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Aviation Security Information System Design to Optimize Monitoring and Management of Aviation Security Personnel Data at Djalaluddin Gorontalo Airport

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Abstract

Djalaluddin Airport Gorontalo still uses manual methods and spreadsheets in managing and monitoring Aviation Security (Avsec) personnel, especially for recording license and training data. To overcome this problem, the author developed an integrated website-based information system to optimize the monitoring and management process of Avsec personnel more effectively and efficiently. Research and Development (R&D) with the ADDIE (Analysis, Design, Development, Implementation, Evaluation) model approach is the research method used. This system was developed using the Laravel (PHP) framework and MySQL database, with main features including personnel data management, license monitoring, automatic notifications, recurrence and training submissions, and document uploads. This system is also equipped with a responsive and user-friendly interface to facilitate use by admins and Avsec personnel. This information system has features that meet the operational needs of Djalaluddin Airport Gorontalo, such as personnel data management, license management, automatic notifications, training and recurrence history, and document management. With the implementation of this system, Avsec personnel management becomes more transparent and accurate.

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1 INTRODUCTION

In the aviation industry, security is a crucial aspect that must be consistently maintained. Aviation Security (Avsec) plays a vital role in ensuring security at airports and throughout the flight process. Aviation Security is a series of measures aimed at protecting civil aviation from unlawful acts, such as sabotage and terrorism. Aviation Security is responsible for overseeing the operational safety of flights and airport facilities. This includes not only security and safety, but also the protection of people, cargo, aircraft, buildings, and important assets on the ground and in the air, especially those located around and inside airports [1]. At Djalaluddin Gorontalo Airport, Avsec personnel management is still carried out manually using spreadsheets, which are prone to data inaccuracies and delays in license updates. This situation has the potential to hinder decision-making processes related to training and license renewals for Avsec personnel. However, valid licenses are essential for personnel to

perform their duties in accordance with established standards. An airport is an area that can take the form of a building, installation, and equipment either on land or water.

This area is used either as a whole or for departures, arrivals, and aircraft movements [2]. An airport is an area on land and/or water with specific boundaries used as a place for aircraft to land and take off, embark and disembark passengers, load and unload cargo, and transfer between modes of transportation, equipped with aviation safety and security facilities, as well as other basic and supporting facilities a, [3]. The role of airports in Ministerial Regulation No. 69 of 2013 concerning the National Airport System is that airports serve as drivers and supporters of industrial and/or trade activities as referred to in Article 4 letter d, namely from the surrounding areas in order to drive and support industrial, trade and/or tourism activities in promoting national development dynamics, as well as integration with other development sectors [4] .

Given this reality, there is a need for an integrated information system that can be used to monitor Avsec personnel data, license status, and training history efficiently and accurately. This system is expected to assist managers in setting training priorities, detecting licenses that are about to expire, and improving the efficiency of human resource management in the airport environment.

Based on this background, this study formulates two main problems: How to design an Aviation Security personnel information system for optimal monitoring and management at Djalaluddin Gorontalo Airport, and What are the important features in the system needed to support decision-making related to personnel development?

The objective of this study is to design a web-based information system capable of comprehensively integrating Avsec personnel data and identifying relevant features to support administrative processes and decision-making, such as license notifications, training history, and recurrence applications. Through the development of this system, it is hoped that Avsec personnel management can become more effective, efficient, and transparent, and capable of supporting the improvement of overall aviation security quality.

2 METHOD

This study uses a Research and Development (R&D) approach with the ADDIE. Research and Development (R&D) is a method of creating or developing a product that is useful in a particular field of work and can be accounted for [5]. According to Branch in Sugiyono, 2017:38, the ADDIE stages are an extension of (Analysis, Design, Development, Implementation, and Evaluation) [6]

This approach was chosen because it is suitable for producing a website-based information system product that can be implemented directly in the operational context of an airport. The following are the system design stages in this study, as outlined by the ADDIE method:

1) Analysis
   This initial stage aims to identify the needs and challenges in developing the device. The analysis includes determining the purpose of the device, understanding the target users, technical specifications, and available resources. In addition, observations, feasibility studies, and system requirements analyses are conducted to ensure that the device being developed meets user needs and has added value and competitiveness. In this stage, the author identified the aviation security needs at Djalaluddin Gorontalo Airport regarding the required information system, as well as analyzed the dominant licensing issues and the need for upgrading to Junior Avsec. The analysis results indicate the necessity of developing an aviation security information system to streamline administrative processes and personnel management at Djalaluddin Gorontalo Airport.
2) Design
   The next stage is the detailed design of the device concept. The design activities in the ADDIE development research model are a systematic process, starting from the concept and content in product design [7]. The design includes the creation of initial prototypes, system flowcharts, hardware or software architecture, and user interfaces. This stage also includes selecting technology, testing strategies, and compiling technical specifications so that the device can be developed efficiently and in accordance with applicable standards. In this stage, the author designs a database structure to store personnel and avsec license data, determines the main features (license monitoring dashboard, recurrence notifications, and training submissions), and compiles flowcharts and system prototypes.

   a. System design, This system also has two interfaces, namely user admin and employee user (personnel), which can help staff and avsec personnel enter data more quickly and efficiently. Figure below is a use case diagram that explains the two interfaces of the information system that the author will develop.

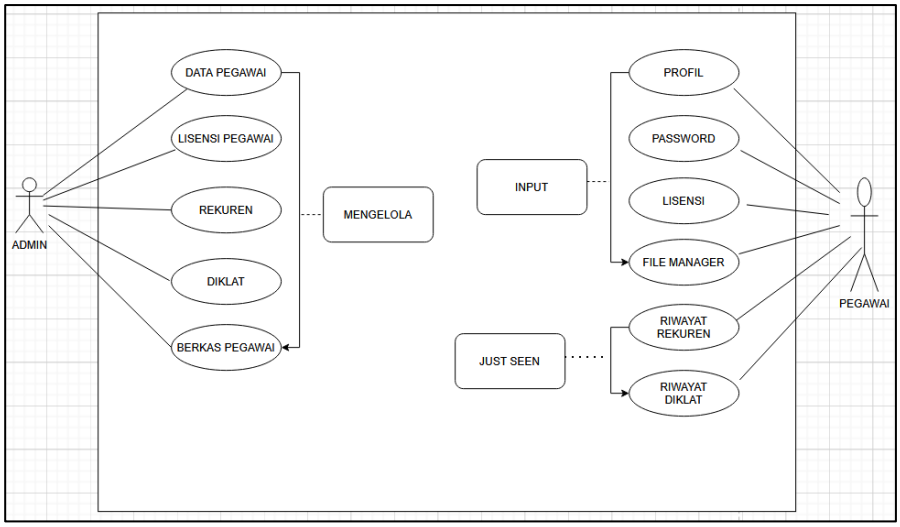


Figure 1 Use Case Diagram

b. Website menu structure, this structure outlines the various menus that will be displayed on the website.

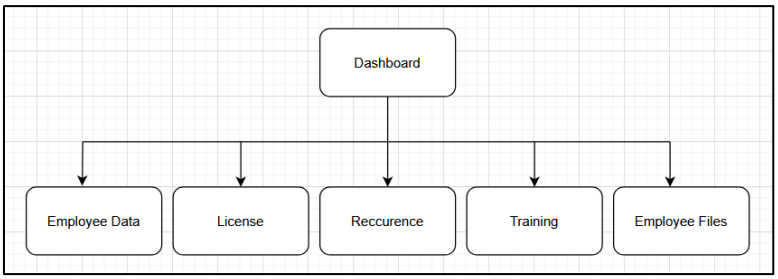


Figure 2 Website menu structure

3) Development
At this stage, the design concept begins to be realized into a testable device. The development process includes the design and assembly of the device, software programming, and the integration of various components so that the device can function according to specifications. Initial testing is carried out to ensure that the device works properly before proceeding to the implementation stage. In this stage, website-based system coding is carried out in accordance with the design and implements features for recording and monitoring avsec licenses. Then, if the website is not yet available, the author can proceed to the next stage, which is implementation at the airport.

4) Implementation
The implementation stage is the phase in which the developed system begins to be used by users to ensure that all features function in accordance with the original design [8]. The developed device was then tested in a real environment or given to early adopters to gather feedback. Data on device performance, user experience, and potential improvements were collected for further analysis. If necessary, technical documentation, user training, or operational guidelines were provided so that the device could be used optimally. At this stage, the author conducted system testing in a limited environment, specifically at Djalaluddin Gorontalo Airport, with section heads/staff from aviation security and emergency services. The author also conducted user training for aviation security personnel via Zoom (online) and then implemented the system gradually.

5) Evaluation
The evaluation stage is a process of assessing the implemented system to determine the extent to which it meets the development objectives [9]. This final stage focuses on a comprehensive assessment of the developed tool. The evaluation is conducted through user testing, system performance analysis, and stakeholder feedback. The evaluation can be formative (during development) or summative (after implementation). The evaluation results are used to refine the tool, improve its functionality and reliability, and ensure that it meets standards and requirements before being released widely. At this stage, system performance is evaluated based on user feedback and monitoring of the system's effectiveness in optimizing the management of avsec human resources.

3 RESULTS

This research resulted in the design and development of a website-based information system to monitor and manage Avsec personnel at Djalaluddin Airport in Gorontalo, using the ADDIE model in an R&D approach. The analysis stage was carried out to understand user needs, field issues, and formulate relevant solutions as the basis for system development. One of the main results of this website design is the menu for employee data, licenses, recurrence, training, and employee files. This website was designed using Visual Studio Code and the Laravel PHP-based platform, and MySQL was used to store the database structure. The final result of the system design is a user interface (UI) that is simple, responsive, and consistent, allowing Avsec personnel and administrators to interact seamlessly—whether via office computers or mobile devices:

1) Personnel Data Management

One of the main outcomes is a centralized personnel database that allows administrators to record, update, and monitor Avsec employee profiles. This feature includes biodata, license type (Basic, Junior, Senior), duty assignment, and training records. The system also enables the upload of supporting documents, ensuring more accurate and transparent personnel management.

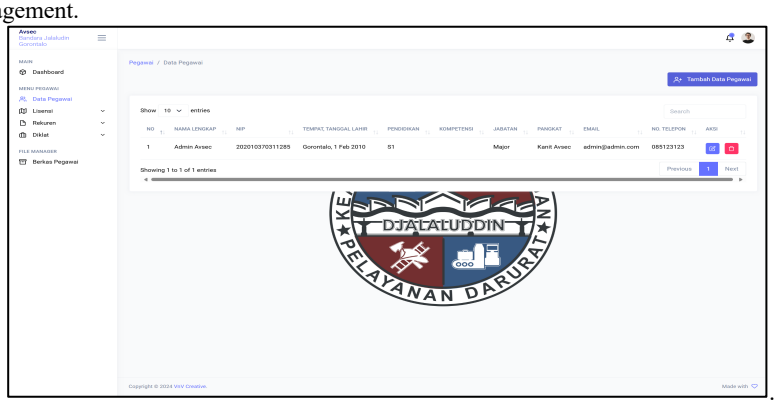
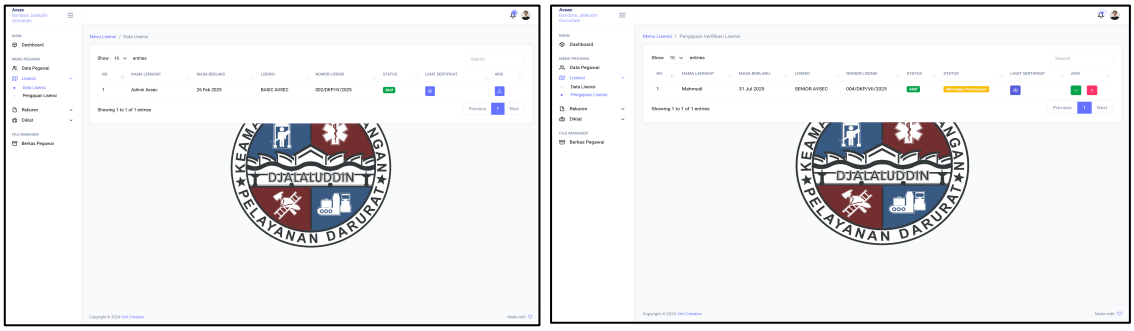


Figure above shows the **Employee Data menu** on the Aviation Security Information System at Djalaluddin Gorontalo Airport. This menu displays a structured table containing personnel information such as full name, employee identification number (NIP), place and date of birth, educational background, competency level, job title, rank, email, and telephone number. On the right side of the interface, the "Action" column provides buttons to edit or delete personnel data, allowing administrators to manage records efficiently. At the top-right corner, there is also have "Add Employee Data" button, which enables administrators to input new personnel information directly into the system. In addition, the search box helps users quickly find specific employee records. This menu serves as the main access point for administrators to monitor, update, and maintain Avsec personnel information in a transparent and organized manner.

2) License Monitoring and Notifications

The system provides a license management module that tracks license validity and issues automatic notifications when a license is nearing expiration. This feature ensures that no personnel operate with expired licenses and facilitates timely submission of recurrence training requests.



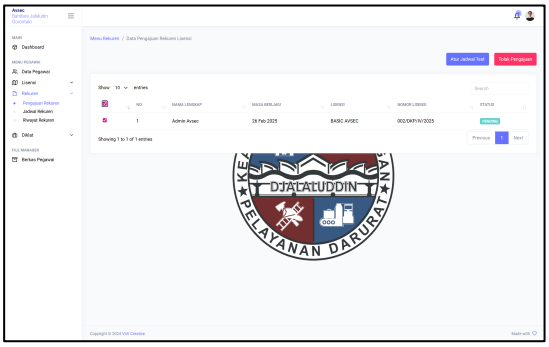
(a) (b)

Figure 3. (a) Tenant information menu display (b) Terms and conditions menu display

Image A is the license data page, which displays all AVSEC personnel licenses. Administrators can also monitor whether the licenses of personnel are active or not. Image B displays the license verification submission page. On this page, the administrator has the authority to verify the license certificates submitted by personnel by selecting one of two options: "Yes" to approve or "No" to reject the license verification.

3) Training and Recurrence Management

This Another result is the integration of training and recurrence data. Avsec personnel can submit recurrence requests through the system, while administrators can approve and archive them digitally. The training history feature records all training attended by personnel, making it easier for managers to identify skill upgrades and compliance.



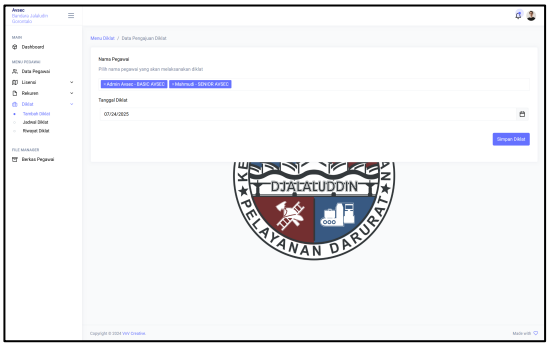
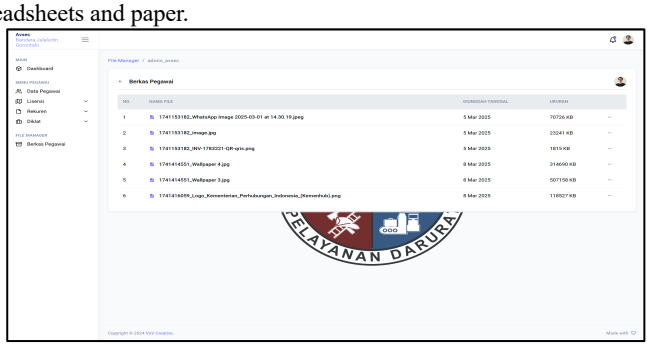


Image a shows the reccurence application page. On this page, Aviation Security (Avsec) personnel can submit a reccurence application after receiving notification that their license is about to expire. Next, the admin will schedule the reccurence test based on the submitted requests. Image b shows the training data addition page. On this page, the admin is responsible for adding the training schedule for personnel who have been selected to participate in the training program, so that information related to time and activities can be well organized in the system.

4) Document Management
The system includes a document directory for each employee, where digital files such as license certificates, training records, and administrative documents can be uploaded and stored securely. This replaces the manual filing system previously done with spreadsheets and paper.



The image above shows the file management page. On this page, administrators can manage various files that have been uploaded by personnel for administrative purposes, such as license supporting documents, training certificates, and other requirements needed for personnel data management.

5) User Interface (UI) and Accessibility
The final system design produced a user-friendly and responsive interface for both administrators and Avsec personnel. The admin interface includes menus for personnel data, license verification, training approval, and document management. Meanwhile, the personnel interface allows employees to view their data, submit recurrence requests, update personal profiles, and upload documents. The system can be accessed via office computers and mobile devices, supporting flexibility in daily operations.

6) System Testing
System testing was conducted by validating the Aviation Security information system design that had been developed. Validation was carried out by several parties, namely IT experts from the Surabaya Aviation Polytechnic and superiors, staff, and personnel from the Aviation Security and Emergency Services Office at Djalaluddin Gorontalo Airport. During the testing process, the information system could be accessed via the URL https://avsecdjalaluddin.my.id. Each validator assessed the main components of the system, such as website access, login features, license monitoring dashboard, notifications, and others. The testing process with the airport authorities was conducted online via Zoom, which was used as a step to maximize the use of the system.

7) Validation Results
Validation by airport administrators and IT experts shows that the system meets feasibility and usability standards. Evaluation aspects included website accessibility, dashboard display, navigation, form functionality, and data processing accuracy. The results demonstrate that the system achieved over 90% validation scores across all aspects, confirming its reliability for operational use. Specifically, the effectiveness of the system can be seen from the following aspects:
   a Admins can manage personnel data digitally, including adding, editing, and deleting employee data, as well as monitoring license status and training history. This feature makes it easier for admins to administer and supervise Avsec personnel.

b Avsec personnel can upload license documents and apply for recurrence training or training courses online. This process becomes more efficient as it is done digitally, reducing reliance on manual methods.
c Automatic notifications for licenses nearing expiration help personnel and administrators take timely action, thereby minimizing the risk of licenses not being renewed.
d A responsive and user-friendly interface ensures that users can interact with the system without difficulty, whether via computer or mobile device.
e Data access security is maintained through clear access rights allocation between administrators and users, ensuring that each party can only access information relevant to their role.

Based on these results, it can be concluded that the Aviation Security information system significantly enhances the effectiveness of monitoring and managing Avsec personnel at Djalaluddin Gorontalo Airport. This is evidenced by all evaluation aspects receiving a "satisfactory" rating and positive feedback from all parties involved in the validation process.

CONCLUSION

Based on the results of research and discussion from the previous chapters, it can be concluded that the Avsec personnel information system at Djalaluddin Gorontalo Airport was successfully designed and developed using an R&D approach with the ADDIE model, based on a website (Laravel & MySQL) with a responsive interface. This system replaces manual methods with integrated digital methods for administration, license monitoring, and training history management. The system aims to streamline and simplify personnel administration and monitoring, featuring key functionalities such as personnel data management, license management, automatic notifications, training history/recurrence tracking, and document management.

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