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THE INSPECTIFY: MOBILE APPLICATION FOR SUPPORTING AIRPORT FACILITY TERMINAL INSPECTION SERVICE

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Abstract

Operational activities at the airport are highly dependent on the efficiency and reliability of facilities, and formal reporting evidence is needed to improve the quality of facilities inspections at the Terminal Inspection Service (TIS) unit, as well as to serve as monitoring evidence that will be used as a basis for facility improvement evaluations. This study aims to design and develop the Inspectify application. The research methodology used is the Research and Development (R&D) method with the Borg and Gall research model. The study results show that the Inspectify application can facilitate the reporting process of facility damages and maintenance while improving the response to issues occurring since this application has features to track the status of repairs and receive real-time notifications. This application supported TIS personnel in conducting inspections more effectively and efficiently. Implementing this application is expected to contribute positively to airport operations, improve the efficiency of TIS personnel's work, become the TIS data center, and increase overall passenger satisfaction.

Keywords: *inspectify, facility inspection, terminal inspection, service*

Introduction

The utilization of technology in the era of society 5.0 triggers increasingly advanced and rapid technological developments, one of which is, of course, in the field of information and communication technology, which makes everything unlimited by using internet data (Nastiti & Abdu, 2020). The development of information technology is also used in the field of transportation, one of which is air transportation using FIDS (Flight Information Display System), which displays data, starting from flight information, weather, navigation, airport conditions, etc., which is in the airport terminal (Meilani, 2022).

Information technology was created to help or facilitate human activities, which, of course, must be utilized as much as possible, especially in fields operating in airports (Dwipa et al., 2024). Similarly, FIDS aims to improve communication and ensure all passengers get the appropriate status about their flight. This device plays an important role for passengers to get flight information as soon as possible (Melissa & Theopilus, 2020). Based on PM 41 of 2023, the Terminal Inspection Service (TIS) unit is a unit that supervises or monitors the facilities used are running well. Along with the rapid pace of technological development, all work should be able to be completed quickly, smoothly, and efficiently. Smoothness and preparedness of activities TIS personnel operations will certainly affect passenger comfort in the terminal, which is a very important thing to pay attention to when operating in the world of aviation.

When the author carried out research at Radin Inten II Airport Lampung, which is managed by the Company under the auspices of the State-Owned Enterprise (BUMN), Angkasa Pura in-journey, it was found that breakdowns that take a long time, especially during peak passenger hours, often make it difficult for TIS personnel to coordinate with each other. Specifically, the escalator in the arrival terminal is only activated when passengers disembark from the aircraft. However, after being activated for approximately 3 minutes, the escalator frequently experiences an error with code 18, causing it to stop working or halt and requiring a restart. The control system for the escalator is located in the international immigration power room, which is quite far from the arrival terminal.

As a result, the assigned TIS staff must repeatedly travel back and forth to restart the escalator in the control room and then return to the arrival terminal to activate it. This process takes a considerable amount of time. The escalator in the arrival terminal is a vital facility that supports passenger movement and operations as they disembark from the aircraft. Consequently, escalator malfunctions are one of the most frequent complaints from passengers. TIS system activities include providing instructions and supervision, checking and handling all facilities, and to every personnel operating in the airport terminal area who is very concerned about the security, comfort, smoothness, and safety of anyone who is at the airport (Tirtajaya & Laksana, 2023). Therefore, the TIS unit is responsible for initiating and closing reports when facility malfunctions or repairs occur. When the TIS unit identifies a malfunction, they take a photo of the facility that requires repair, input it into the computer, and upload it to the AP2Score website managed by Angkasa Pura in-journey as a report to the central authority. However, maintenance personnel do not have access to the AP2score, which is considered inefficient because the report cannot be directly managed, and they sometimes forget to answer reports made by TIS personnel. Instead, the system relies on notifications via *WhatsApp* and daily paper-based checklists for repairs, which could be more effective. The daily workflow involves TIS personnel identifying malfunctions, entering them into the website, and creating another report to be shared via *Whatsapp* group specific to the TIS and maintenance units for further action. This process often leads to human error due to damaged or lost paper checklists when conducting inspections, so reports must be made twice and go through several stages. For example, there have been cases where the admin had to report the same issue more than 3-4 times to the maintenance unit due to their lack of response.

The utilization of technology, especially in information and communication technology

(ICT), plays an important role in the transportation system to provide connections between transportation system users, system planners, operators, and managers, especially in the transportation services sector (Yigitcanlar et al., 2024). Without the development of facilities that can enhance the performance of data reporting services faster and more securely, this can lead to instability in the security activities and data archiving of the company. Furthermore, implementing service aimed at user comfort would be less optimal, resulting in a decline in trust regarding the provision of transportation services.

For the development of the application, focus on creating a system used to manage and be accountable for controlling damage data and generating reports from routine inspection checklists of the terminal building (Musadek et al., 2022). The similarity with this study lies in its use for facility inspections, damage reports, and reporting inspection results. However, Inspectify is also used for online monitoring with real-time information.

The work system is a system designed to automate HVAC systems and make them more efficient within buildings by optimizing resource use and reducing energy waste (Indarko et al., 2023). The similarity with this study lies in the system's ability to control or act as a controller by processing input or uploaded data to be managed into reports for the maintenance unit. Additionally, the method used is the same as the one the author applies, namely the Research and Development (R&D) method based on the Borg and Gall model.

This research aims to design, develop, and test Inspectify applications. The use of Thunkable software as a tool in the Android application development process with various features provided makes the application development process faster, easier and more efficient (Musdalifah et al., 2023). Thunkable is a website with no code platform that allows users to build mobile applications for Android, IOS, and the web without requiring programming skills. It features an intuitive drag-and-drop interface, over 50 design components, and advanced logic blocks to create interactive tools like Firebase, air-table, or Google Maps for added functionality (Raibowo et al., 2023).

The implication of the research is to optimize the supervision or inspection by TIS personnel during facility repair inspections while also remaining on standby in the arrival area to ensure the escalator can be reset and continues to function and enhance the reporting of facility malfunctions, as well as the creation and closure of reports, alongside monitoring or supervision of facilities under repair. A method needs to be devised that allows for seamless collaboration without compromising or reducing the performance of TIS personnel.

Methods

This study's research type is Research and Development (R&D). According to Borg & Gall, development research is oriented to develop and validate products (Wardani et al., 2021). The application designed and developed in this research is an inspection and supervision media for Radin Inten II Airport in Lampung. This research carried out research and problem observation from October 2023 to January 2024 at Radin Inten II Airport, Lampung, continued for 6 months at Politeknik Penerbangan Palembang.

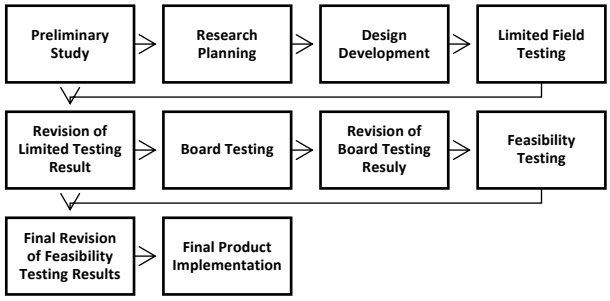

Figure 1. Borg & Gall 1971

We simplified the 10 development stages into 5 stages to produce a final product ready to be implemented in the TIS unit at the airport. The research stages conducted after the simplification are shown in Figure 2.

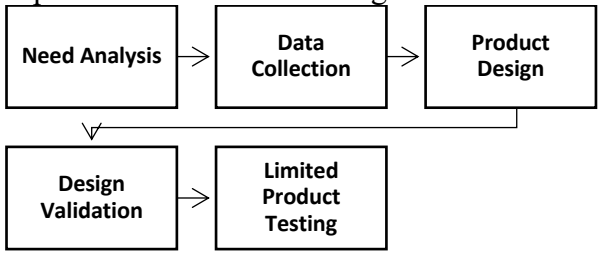

Figure 2. The R&D stages in Inspectify

This approach is based on a previously tested research journal that reduced the ten stages to three: preliminary study, development research, and validation. This adjustment is made to enhance the efficiency and effectiveness of the research activities while maintaining the scientific rigor needed to strengthen the research outcomes (Abdullah et al., 2023). Data collection is done to analyze a product, where website developers use quantitative and qualitative data. The quantitative data describes the quality assessment of the Inspectify application (Nugraha & Umam, 2023). This data was collected through interviews, surveys, and direct observation.

The findings highlighted the demand for a centralized platform to streamline communication and coordination among TIS personnel, maintenance staff, and administrators. TIS personnel perform inspections manually using paper checklists and patrol the areas where facility damage occurs. During patrols, they record facilities that have been repaired and those that remain unrepaired. If the facilities still need to be repaired, the TIS personnel create new reports until the facilities are fixed. Also, the signs made by TIS personnel are sometimes unclear, so the details of the information conveyed are less clear. These insights were critical in shaping the application's functional requirements. Based on interviews with representatives of TIS and maintenance officers at Radin Inten II Airport Lampung, an application is needed to increase time efficiency and help their tasks so that they do not do many lines but only one line.

In the product design phase, an initial prototype of Inspectify was created, tailored to the needs of TIS at Radin Inten II Airport in Lampung. The author focused on developing a user-friendly application to facilitate daily tasks and improve operational efficiency. The application underwent validation involving experts who have the ability in accordance with the research being conducted in design, information systems, maintenance, and TIS operations, to ensure its effectiveness and alignment with operational needs (Arsyaf et al., 2022). Subsequently, limited product testing using black box testing confirmed its functionality. Key features include a damage reporting login system, repair progress monitoring, tools for scheduling and confirming repairs, and data management by admins, who forward reports to the ap2score platform for broader integration.

The study also involves validators who are experts in IT and competent in the subject matter to conduct validity testing on the Inspectify application. This validity testing aims to determine whether the application functions properly and is feasible for use (Bayu et al., 2023). The development of the Inspectify application begins with a thorough needs analysis, where challenges and potential solutions are identified. Observations conducted during on-the-job training (OJT), particularly in the Terminal Inspection Service (TIS) unit, revealed inefficiencies in the current workflow. The author used descriptive analysis for the data analysis technique, where the percentage of validation results was calculated as the assessment method. The formula used is as follows:

$$P = \frac{N}{f}\ x\ 100\% \quad \text{(figure 1)}$$

Explanation:
P = percentage
N = obtained score
F = maximum score

The feasibility level of the product resulting from the research and development is correlated with the percentage score. The higher the percentage score obtained from data analysis, the greater the feasibility of the product resulting from the research and development.

Table 1. Validation Criteria

Score (%)	Criteria
< 21 %	Very Unfeasible
21 – 40 %	Unfeasible
41 – 60 %	Fairly Feasible
61 – 80 %	Feasible
81 – 100 %	Highly Feasible

The validation criteria, also known as instrument validation, ensure that the developed tool is appropriate for use and accurately measures what it is intended to measure. Reliability testing is conducted after completing

the validation process to evaluate the instrument's consistency and dependability (Ernawati & Sukardiyono, 2017).

Results And Discussions

Radin Inten II Airport's terminal has an adequate network and Wi-Fi infrastructure, allowing personnel to utilize technological advancements effectively. Therefore, the author developed a product to solve the issues faced by TIS Personnel at Radin Inten II Airport. The product is expected to enable TIS personnel to perform tasks such as inspecting and monitoring facilities under repair and managing the opening and closing of reports more easily and efficiently. This development of Inspectify was based on the R&D design framework by Borg & Gall and was carried out in five stages: identifying potential problems, information gathering, product design and revision, product validation, and product testing (Abdullah et al., 2023). Based on interviews, there is a need for an application that can help improve time efficiency and assist their tasks, so they do not need to go through multiple processes but only a single one.

Inspectify is a mobile application accessible via smartphones. This application is created as an innovation to facilitate inspection activities and reporting facility damages within the TIS unit while reducing unexpected issues. The idea of digital or online inspection systems is based on several studies and research previously conducted by the author. With advancements in this technology, the process of inspections is expected to become easier as data entered will be stored in a database, namely *Cloudinary*. This ensures that users and administrators do not need to worry about data loss if their smartphones are damaged since the application can also be accessed through computers or tablets, provided they have a username and password issued by the administrator.

In this application, TIS personnel can monitor and supervise facilities prone to damage and track facilities under repair online, maintenance personnel can respond to the TIS unit more clearly and in detail and AOS admin, who works in the office, can view data and forward it to the AP2Score website as a required report for Angkasa Pura 2, while also monitoring the progress of both the TIS unit and the maintenance unit.

The working system of this application is as shown in the image below:

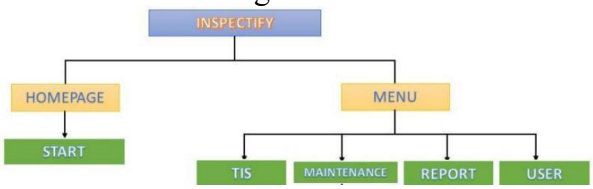

Figure 3. Use Case Diagram Inspectify

The system workflow of the application is generally similar to the system used in applications like Instagram. When first downloaded, users will be directed to start page. After logging in, the account owner will be directed to the main page, which includes several options designed by the author for users of all ages, from young to old.

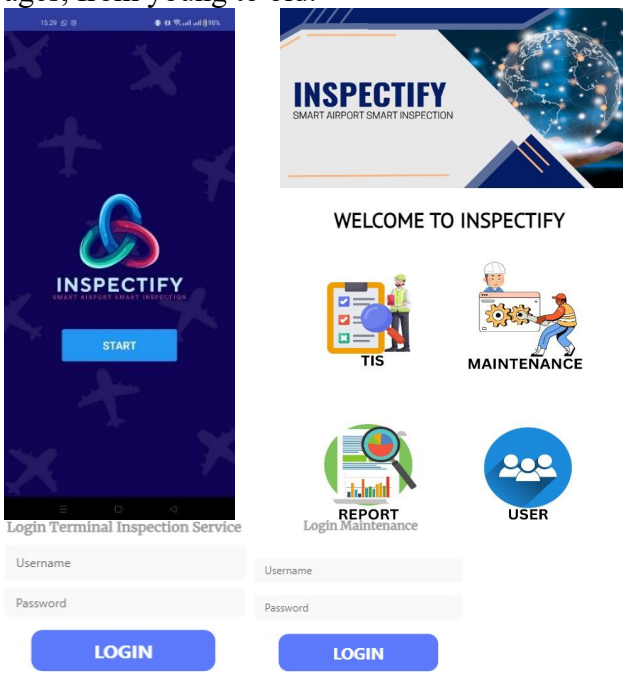

Figure 4. Inspectify Interface Design

The design ensures that everyone can navigate and operate the application smoothly without difficulty. After entering the main menu, there are several options available to choose from. If the user is a TIS personnel, they can select the TIS menu. If the user is a maintenance personnel, they can choose the maintenance menu, whether TIS personnel or maintenance personnel. Meanwhile, the admin serves as a monitor or third party overseeing both units' reports or results. If the account owner forgets

their password or loses their phone, the admin can reset it to prevent data misuse.

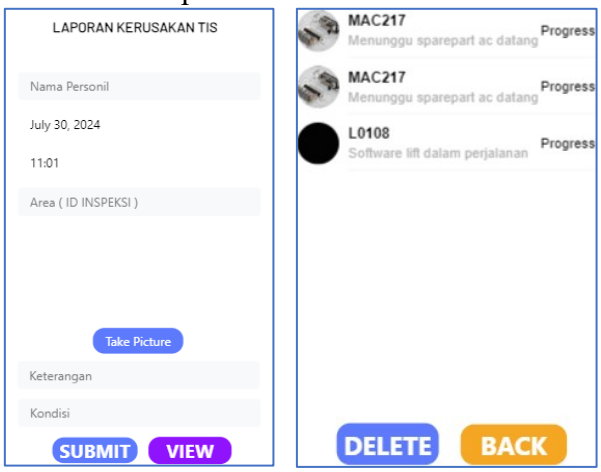

Figure 5. TIS Inspection Menu

If the user is a TIS personnel, after logging in, they will be directed to a page similar to the one shown above, where they can report damage. Once the damage is reported, the TIS unit will receive an invoice and be able to monitor the damage live through their phone, just like when using the live location sharing feature on *Whatsapp*.

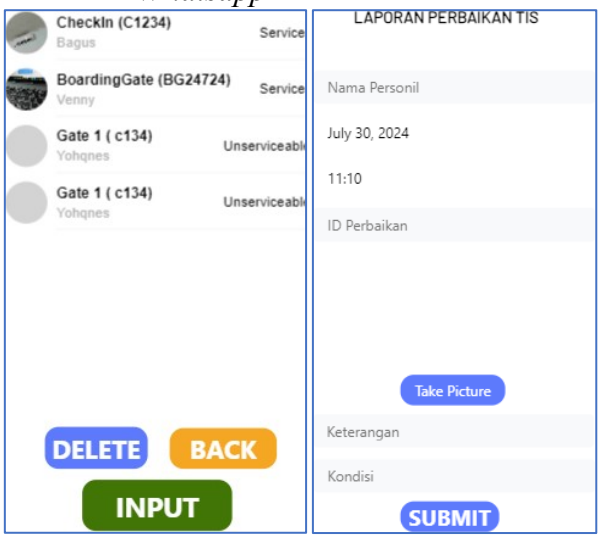

Figure 6. Maintenance Menu

If the user is a maintenance personnel, after logging in, they will be directed to the notification page showing reports made by TIS personnel (as shown in the image). If the maintenance personnel cannot fix the issue immediately, they can explain the input button, allowing TIS personnel to monitor the status regularly.

Figure 7. Report Menu

The "Report" and "User" menus are accessible by TIS personnel, maintenance personnel, and admin. The "Report" menu accumulates data over one month, while the "User" menu displays the name of the personnel themselves. The author gathered numerous samples to develop Inspectify, but overall, the application was designed based on the essential functions required at the airport.

At the product design validation stage, the developer conducts design expert validation to produce an appropriate application display both in terms of colors, letters, images and menus contained in the application display and material expert validation to observe whether the features that have been presented and the required menu menus are sufficiently following what is needed.

The results obtained when analyzing the validation of design experts on the Inspectify application were 91%, with each aspect assessed ranging from the appearance and menu to the implementation of applications that have been adapted to the needs of personnel conducting inspections at the terminal.

Table 2. Design Validation Results

No.	Assessment Aspect	Percentage	Criteria
1.	Display and Suggestions	95%	Very Feasible
2.	User-friendliness	100%	Very Feasible
3.	Discussion	80%	Feasible
4.	Flexibility	100%	Very Feasible
5.	Applicability	80%	Feasible
	Average	91%	Very Feasible

Meanwhile, the results of the material expert validation analysis on the Inspectify application obtain a total score of 96%. The aspects assessed are the quality of the content and purpose of the application, which has been adjusted and developed to support the needs of Airport TIS personnel.

Table 3. Material Expert Validation Results

No.	Assessment Aspect	Percentage	Criteria
1.	Quality and Purpose	92%	Very Feasible
2.	Discussion Aspects	100%	Very Feasible
	Average	96%	Very Feasible

The author also conducted limited application testing using black-box testing. This software testing method assesses the functionality of an application without examining the internal code structure or how it is implemented to verify whether the application functions as intended according to the predefined commands. Testers only know the input given and the expected results without knowing the internal workings of the program (Sholeh et al., 2020). The results of black-box testing in this study are shown in table 4.

Table 4. Material Expert Validation Results

No.	Test Activity	Result
1.	Click Start Button	Comply
2.	Click TIS Button	Comply
3.	Click Maintenance Button	Comply
4.	Click Report Button	Comply
5.	Click User Button	Comply

In this study, the authors used black box testing because according to other studies this method is one of the easiest methods to use because it only requires the lower limit and upper limit of the expected data and it can be seen if the functionality can still accept input data that is not expected, causing the data stored to be less valid (Cholifah et al., 2018).

The design of the Inspectify application improve efficiency and convenience for TIS and maintenance personnel in reporting facility damages and notifying facility repairs at Radin Inten II Airport, Lampung. The main purpose of design is to create solutions that are effective, efficient, and follow user needs or project objectives (Karim, 2020). In addition, TIS personnel can use this application as a monitoring tool to assist the TIS unit in overseeing facilities under maintenance. Not only TIS personnel but also maintenance personnel and admins can access the Inspectify application. In other studies, similar applications consist of 2 user accounts, namely an account as an admin that functions to manage as well as be responsible for data control in the application and an account as a user that functions to provide reports on the results of routine inspection checklists of terminal buildings that are correct and in accordance with actual field conditions (Musadek et al., 2022).

In developing the Inspectify application, the author utilized the research and development (R&D) model initially proposed by Borg and Gall (Aka, 2019) to create new products to address current challenges. Like the research conducted to create a fuel distribution controller for the ARFF Trainer device, a practical tool for aircraft fire fighting training, also adopted an adapted version of the Research and Development (R&D) model originally proposed by Borg and Gall as its research method (Abdullah et al., 2023).

Conclusion

Based on the development and discussion, the following conclusions were obtained: The design of the Inspectify application was created and tailored to address the problems at the terminal, where the author designed an application capable of identifying the main issues faced. The development of the Inspectify application involved the creation of features, concepts, styles, and menus for users. This included integrating various features into menus that support TIS personnel inspections. The resulting application design was then validated to assess its feasibility, as evaluated by media/IT experts and subject matter experts. The trial results of this product indicate that the Inspectify application can be classified as “highly feasible” based on the product evaluation table. Therefore, the Inspectify application is considered highly suitable and ready to function as a medium for reporting facility damages, facility repairs, and monitoring facilities under repair for TIS personnel at Radin Inten II Airport, Lampung.

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