage is to produce a preliminary design of the product or device to be developed. The Design stage involves designing a client-server-based system architecture, a minimal touch user interface, and a database schema.
3. The Develop stage is the third phase in the 4D method, in which the initial design or draft that was created earlier is developed into a real product (application). The Develop stage produces an application prototype built with Flutter and Firebase Realtime Database. Limited trials involve inspection officers, while black box testing shows that all functions are running according to design.
4. The Disseminate stage is the final stage of the 4D method. At this stage, the developed and revised application product is disseminated for wider use and a final evaluation is carried out to assess its overall effectiveness.

The following is the conceptual framework of the research:



3. RESULT AND DISCUSSION

This study resulted in an Android-based application for inspecting ground and airside facilities at Betoambari Baubau Airport. Below is a flowchart of the inspection application:

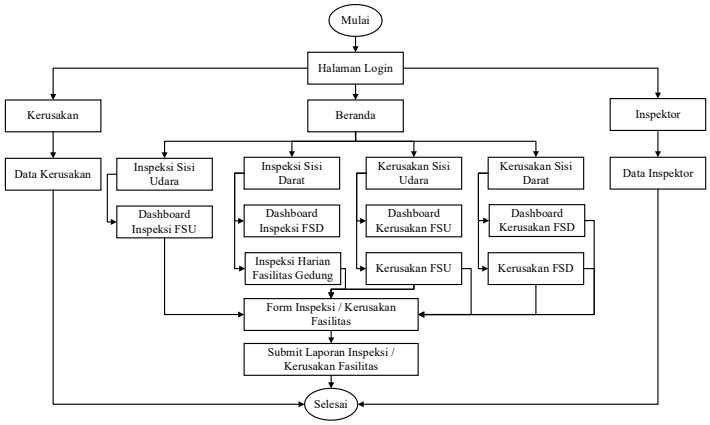


Figure 2 Flowchart

The flowchart shows the design of the application, which has four main menus, namely home, damage history, users, and inspector profiles.

1. Log-In Page

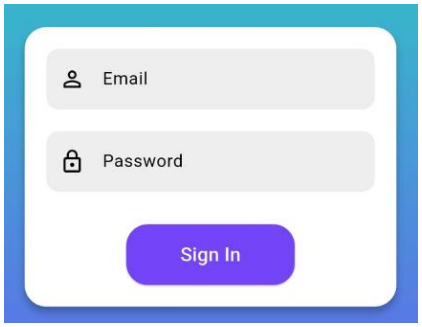


Figure 3 Log-In Page Display

The following shows the initial log-in display, which requires the user to enter their email address and password in the fields provided.

2. Home Page

The home page is the main page or initial display that appears after the user successfully logs into the application. Its function is as a navigation center and summary of key information. In this section, there are two important sub-menus in the inspection, namely aircraft movement area inspection and ground side inspection. In addition, there are several other sub-menus, namely history, users, and profile.

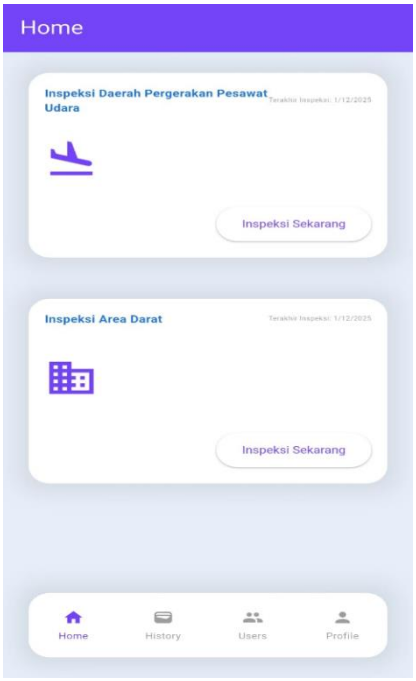


Figure 4 Home Page

a. Airside and Landside Facility Inspection Page

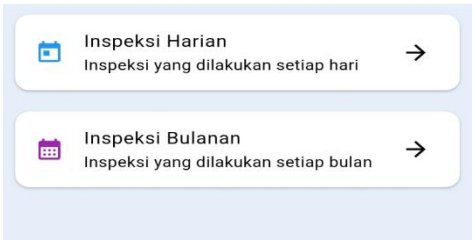


Figure 5 Inspection Page

On the inspection page, there are two categories of inspection schedules, namely daily inspections and monthly inspections.

Figure 6 FSU Inspection Area

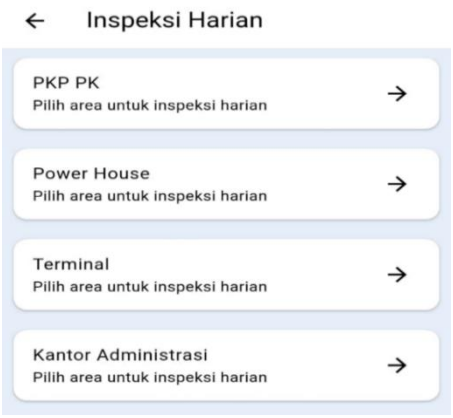


Figure 7 FSD Inspection Area

This feature contains the main sections for airside and landside inspections.

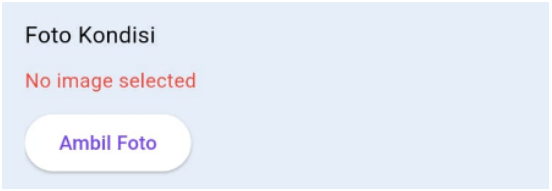


Figure 8 Inspection Conditions

Conditions describe the situation at the time of inspection. There are three options: immediate rehabilitation, rehabilitation required, and no rehabilitation required.

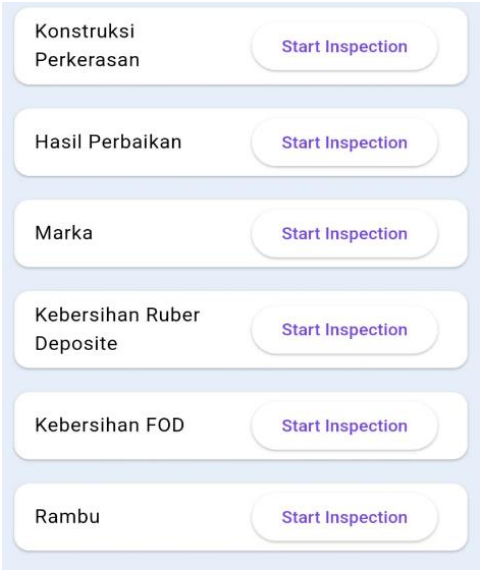


Figure 9 Condition Photos

Condition photos are used to take pictures of the location at the time of inspection.

Figure 10 Notes

Notes is a column for adding details about the condition if damage is found during the inspection.

Figure 11 Inspector's Signature

The inspector's signature is a sign that the inspector has carried out the inspection.

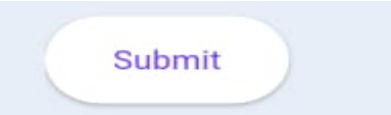


Figure 12 Submit

Submit is the last button to send the inspection results.

3. Damage History Page

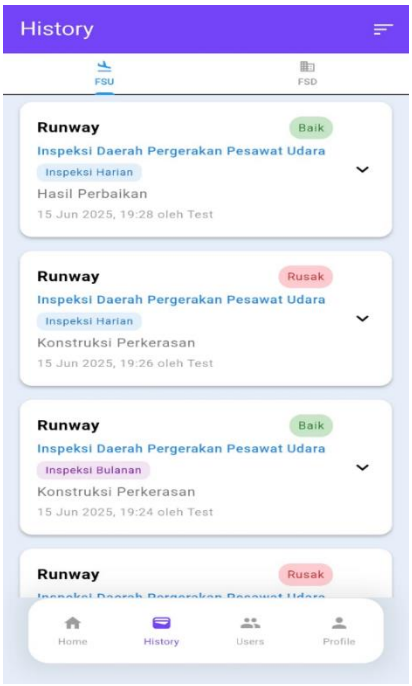


Figure 13 Damage History

This page contains inspection categories, namely airside facilities and landside facilities.

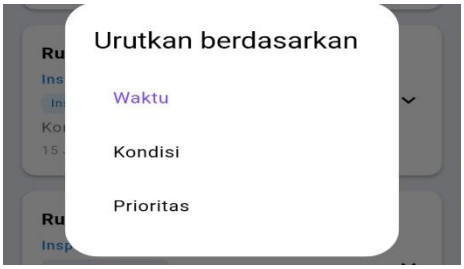


Figure 14 Sort By

The sort column contains the sorting of inspection reports based on three categories, namely time, condition, and repair priority.

4. Inspector Users Page

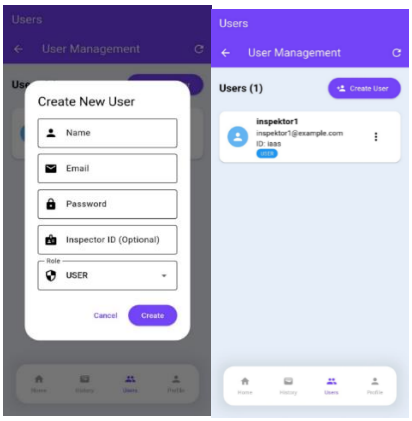


Figure 15 Inspector Users Page

This page is used to add users as inspectors. The menu displays the biodata of the inspectors, which can be filled in with their respective personal data. This page has several submenus, including inspector name, email, password, inspector ID, and inspector category, namely user and admin. With this, inspectors are expected to be able to monitor each other's progress and performance.

5. Inspector Profile

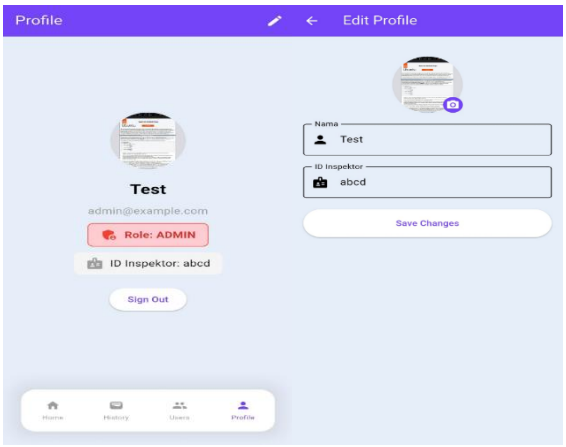


Figure 16 Inspector Profile Page

The profile page serves to display the data of building and ground staff as inspectors in charge of inspecting

airside and landside facilities. This data is provided by an admin for the inspection. This page displays a picture of the admin inspector, the inspector ID, and a sign-out button to log out of the user or admin account.

4. CONCLUSION

The design and development process for the Airport Inspection application was carried out for Android-based devices, beginning with the preparation of a workflow diagram as the basis for development. The user interface (UI) and user experience (UX) were developed using Flutter. This application is compatible with Android version 10 and above and runs online, with four main features: a home page for Airside and Landside Facility inspections, inspection activity history and damage reporting, an inspector user menu, and inspector profiles. The application outputs FSU and FSD inspection files in JSON format and visual documentation that is automatically stored in the Firebase database, which can then be used as a basis for further analysis.

The Android-based inspection application has been successfully designed and built according to requirements and is capable of improving the effectiveness, efficiency, and accuracy of the ground and airside facility inspection process at Betoambari Baubau Airport. Therefore, further development should be carried out with the integration of the airport management system. Addition of repair notification features and a web-based dashboard for management.

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