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Design of Progress Logbook for Operational and Watchroom Recording at YIA Airport

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Abstract: Aviation safety is a crucial aspect that requires the support of a reliable information system, particularly in the Airport Rescue and Fire Fighting (ARFF) unit, which plays a key role in handling airport emergencies. At Yogyakarta International Airport (YIA), activity reports and watchroom monitoring are still recorded manually, making the process prone to errors, delays, and inefficiencies. This study aims to design and develop ARFF Progress Logbook, a web-based portal that facilitates daily report recording and real-time, integrated monitoring of watchroom activities. The research method used is Research and Development (R&D) with the Waterfall model, covering the stages of needs analysis, system design, implementation, as well as testing and evaluation based on ISO 25010 standards. System testing was conducted through a functionality checklist and by distributing questionnaires to ARFF personnel and IT experts, focusing on aspects of functional suitability, usability, compatibility, and performance efficiency. The results show that all main features of the Progress Logbook system have functioned well, with the system obtaining an average score above 85% across all ISO 25010 evaluation aspects, thus being categorized as highly feasible for implementation. The system improves recording efficiency and monitoring effectiveness in ARFF operations, supporting integrated, responsive, and modern aviation safety standards.

Keywords: ARFF, Progress Logbook, Watchroom, Aviation Safety, Report Digitalization

INTRODUCTION

Aviation safety is a crucial aspect of the aviation industry as it concerns the safety of human lives and the overall operation of airports. Every airport is required to have a reliable safety system to anticipate and respond to potential accidents or flight emergencies that may occur at any time. One key element of this safety system is the Airport Rescue and Fire Fighting (ARFF) unit, whose primary duty is to provide rapid and effective rescue and firefighting in the event of an incident within the airport environment [1]. The responsibilities of ARFF are not limited to major accident situations but also include various minor incidents such as fuel leaks, aircraft engine overheating, and non-operational incidents that may pose potential safety threats [2].

As the front-line unit in emergency response, ARFF is required to have clear and strictly documented standard operating procedures. This ensures accuracy of action in emergency

situations, readiness of personnel under critical conditions, and compliance with applicable international and national regulations. Such documentation includes incident records, daily reports, readiness status of rescue vehicles and equipment. It also covers personnel health and preparedness records, all of which must be documented consistently [3]. The completeness and accuracy of this documentation are crucial as they form the basis for evaluation, risk analysis, and decision-making by airport management in maintaining overall flight operational safety.

In the operational context of Yogyakarta International Airport (YIA), ARFF plays a vital role given its status as an international airport serving numerous domestic and international flights with high frequency. As flight intensity increases, the challenges and operational complexities faced by ARFF at YIA also grow. Currently, the process of recording daily operational activities, incidents, and monitoring activities carried out by watchroom personnel still relies on conventional methods such as manual entry in daily logbooks and separate spreadsheet files. This condition leads to operational challenges such as the risk of data loss due to damage or loss of physical documents, difficulty in quickly searching and retrieving data when needed, and potential recording errors caused by human error that may affect the accuracy of critical information. Furthermore, manual or semi-digital recording methods that are not integrated also cause difficulties in coordination between units or between watchroom shifts. In emergency situations that require quick decisions, delays in information or inaccuracies in recorded data can have serious implications on the effectiveness of operational response, potentially slowing down critical rescue and firefighting efforts [4].

Several aviation incidents have demonstrated how negligence in recording and coordination systems can have fatal consequences. For example, in 2016 at Halim Perdanakusuma Airport, a Batik Air Boeing 737-800 collided with an ATR-42 aircraft being towed across the runway. The incident caused a fire on the aircraft's wing, although there were no fatalities. Investigation revealed that inaccurate coordination between air traffic control units and ground handling vehicles was the main trigger. In this context, fast and accurate recording and documentation are essential for post-incident evaluation and safety audits. On the international stage, the collision between a Japan Airlines Airbus A350 and a Coast Guard aircraft at Haneda Airport, Tokyo, on January 2, 2024, serves as a major lesson in the strategic role of ARFF. Although the Airbus aircraft was engulfed in flames, all 379 passengers were evacuated in under three minutes thanks to the preparedness of ARFF and a well-standardized, well-documented emergency response system. This case provides clear evidence that an integrated digital system can accelerate response, reduce human error, and enhance overall safety.

These two cases illustrate the critical importance of reliable recording and documentation systems in supporting rapid and accurate emergency response. This is increasingly relevant to the current conditions within YIA's ARFF unit, where there are still issues related to the speed and accuracy of recording that run counter to ARFF's basic operational principles. The problems in data recording and management methods emphasize the need for a more modern, integrated, and digital-based recording system to support ARFF performance at YIA. Digital solutions are expected to overcome these operational challenges while improving the effectiveness and efficiency of daily data recording and operational activities carried out by ARFF personnel.

The rapid development of information technology offers significant opportunities to improve efficiency and effectiveness in various work processes, including aviation safety, particularly within ARFF units. In response to the growing need for digitalization of recording and documentation, a digital information system called "Progress Logbook" has been designed. This web-based portal is specifically developed to meet the operational needs of ARFF at Yogyakarta International Airport (YIA). Progress Logbook provides core functions such as digital recording of daily reports, incident logs, documentation, and support for routine monitoring activities conducted by watchroom personnel. The implementation of this system

is expected to improve the speed of operational response through the availability of accurate and real-time data, enhance data security through safer and more reliable storage, and facilitate safety audits and performance evaluations regularly conducted by airport management and regulators.

A relevant previous study on the successful development of a digital system for ARFF units was conducted by gede Andhra Paradipta, (2024) titled "Design of ARFF Smart Application to Support PKP-PK Vehicle Maintenance Activities." This study aimed to design and develop the ARFF SMART APPLICATION (ASAP) to support vehicle maintenance activities in the Airport Rescue and Fire Fighting unit at I Gusti Ngurah Rai International Airport, Bali. The research resulted in the development of the ASAP application, which was evaluated as "highly feasible" by media/IT experts with a score of 89.5% and maintenance experts with a score of 92.5%. Product testing also indicated that 54.39% of personnel were very satisfied, 44.39% were satisfied, and 12.5% were moderately satisfied with the application. These results prove that the application was effective in assisting vehicle maintenance activities within the ARFF unit.

Based on the problems described above, this research, titled "ARFF Progress Logbook YIA – Reporting and Watchroom Log Portal", aims to develop an information system named "Progress Logbook" for the ARFF unit at Yogyakarta International Airport. This system is intended not only to improve the efficiency of operational data recording and management but also to strengthen aviation safety standards through the integration of fast, accurate, and well-documented information. Thus, the implementation of this research is not only applicative but also strategic in supporting modern, safe, and internationally standardized airport operations.

METHOD

This study uses the Research and Development (R&D) method to produce a web-based information system named ARFF Progress Logbook YIA, which can be used to support the reporting and watchroom activity monitoring processes in the ARFF unit at Yogyakarta International Airport. The system development model used in this study is the Waterfall model, consisting of five main stages: requirements analysis, system design, system implementation, system testing, and evaluation and improvement.

In this study, the developed tool is the ARFF Progress Logbook YIA information system. To facilitate understanding, the instrument components are divided into two main parts: hardware and software. At the system testing stage, ARFF Progress Logbook YIA was evaluated to ensure that all features worked according to specifications and met the ISO 25010 quality standards. The data analysis technique applied in this study is descriptive quantitative analysis. Quantitative data were obtained through the distribution of system evaluation questionnaires to both users and experts, based on the ISO 25010 software quality standards. The questionnaire was developed according to four main aspects being tested: functional suitability, usability, compatibility, and performance efficiency. Each item was rated using a Likert scale from 1 to 5, where a score of 1 indicates "very non-conforming" and a score of 5 indicates "highly conforming."

This research was conducted in the Airport Rescue and Fire Fighting (ARFF) unit at Yogyakarta International Airport (YIA), located in Kulon Progo Regency, Special Region of Yogyakarta. This location was chosen because the ARFF personnel at the airport are the primary users of the Progress Logbook system developed in this study. The ARFF Progress Logbook system is designed to support the processes of daily report recording, documentation, and integrated digital monitoring of watchroom activities.

RESULTS AND DISCUSSION

Result

Analysis Stage

a. ARFF Progress Logbook System Requirements Analysis

Interviews with ARFF team personnel indicated that most staff members wanted a digital-based system that:

1) Makes it easier for them to fill out daily reports in a standardized format,
2) Provides a dashboard view to monitor team status, shifts, and fire extinguisher conditions,
3) Stores data on a server that can be accessed by the Manager for audit or periodic evaluation purposes.

b. System Requirements Analysis

From the results of this analysis, it can be concluded that the information system to be developed must have features that meet the following functional and non-functional requirements:

Table 1. Functional & Non-Functional Requirements

Type of Requirement	Requirement Description
Functional	
F1. Report Recording	The system must provide a digital input form for ARFF daily activity reports that is properly documented.
F3. Watchroom Monitoring	The system must display information on shift schedules, personnel conditions, and equipment readiness status.
F4. Information Dashboard	The system must provide a dashboard for Managers to view summaries of reports, activities, and ARFF status.
F5. System Activity Log	The system must record all user activities (login, data entry, data modifications) as a history log.
F6. User Management	The system must manage different access rights for regular staff, watch teams, and admins/Managers.
Non-Functional	
NF1. System Availability	The system must be available and accessible 24 hours a day under normal operations.
NF2. Data Security	The system must use login authentication and restrict access based on user roles.
NF3. Performance	The system's response time must be a maximum of 2 seconds for normal data processing.
NF4. Compatibility	The system must run on various devices (PC, laptop) and across multiple browsers.
NF5. Usability	The system interface must be easy to understand and use by staff without a technical IT background.
NF6. Maintainability	The system must be designed modularly and well-documented to facilitate development or maintenance..

Design Stage

a. User Interface and System Flow Design

1) User Interface Design

User interface (UI) design is an important stage in the development process of the Progress Logbook system because it directly affects the user experience in operating the application. The interface is not only intended to make the system visually appealing but must also consider functionality, ease of navigation, and clarity of information so that it can be used optimally by ARFF personnel from various technical backgrounds.

In its development, the Progress Logbook system interface was designed with a simple and intuitive approach. Users can easily recognize the main features upon entering the system, such as the report logging menu, watchroom monitoring, and the

supervisor dashboard. The navigation structure is arranged hierarchically and consistently across all pages, with the main menu placed on the left side (sidebar) and additional menus at the top (header), following standard practices for web-based information systems.

The daily report input form is designed to resemble the manual format commonly used by personnel, ensuring a smooth transition to the digital system. Elements such as date, team, activity type, equipment status, and daily notes are displayed in a concise, easy-to-fill form. The form also includes input validation to ensure that the data entered meets applicable standards.

For the watchroom monitoring feature, the interface displays the list of active personnel, attendance status, shift schedule, and equipment status in an easy-to-read dashboard view. Status visualization uses colored icons (e.g., green for active/ready and red for not ready) to enable quick identification by supervisors.

For managers and administrators, the dashboard interface displays daily report summaries, operational activity graphs, and user activity logs, which can be filtered by date and user. This feature is useful for team performance evaluation and internal audits. The interface design applies a responsive design approach so that the system can be accessed and displayed properly on various devices, whether desktop or laptop. The visual language uses high-contrast colors and clear fonts to ensure readability even in low-light watchroom conditions.

Overall, the Progress Logbook interface is designed to accommodate the operational needs of ARFF personnel directly, prioritizing ease of use, readability, and efficient access to frequently used core features.

2) System Flow

The diagram below illustrates the system flow of ARFF Progress Logbook.

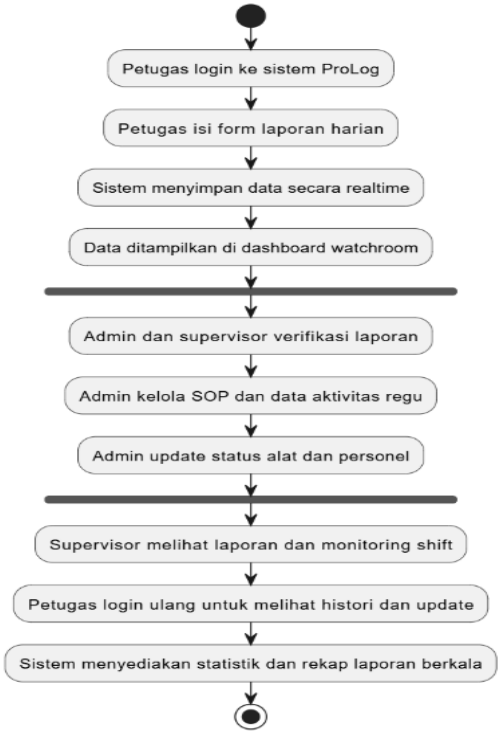

Figure 1 System Flow
(Source: Processed by the author)

The Progress Logbook system flow describes how the workflow proceeds from start to finish in the web-based ARFF reporting and monitoring platform. This flow represents interactions between officers, administrators, and supervisors through a sequence of documented activities. The process begins when an officer logs into the Progress

Logbook system using their account. After logging in successfully, the user is directed to access the daily report form provided. In this form, the officer records important information such as the team on duty, time and type of activity, equipment status, and additional notes relevant to that day's operations.

Once the report is filled in and submitted, the system immediately stores the data in a centralized database in real time. This process is automatic, ensuring that the data is instantly available for display on the next page.

The submitted report information is displayed on the watchroom dashboard a core system feature that shows current operational conditions, including team status, shift schedules, and equipment readiness. After being displayed, the process continues with verification by the admin and supervisor, who ensure that the submitted data is valid, complete, and accurate. This verification is crucial to guarantee that the information can be used for evaluations or follow-ups.

Next, the admin has the authority to manage team documents and activity data. The admin can update documents, add procedural information, and manage access so documents are always available to all users. The admin can also manually update equipment and personnel status if urgent changes occur, such as tools becoming unserviceable or teams being under special conditions.

After verification and updates are complete, the supervisor can use the system to review reports and monitor team activities in real time. The supervisor's dashboard provides an overview of operations, supporting quick and accurate decision-making.

Officers can also log back into the system to view previous report histories and make updates if needed. This feature supports continuous documentation and task tracking over time.

As the final stage of the cycle, the system periodically generates statistical reports and activity summaries for performance evaluation, safety audits, and other managerial needs. This process is automated using validated data stored in the database during previous stages.

3) User Interface Wireframes

a) **Login Screen**

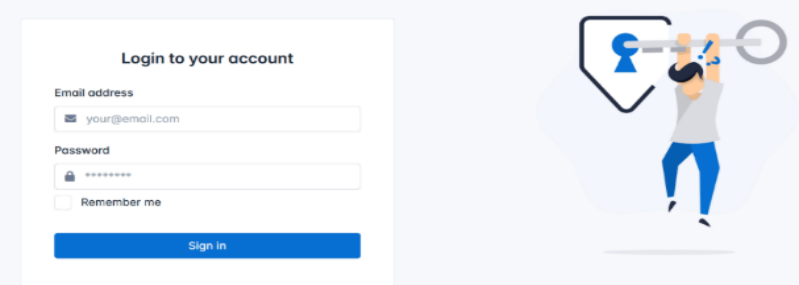

Figure 2. Login Screen
(Source: Processed by the author)

The figure shows the interface of the system's web-based login page. The layout is designed in a minimalist and professional style, providing secure and easy access for users.

b) **Watchroom Logbook Screen**

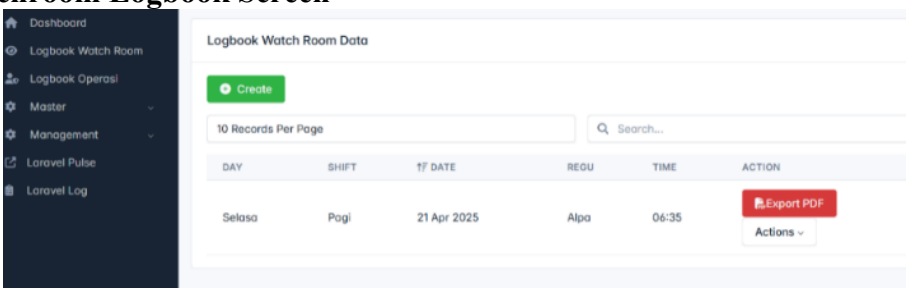

Figure 3. Watchroom Logbook Screen
(Source: Processed by the author)

The figure shows the Watchroom Logbook interface of the Progress Logbook system. This page is designed to facilitate digital and structured logging and monitoring of ARFF watch team activities.

c) **Operations Logbook Screen**

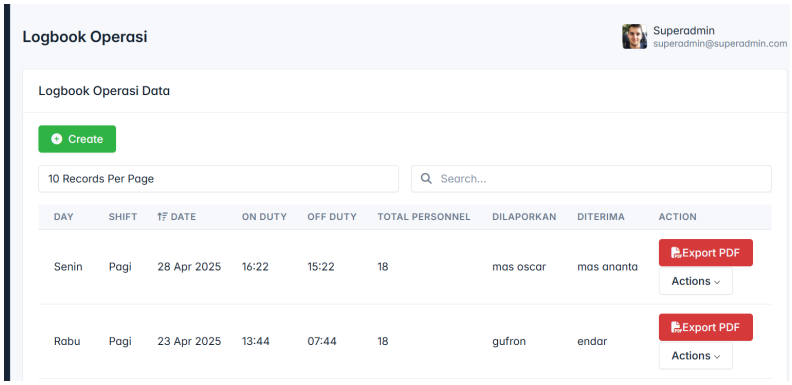

Figure 4. Operations Logbook Screen
(Source: Processed by the author)

The figure shows the Operations Logbook page in the Progress Logbook system. This page serves as the main documentation center for ARFF team operational activities, especially regarding duty times, the number of personnel on duty, and records of who reported and received task handovers.

b. Database Structure Design

1) Database Structure

The database is designed relationally to manage data in a structured, consistent, and traceable manner for monitoring, reporting, and evaluating team performance. The design follows data normalization principles to avoid redundancy and supports table integrity so that relationships between entities can be managed efficiently.

Table 2. Database Structure

Table Name	Structure Description
Users	id_user (PK), name, email, password, role
LogbookWatchroom	id_*watchroom* (PK), date, day, shift, regu, time, created_by (FK: Users)
*Logbook*Operasi	id_operasi (PK), date, day, shift, on_duty, off_duty, total_personel, dilaporkan, diterima, created_by (FK: Users)
Shifts	id_shift (PK), shift_name, waktu_mulai, waktu_selesai

Equipments	id_equipment (PK), nama_alat, status_alat, lokasi, updated_by (FK: Users)
ActivityLogs	id_log (PK), user_id (FK: Users), aktivitas, timestamp

In general, the Progress Logbook database consists of several main entities, namely Users, LogbookWatchroom, LogbookOperations, Shifts, Equipments, and ActivityLogs.

The Users table stores user account information such as name, email, encrypted password, and user role (e.g., staff, admin, or supervisor). Foreign key relationships are used to link users with logbook entries and system activities.

2) System Navigation Design

The navigation structure is built using a sidebar menu model located on the left side of the screen, containing a list of main pages according to the user's role. The menu is dynamic, meaning it will differ depending on whether the user logs in as crew staff, admin, or supervisor. The use of icons, clear text labels, and a hierarchical sub-menu structure helps users understand the context of each page without confusion.

Below is a table showing the main pages in the Progress Logbook system along with descriptions and key features of each page:

Table 3. Progress Logbook System Navigation

Page	**Description / Main Features**
Dashboard	Displays a summary of activities, system notifications, and the readiness status of teams and equipment.
Logbook Watch Room	Activity recording form for the team, including shift, time, team status, and personnel attendance.
Logbook Operations	Stores daily operational data: duty time, total personnel, and task handover.
Monitoring Watchroom	Real-time dashboard displaying equipment status, active teams, and ongoing shifts.
User Management	Admin page for managing user accounts, roles, and system access rights.
Reports & Statistics	Page for downloading logbook reports and viewing statistical summaries of operational activities.
Activity Log	Displays user activity history (login, data entry, editing, deletion).
Account Settings	Page for changing passwords, personal information, and account security settings.

3) Admin Navigation

Users with an admin role have the broadest access in the Progress Logbook system, as they are responsible for data management, user administration, and verification of reports from the watch teams. The navigation provided for admins is designed to be comprehensive and structured, making it easier to carry out administrative tasks and oversee the system's operations in full. After successfully logging in, the admin is directed to the Dashboard, which displays an overview of operational status such as the number of incoming reports, team readiness status, and personnel attendance statistics. On the left side of the screen, the admin has access to the main navigation menu via a sidebar containing a number of important, interconnected pages.

Table 4. Admin Navigation

Page	Description / Key Features
Dashboard	Displays a summary of report status, active teams, and daily operational charts.
Logbook Watchroom	View and verify daily watch team reports, including activities and reporting times.
Logbook Operations	Monitor on-duty/off-duty data, total active personnel, and report submitters/recipients.
Monitoring Watchroom	View equipment status and personnel attendance in real-time with visual indicators.
User Management	Create, edit, or deactivate user accounts and set access rights based on roles.
Activity Log	Track user activities such as logins, data entry, and report modifications.
Reports & Statistics	Provide activity summary charts and export operational reports to PDF or Excel.
Account Settings	Manage admin personal information, change passwords, and configure account notifications.

4) Use Case Diagram, Flowchart, and ERD

1. Use Case Diagram

A use case diagram is used to illustrate the interaction between actors (system users) and the system itself in the context of the available functionalities. This diagram shows how each user role such as Crew Members, Admin, and Supervisor interacts with the various features provided by the Progress Logbook system.

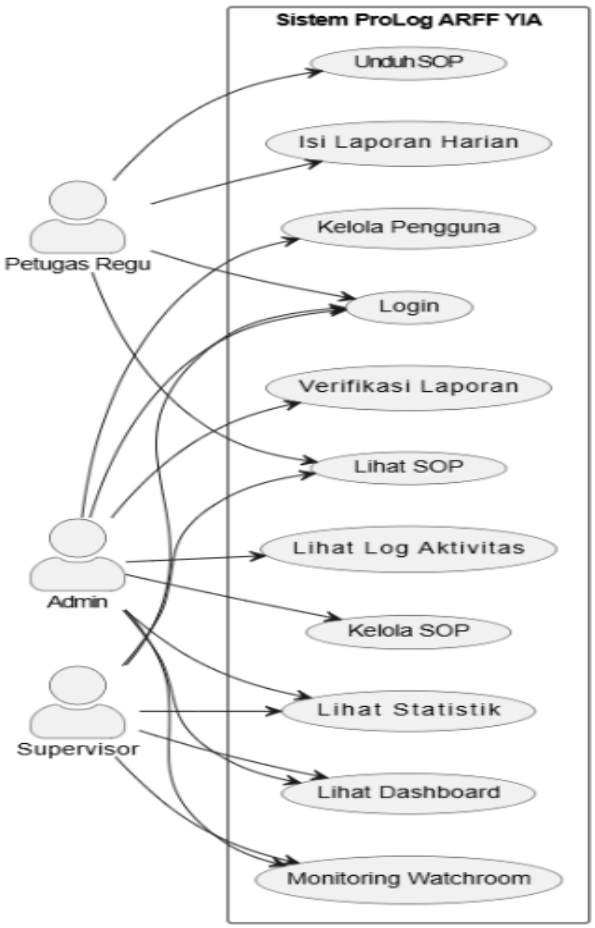

Figure 5. Use Case Diagram (Source: Processed personal data)

2. System Flowchart

The purpose of designing the flowchart is to visually and systematically depict the logical flow of the ARFF Progress Logbook YIA system. This flowchart helps in understanding the system's workflow, from data input by users to data storage and display by the system. The design of this flow also serves as a basis for translating user requirements into well-structured system functions.

a) **Login and Dashboard Access Flowchart**

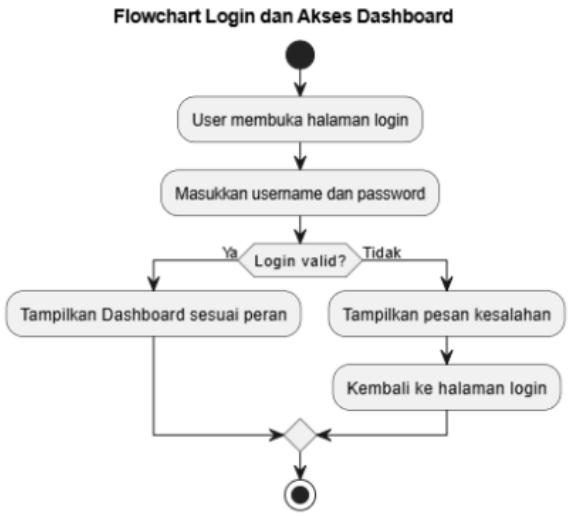

Figure 6. Login and Dashboard Access Flowchart
(Source: Processed personal data)

Based on the flowchart, the initial stage is when the user enters their username and password, after which the system verifies the credentials. If valid, the user is directed to the dashboard according to their role; if invalid, the system will display an error message.

b) **Daily Report Input Flowchart**

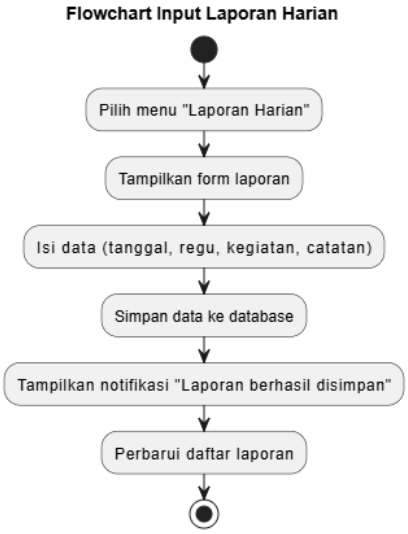

Figure 7. Daily Report Input Flowchart
(Source: Processed personal data)

Based on the flowchart, the initial stage is when the user selects the “Daily Report” menu. The system then displays the report form. The user fills in the activity data (date, crew, activity, notes). Afterward, the data is submitted and stored in the database, and the system will display a “successfully saved” notification.

c) **Watchroom Monitoring Flowchart**

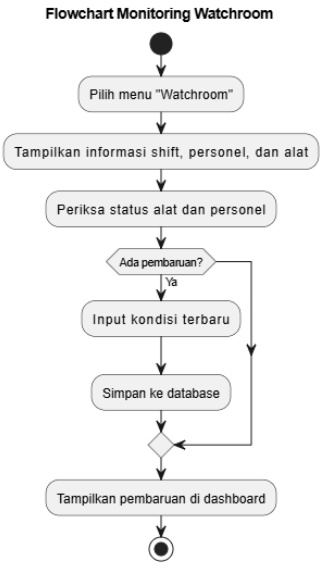

Figure 8. Watchroom Monitoring Flowchart
(Source: Processed personal data)

Based on the flowchart, the officer can select the “Watchroom” menu, which displays information on shifts, active personnel, and the status of other equipment.

3. **Entity Relationship Diagram (ERD)**

The Entity Relationship Diagram (ERD) is a visual representation of the database structure, showing entities, attributes, and relationships between entities in the system. The ERD functions to model how data is stored, interconnected, and managed in the Progress Logbook system. With an ERD, the design and development process becomes more directed because each entity has a clear relationship, avoiding data duplication and ensuring information integrity. In the ARFF YIA Progress Logbook system, there are several main entities, such as Users, LogbookWatchroom, LogbookOperasi, Shifts, Equipments, and ActivityLogs. Each entity has specific attributes and is linked using one-to-many or many-to-one relationships depending on the usage context.

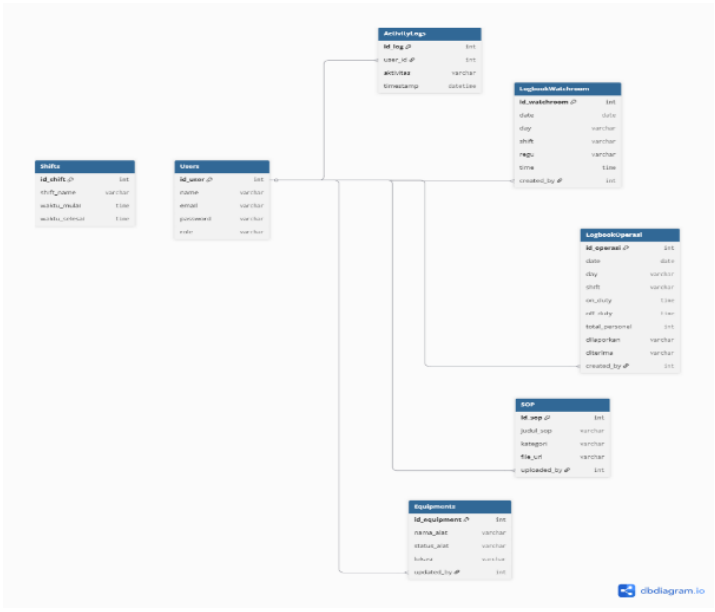

Figure 9. ERD Diagram
(Source: Processed personal data)

Development Stage

1. **Selection of Development Method**

In developing the Progress Logbook system to support documentation reporting and watchroom monitoring operations at the ARFF Unit of Yogyakarta International Airport (YIA), the method used is the Waterfall Model. This method was chosen because it offers a structured and systematic approach, suitable for small to medium-scale information system development projects with well-defined scope and requirements from the outset. The Waterfall Model is one of the classic models in software engineering, first introduced by Winston W. Royce in 1970. The main characteristic of this model is its linear and sequential approach, where each stage must be completed thoroughly before moving on to the next stage. This is highly relevant to the development of the Progress Logbook system, which has a time constraint and a specific end goal: to produce a web-based system that can be immediately used by ARFF officers.

2. **Development Environment**

The development environment refers to the set of hardware and software used during the construction of the Progress Logbook system. The choice of environment is tailored to the needs of a stable, flexible, and easily managed web-based application, especially for an information system to be used by the ARFF Unit of Yogyakarta International Airport. The Progress Logbook system was developed locally using a laptop with a minimum specification of an Intel Core i5 processor, 8 GB RAM, and Windows 11 operating system. These specifications are adequate to support coding activities, system testing, and database management in parallel without significant obstacles. From the software environment perspective, development was carried out using full-stack web development technology with the following details:

Table 5. Development Environment

Component	Details
Programming Language	PHP (Backend), HTML, CSS, JavaScript (Frontend)
Framework and Library	Laravel (MVC Framework), Bootstrap (UI Styling)
Database Management System (DBMS)	MySQL
Text Editor and Development Tools	Visual Studio Code, XAMPP (Apache, MySQL, PHP)

Version Control and Documentation	Git, GitHub
Browser for Testing	Google Chrome, Mozilla Firefox
Supporting Tools for System Design	Draw.io (diagram), Figma (wireframe)

Implementation Stage

a. System Integration

System integration is an important stage after the installation process and separate module testing have been completed. This stage aims to ensure that all components and features developed in the Progress Logbook system can work in an integrated manner, from the frontend and backend to interactions with the database. The integration process is carried out gradually using a modular approach, so that each part of the system can be tested and connected efficiently without causing functional conflicts.

b. **Initial User Implementation**

After the system integration process is completed and internal testing is conducted, the next stage is the initial implementation of the system by the actual users, namely the ARFF unit personnel at Yogyakarta International Airport. This stage is carried out to determine the extent to which the Progress Logbook system can be used directly in supporting daily operational tasks, as well as to identify potential technical issues or improvement needs from the user experience perspective.

Evaluation Stage

a. Validation Results from the Content Aspect

The content aspect includes the feasibility of the information presented on the website. This validation aims to evaluate whether the information provided can support the reporting process accurately, in accordance with ARFF standard procedures, and is easy for users (both visitors and personnel) to understand. Validation was carried out by website/IT experts with the following results:

Table 6. Website Expert Validation Results

No	Validation Elements	Statement	Maximum Value	Value Earned
1	Concept	1) The effectiveness of the logbook recording and watchroom activity monitoring website is adequate	5	4
		2) The website display aligns with the urgency of improving operational recording and transparency of ARFF unit activities	5	4
		3) The display and features of the Progress Logbook website are highly relevant in addressing the digital transformation	5	4
2	Construction	1) The Progress Logbook website has measured system quality based on ISO 25010 (functionality, efficiency, usability, compatibility)	5	4
		2) The main features provide logbook recording, shift change reports, and watchroom monitoring	5	4
		3) The website construction is logical and supports system effectiveness measurement	5	4
3	Language	1) Sentences are composed in easily understandable language	5	4

		2) Uses standard, clear, and unambiguous Indonesian	5	4
		3) Does not confuse or allow multiple interpretations by respondents	5	4
4	Technical Terms	1) Technical terms in the Progress Logbook website are appropriate to the ARFF work environment	5	4
		2) Not overly academic, yet still reflects a practical digitalization system	5	4
5	System Function Suitability	1) The instrument reflects the needs of daily operational logbook recording in the ARFF unit	5	4
		2) The website format supports the evaluation of personnel monitoring effectiveness	5	4

Based on the expert validation results for the Progress Logbook website presented in Table 6, it can be concluded that all validated aspects scored 4 out of a maximum of 5. In the *Concept* element, the website was assessed as effective in recording logbook entries and monitoring watchroom activities, and its appearance was considered relevant to digitalization demands, although there is still room for improvement in conveying the urgency and linkage to digital transformation. The *Construction* element also received the same score, indicating that the website's structure already meets ISO 25010 standards and supports recording and monitoring, but certain technical aspects can still be improved for optimal performance.

Next, in the *Language* element, the use of proper, clear, and unambiguous Indonesian has been well implemented, but could still be refined to be more concise and easily understood by all user groups. The *Technical Terms* element received a similar score, indicating that the terms used in the system are already aligned with ARFF work context and the academic field, yet still need alignment to be more practical and applicable. Finally, in the *System Function Suitability* element, the website's features and format were assessed as effectively supporting personnel recording and monitoring functions, although their usage effectiveness can still be enhanced.

Overall, the validation results show that the Progress Logbook website is at a high level of feasibility, with a total score of 52 out of 65 or equivalent to 80%. It can therefore be concluded that the website is highly feasible for use, but still requires some refinements to deliver maximum results in supporting ARFF operations**.**

b. Expert Validation Results from the Technical Aspect

Technical aspect validation was conducted to assess the system's overall performance and usability, particularly in terms of interface design, navigation, speed, security, and integration with the Watchroom system.

Table 7. Expert Validation Results

No	Validation Elements	Statement	Expert Rating 1	Expert Rating 2	Expert Rating 3
1	Concept	1) The effectiveness of the website for logbook recording and watchroom activity monitoring is adequate	5	5	5
		2) The website display aligns with the urgency of improving operational	4	5	5

		recording and activity transparency in the ARFF unit			
		3) The appearance and features of the Progress Logbook website are highly relevant in facing digital transformation	4	5	5
2	Construction	1) The Progress Logbook website measures system quality based on ISO 25010 (functionality, efficiency, usability, compatibility)	3	5	5
		2) The main features provide logbook recording, shift handover reports, and watchroom monitoring	4	5	5
		3) The website construction is logical and supports measuring system effectiveness	4	5	5
3	Language	1) Sentences are composed in an easily understandable language	4	5	5
		2) Uses standard Indonesian that is clear and unambiguous	5	5	5
		3) Does not confuse or cause multipl			
4	Technical Terms	1) Technical terms in the Progress Logbook website match the ARFF work environment	5	4	5
		2) Not overly academic, yet still reflects a practical digitalization system	4	4	5
5	System Function Suitability	1) The instrument reflects the needs for daily operational logbook recording in the ARFF unit	4	4	5
		2) The website format supports evaluating the effectiveness of personnel monitoring	4	4	5

Based on the expert validation results presented in Table 7, the Progress Logbook website generally received an excellent assessment from all three experts.

In the Concept element, statements regarding the website's effectiveness in logbook recording and watchroom activity monitoring received perfect scores (5) from all experts, indicating that the system is considered highly adequate in supporting its main function. However, for the aspects of appearance and the relevance of features to digital transformation, there was a slight variation in assessment, with an average score of 4.3. This suggests that, while the appearance is already good, there is still room for refinement from the perspective of some experts.

In the Construction element, two out of three statements received near-perfect scores with an average of 4.7, reflecting that the structure and core features of the system are deemed to effectively support logbook recording, shift reporting, and watchroom monitoring. However, regarding the statement on the system's compliance with ISO 25010 standards, one expert gave a score of 3, resulting in a slightly lower average compared to other indicators. This indicates input for further improvement in the system's functionality, efficiency, and compatibility.

Meanwhile, in the Language element, all indicators received perfect scores (5) from all experts. This signifies that the language used in the system is already very good, easy to understand, non-confusing, and follows standard Indonesian grammar rules. The same applies to the Technical Terminology element, where both statements obtained perfect

scores from all experts, indicating that the terms used are appropriate to the ARFF work context, not overly academic, and practical for application.

In the final element, System Function Suitability, all indicators received high scores with an average of 4.7. The website is considered capable of reflecting the needs of daily operational recording and supporting the evaluation of personnel monitoring effectiveness. Nonetheless, one expert gave a score of 4, indicating that improvements in the format or presentation of information are still possible.

Overall, the validation results show that the Progress Logbook website meets feasibility criteria from various aspects, including concept, construction, language, technical terminology, and system function suitability. The predominance of perfect scores and other high scores reflects that this website is highly suitable for use in ARFF operations, while remaining open to minor refinements based on expert feedback.

c. Interview Results on System Effectiveness

Based on interviews with ARFF YIA personnel, a digital system like Progress Logbook is considered highly supportive of recording and monitoring activities in the watchroom, particularly in aspects of shift scheduling, personnel readiness, and equipment status. The digital system allows all operational information to be recorded in a standardized, easily readable, and real-time accessible format, thereby reducing the risk of errors and data loss. As stated by one respondent:

"With digitalization later on, there will no longer be differences in handwriting, and we will no longer be using paper... all information that was previously recorded manually can now be entered in a standardized way, backed up, and accessed again in real time by both staff and supervisors."

Progress Logbook also provides a dashboard displaying personnel attendance data, shift schedules, and the status of equipment and vehicles in a centralized manner. This greatly facilitates monitoring, supervision, and information exchange between teams:

"From how many personnel will be on duty, how many are present, whether it's the morning, afternoon, or night shift, what time they will work until what time, then which vehicle they will be assigned to, the time explained, and so on... I think this is already very good because it accommodates all the items needed in a logbook record."

The system also makes it easier to track historical data, conduct audits, and validate activities tasks that were previously difficult with a manual logbook:

"Data that is properly stored and well-documented, if something undesirable happens, we can quickly access it just open the date, see who was on duty at the time—it's all recorded there. But with a manual system, we have to open page after page, which I think is ineffective and inefficient."

Furthermore, development potential such as digital signature features, supervisor notifications, and data download capability are highly appreciated by personnel as a means to strengthen data validity and security.

In conclusion, the implementation of the Progress Logbook system strongly supports recording and monitoring activities in the ARFF YIA watchroom, simplifying supervision of shifts, personnel readiness, and equipment status in an integrated and accurate manner.

Discussion

Design of the ARFF Personnel Activity Report Recording System

The manual recording system previously used in the ARFF unit often caused issues such as delays in reporting, transcription errors, and difficulty in retrieving important data. To address these issues, a digital system called Progress Logbook or Progress Logbook was developed, designed to follow the operational workflow of ARFF personnel. Progress Logbook facilitates systematic daily reporting through digital forms containing key elements such as

date, shift, team, equipment status, and activity details. Data entered is automatically stored in a database and can be accessed at any time.

Its simple yet informative interface enables personnel to record data faster, neater, and more accurately. All data is stored automatically and can be accessed whenever needed, eliminating the hassle of searching for physical files. With a concise and user-friendly design, recording becomes more organized, traceable, and supportive of field operations.

The PDF export feature further supports formal documentation needs as typically required by regulators, internal auditors, or management units. With this feature, daily reports can be converted into print-ready formats without additional processing, while maintaining uniformity in the report format submitted to external parties.

This innovation is not merely a replacement for the manual system but represents a deeper integration between information technology and airport rescue operations. Progress Logbook is tailored to the unit's technical and administrative needs, allowing implementation without disrupting established work rhythms. Automatic, centralized data storage—downloadable in PDF format eliminates the need for manual saving or printing as a form of documentation. This indirectly removes the risk of data loss due to physical storage negligence and simplifies auditing and periodic evaluation processes.

With its intuitive interface, the system enables personnel to record activities more quickly, neatly, and accurately. The user interface design prioritizes clear navigation, the use of terminology familiar to ARFF personnel, and logical menu placement, making the system easy to learn even for those not accustomed to intensive digital device use.

All inputted data is stored automatically on the internal server or database and can be accessed at any time when needed. This advantage directly addresses previous problems in the manual system, such as lengthy document searches, the risk of losing physical archives, and data inconsistencies due to repeated unrecorded revisions. The system is also equipped with search and filtering features, enabling quick retrieval of relevant data based on parameters such as date, team, or activity type.

With its concise and user-friendly interface, the recording process becomes more orderly, traceable, and directly supportive of field operations. In the dynamic ARFF operational context, this system plays a vital supporting role, both in routine reporting and in special situations such as emergency incidents or inspections. Progress Logbook standardizes reporting while providing flexibility for accurate and efficient documentation.

Trial implementation at ARFF YIA showed that personnel found the system helpful, as it made reporting easier, more practical, and well-documented. Progress Logbook significantly reduces the administrative burden, allowing personnel to focus more on operational readiness. Initial assessments also revealed high satisfaction levels, particularly regarding accessibility, work efficiency, and data accuracy.

In conclusion, the Progress Logbook system has successfully replaced the manual method entirely and, beyond that, met the need for an orderly, efficient, and digitized recording system. It offers not only a technological solution but also strengthens professional, accountable, and adaptive operational governance. Moving forward, Progress Logbook has the potential to be further developed, whether through cross-system integration, expansion of reporting modules, or enhancement of data security features. This digital transformation demonstrates that innovations based on real field needs can drive efficiency and foster a more orderly and professional work culture within ARFF.

Support for Recording and Monitoring Activities in the Watchroom

The implementation of Progress Logbook impacts not only the recording of daily operational activities but also significantly strengthens the role of the watchroom as the central monitoring and control hub for ARFF operations at Yogyakarta International Airport. The

watchroom serves a strategic function as the primary point for monitoring, coordination, and decision-making in both normal and emergency situations.

Through Progress Logbook integration, the watchroom's role has evolved from merely being a shift change point to an active, digitized information center. Progress Logbook offers several key features to support watchroom tasks, including Watchroom Logbook, Operations Logbook, Inventory, and Vehicles. These features are systematically connected, enabling digital data recording that is automatically stored in the system and can be quickly retrieved without reliance on physical records.

The Watchroom Logbook is designed to document essential basic information related to watchroom duties. Personnel can record shift schedules, names of officers on duty, and significant notes from the shift. Digital recording ensures data is orderly, traceable, and protected from loss, making it easier to monitor and report between teams.

The Operations Logbook records ARFF operational activities, whether routine tasks such as vehicle and equipment inspections, or incidental events such as emergency responses or internal training. Records include date, time, responsible personnel, and activity descriptions. This ensures all operational activities are well-archived for reporting, performance evaluation, and operational audits.

The Inventory feature simplifies the tracking and monitoring of ARFF's equipment, such as personal protective gear, firefighting tools, and communication or rescue devices. Personnel can check availability, condition, and storage locations in real time. This not only improves logistics management efficiency but also promotes accountability, as all data is digitally traceable.

The Vehicles feature logs details of operational vehicles, including unit numbers, types, maintenance schedules, operational readiness, and usage history. This ensures vehicles are ready for deployment and helps prevent operational delays due to late maintenance. Recorded data also informs decisions about repairs or replacements.

All features in Progress Logbook are designed with a simple, informative, and user-friendly interface, allowing all personnel to operate the system without advanced technical skills. The intuitive design speeds up recording and minimizes input errors, fostering an orderly and efficient work environment and facilitating coordination between teams and supervisory staff.

With Progress Logbook, the watchroom now functions more optimally as a responsive monitoring center. Incoming information can be processed quickly and accurately, enabling timely, data-driven decision-making. Beyond administrative support, the system enhances situational awareness and readiness across all operational lines.

In other words, Progress Logbook does more than digitize the manual system it fosters a disciplined, accountable, and data-oriented work habit. It helps personnel work with greater confidence, knowing all activities are systematically documented and easily traceable. In the context of airport safety and readiness, such a system is part of the ongoing effort to improve performance, transparency, and professionalism in service delivery.

System Effectiveness in Improving Efficiency and Reporting

The implementation of Progress Logbook as a digital recording tool in the ARFF unit at Yogyakarta International Airport has undergone validation, trials, and questionnaire surveys to assess its feasibility and effectiveness. This process was conducted thoroughly, involving both subject-matter experts and ARFF field personnel.

Survey results from 62 ARFF personnel showed that the system was generally deemed feasible to support ARFF duties more efficiently, orderly, and with well-documented outputs. The final score was **3.47** (equivalent to 69%), placing it in the "Feasible" category.

The questionnaire evaluated aspects such as operational ease, clarity of instructions, time efficiency, report accuracy, and usefulness in daily tasks. Most respondents indicated that

Progress Logbook made daily activity recording easier and sped up data access. One of the most noticeable benefits was the improved efficiency in administrative work manual processes previously consumed significant time, risked errors, and complicated data retrieval.

The system's effectiveness is reflected in three key areas:

a. Ease of daily digital recording
b. Faster access and tracking of operational data
c. Improved accuracy in report preparation

The tailored digital form enables systematic, quick recording. Data entered is stored directly in the internal database and can be retrieved anytime without needing to search physical archives.

The system also reduces the administrative workload, allowing personnel to focus on core operational duties such as vehicle and equipment inspections.

Additionally, evaluation by four expert validators placed Progress Logbook in the "Feasible" category, with three stating "Feasible for Use" and one stating "Feasible with Modifications." These evaluations considered content relevance, feature usability, ease of use, interface design, and functional benefit indicating the system largely meets operational needs, though improvement opportunities remain.

A major advantage of Progress Logbook is its real-time integration and monitoring capability. Information entered by personnel can be accessed instantly by unit leaders, supporting fast, data-based operational decision-making and enhancing oversight.

Beyond technical benefits, Progress Logbook promotes a more organized, structured, and professional work culture. Features such as PDF export, activity history tracking, and digital vehicle and inventory management contribute to a modern, accountable operational environment.

In conclusion, based on expert validation and field feedback from 62 personnel, Progress Logbook is a feasible system that positively impacts efficiency and the quality of ARFF operational records. It addresses technical shortcomings in manual logging while laying a foundation for orderly, documented, and timely decision-making. With ongoing user-driven development, Progress Logbook has the potential to remain a key tool in supporting ARFF professionalism in the future.

CONCLUSION

The current manual recording system has caused issues such as omissions, illegible handwriting, and difficulty in retrieving data. This study therefore proposed digitalization through the Progress Logbook system. Through the Progress Logbook system, I have drawn several conclusions:

a. Systematic and documented ARFF activity reporting is carried out through a web-based digital platform using the Progress Logbook system. Progress Logbook is designed to follow personnel workflows, from daily reports and equipment inspections to incident logging. All data is stored automatically and can be accessed at any time when needed, without the hassle of searching for physical files. With its concise and user-friendly interface, record-keeping becomes more orderly, easily traceable, and supports the smooth execution of field personnel duties.
b. Recording and monitoring activities in the watchroom can be effectively supported through the Progress Logbook application. This application provides features such as Watchroom Logbook, Operations Logbook, Inventory, and Vehicles, enabling personnel to record shift schedules, personnel readiness, and equipment status digitally. All data is neatly stored, easily accessible, and independent of physical records. With its concise and informative interface, Progress Logbook makes the watchroom more responsive as the operational control center.
c. Progress Logbook has proven effective in improving recording efficiency and information

delivery within the ARFF unit at Yogyakarta International Airport, as evidenced by validation results from four expert validators and a questionnaire distributed to 62 personnel, which yielded a final score of 3.47 or 69%, categorized as "feasible." This effectiveness is reflected in the ease of daily digital logging, faster data access, and increased accuracy in report preparation. With an integrated system, Progress Logbook can reduce the administrative workload that previously consumed significant time, making work more efficient, organized, and easier to manage. Furthermore, the system enables real-time data monitoring by unit leaders, thereby supporting faster and more accurate operational decision-making.

REFERENCE

Ardiansyah, A., & Albanna, F. (2022). Analisis Pemeliharaan pada Kendaraan Operasional PKP-PK di Bandar Udara Adi Soemarmo Solo. *AURELIA: Jurnal Penelitian Dan Pengabdian Masyarakat Indonesia*, *1*(1), 19–28. https://doi.org/10.57235/aurelia.v1i1.21

Azmamiyani, M., & Kurniasari, Z. (2023). Pengaruh Penggunaan Garbarata Sebagai Fasilitas Penunjang Terhadap Kepuasan Penumpang Di Bandar Udara Depati Amir Pangkal Pinang. *Journal of Creative Student Research*, *1*(3), 158–167. http://dx.doi.org/10.55606/jcsrpolitama.v1i3.1712%0Ahttps://ejurnal.politeknikpratama.ac.id/index.php/jcsr/article/download/1712/1692

Badrul, M. (2021). Penerapan Metode waterfall untuk Perancangan Sistem Informasi Inventory Pada Toko Keramik Bintang Terang. *PROSISKO: Jurnal Pengembangan Riset Dan Observasi Sistem Komputer*, *8*(2), 57–52. https://doi.org/10.30656/prosisko.v8i2.3852

Chaerunnisa, K., Saleh, L. M., & Awaluddin, A. (2022). Identifikasi Hazard Dan Risk K3 Unit Arff Bandara Sultan Hasanuddin Makassar. *Hasanuddin Journal of Public Health*, *3*(1), 32–46. https://doi.org/10.30597/hjph.v3i1.20217

Eva, N., Karina, R., Mutiara, S., & Saedudin, R. D. R. (2024). *Analisis Jaminan Kualitas Sistem Keamanan Siber pada Sistem Informasi : sebuah Studi Literatur*. *1*(2), 76–89.

Faruqui, N., Thatoi, P., Choudhary, R., Roncevic, I., Alqahtani, H., Sarker, I. H., & Khanam, S. (2024). AI-Analyst: An AI-Assisted SDLC Analysis Framework for Business Cost Optimization. *IEEE Access*, *12*(November), 195188–195203. https://doi.org/10.1109/ACCESS.2024.3519423

Fathoni, A. R. (2023). Analisis Peran Personil Airport Rescue Fire Fighting Dalam Upaya Menjaga Keselamatan Penerbangan Di Bandar Udara Internasional Adi Soemarmo Boyolali. *Jurnal Mahasiswa*, *5*(4), 61–68. https://doi.org/10.51903/jurnalmahasiswa.v5i4

Fauziah, S., & Febiola Aritonang, Y. (2023). Analisis Fasilitas Penunjang Sektor Pariwisata Di Bandara Internasional Hang Nadim Batam. *Jurnal Flight Attendant Kedirgantaraan*, *5*(1), 2962–6765. https://jurnal.sttkd.ac.id/index.php/jfa/article/view/841

GEDE ANDHRA PARADIPTA, A. (2024). *PERANCANGAN APLIKASI ARFF SMART APPLICATION (ASAP) DALAM MENUNJANG KEGIATAN PEMELIHARAAN KENDARAAN PKP-PK*. POLTEKBANG PALEMBANG.

Goldra, G., & Prayogi, L. (2021). Konsep Arsitektur Neo Vernakular pada Bandar Udara Juanda. *Linears*, *4*(1), 36–42. file:///C:/Users/ASUS TUF/Downloads/Konsep_Arsitektur_Neo_Vernakular_pada_Ba.pdf

Hilal, R. F. (2023). Evaluasi Dan Strategi Peningkatan Fasilitas Unit Pertolongan Kecelakaan Penerbangan Dan Pemadam Kebakaran (Pkp-Pk) Dengan Adanya Pembangunan Access Road Di Bandar Udara Nusawiru Pangandaran. *Flight Attendant Kedirgantaraan: Jurnal Public Relation, Pelayanan, Pariwisata*, *5*(01), 109–116.

I Putu Agus Eka Pratama, S. T. M. T., Muhammad Fachrie, S. T. M. C., & Hapsan, A. (2023). *Prototyping Sebagai Model Pengembangan Software*. CV. Ruang Tentor. https://books.google.co.id/books?id=fWzKEAAAQBAJ

Ibrahim, P., & Astuti, P. (2021). *PERANCANGAN SISTEM INFORMASI PENGIRIMAN BARANG BERBASIS WEB PADA PT. BOMA TIRTA PRIMA Reputasi*. *2*(1), 31–36.

Iqbal Dwi Saputra, M., Sukahir, S., Parjan, P., Amalia, D., & Nugraha, W. (2023). Asa Application (Arff Smart Application) As Learning Media To Improve the Competence of Arff Personnel. *Proceeding of International Conference of Advance Transportation, Engineering, and Applied Social Science*, *2*(1), 650–659. https://doi.org/10.46491/icateas.v2i1.1722

Kalbuana, N. (2022). *PENINGKATAN KEMAMPUAN PERSONIL PENERBANGAN PADA PELAYANAN JASA KEBANDARUDARAAN MELALUI PENDIDIKAN DAN PELATIHAN MANAJEMEN BANDAR UDARA*. *2*(1), 57–65.

Khuznuzzan, A., & Widagdo, D. (2024). Implementasi Peraturan Menteri Perhubungan Nomor 95 Tahun 2021 mengenai Pelatihan Penanggulangan Keadaan Darurat di Bandar Udara Internasional Zainuddin Abdul Madjid Lombok. *Indonesian Journal of Aviation Science and Engineering*, *1*(1), 9. https://doi.org/10.47134/pjase.v1i1.2227

Langodai. (2023). Evaluasi Kinjerja Petugas Unit Airport Resque And Fire Fighting (ARFF) Dalam Melakukan Perawatan Kendaraan. *Jurnal Mahasiswa*, *5*(4), 78–86. https://doi.org/10.51903/jurnalmahasiswa.v5i4

Muhammad, M. A., & Annisa, N. N. (2024). *Implementation of Supporting Safety Aspects At Frans Sales Lega Airport Is Relieved With the Fulfillment of Arff*. *1*, 7–11.

Nugraha, W., Abdullah, A., Sutiyo, S., Hendra, O., & Marwan, I. J. (2021). Basic PKP-PK Initial Training Sebagai Sarana Peningkatan Pelayanan Gawat Darurat di Bandar Udara. *Darmabakti: Jurnal Inovasi Pengabdian Dalam Penerbangan*, *1*(2), 121–130. https://doi.org/10.52989/darmabakti.v1i2.25

Pratama, A., Faroqi, A., & Mandyartha, E. P. (2022). Evaluation of *User experience* in Integrated Learning Information Systems Using *User experience* Questionnaire (UEQ). *Journal of Information Systems and Informatics*, *4*(4), 1019–1029. https://doi.org/10.51519/journalisi.v4i4.394

Purwati, A. A., Mustafa, Z., & Deli, M. M. (2021). Management Information System in Evaluation of Bca Mobile Banking Using Delone and Mclean Model. *Journal of Applied Engineering and Technological Science*, *2*(2), 70–77. https://doi.org/10.37385/jaets.v2i2.217

Rezky Izzatul Yazidah Anwar. (2023). Aplikasi Maintenance Airport Rescue and Fire Fighting (ARFF) Bandar Udara Syamsudin Noor Banjarmasin Berbasis Web. *Jupiter: Publikasi Ilmu Keteknikan Industri, Teknik Elektro Dan Informatika*, *1*(6), 01–07. https://doi.org/10.61132/jupiter.v1i6.61

Risyatala, A., Wulandari, R. R. S., & ... (2023). Optimalisasi Kesesuaian *Watchroom* Unit Pkp-Pk Di Bandar Udara Internasional Hang Nadim Batam. *... Penerbangan)*. https://ejournal.poltekbangsby.ac.id/index.php/SNITP/article/view/1590%0Ahttps://ejournal.poltekbangsby.ac.id/index.php/SNITP/article/download/1590/1523

Rohman, A., & Bhakti, H. D. (2023). Perancangan Sistem Informasi Persediaan Barang Berbasis Web. *Syntax Literate ; Jurnal Ilmiah Indonesia*, *7*(9), 15304–15313. https://doi.org/10.36418/syntax-literate.v7i9.14255

Rozak, I. (2021). Analisis Dan Perancangan Sistem Informasi Geografis Pemetaan Hama Tanaman Padi. *Jurnal Informatika Dan Rekayasa Perangkat Lunak*, *2*(3), 375–381. https://doi.org/10.33365/jatika.v2i3.1239

Sabeh, H. N., Husin, M. H., Kee, D. M. H., Baharudin, A. S., & Abdullah, R. (2021). A Systematic Review of the DeLone and McLean Model of Information Systems Success

in an E-Learning Context (2010-2020). *IEEE Access*, *9*, 81210–81235. https://doi.org/10.1109/ACCESS.2021.3084815

Saravanos, A., & Curinga, M. X. (2023). Simulating the Software Development Lifecycle: The Waterfall Model. *Applied System Innovation*, *6*(6). https://doi.org/10.3390/asi6060108

Simamora, H. I. T. (2020). Perancangan Sistem Informasi Penjualan Cv Mitra Tani Menggunakan Metode Prototype. *JURTEKSI (Jurnal Teknologi Dan Sistem Informasi)*, *6*(2), 173–178. https://doi.org/10.33330/jurteksi.v6i2.552

Siva, F., Assegaf, S. M. U., Pahlevi, S. A., & Yaqin, M. A. (2023). Survei Metode-Metode Software Development Life Cycle dengan Metode Systematic Literature Review. *ILKOMNIKA: Journal of Computer Science and Applied Informatics*, *5*(2), 36–52. https://doi.org/10.28926/ilkomnika.v5i2.447

Soefarmin, M., Daga, R., & Anshar, M. A. (2024). Pengaruh Pemberian Gaya Kepemimpinan , Motivasi Melalui Disiplin Kerja Terhadap Kinerja Pegawai Pada Kantor Divisi Operation Unit Airport Rescue And Fighting (Arff) Bandara Internasional Sultan Hasanuddin Maros. *Jurnal Mirai Management*, *9*(2), 450–464.

Solikin, I., & Hardini, S. (2019). Aplikasi Forecasting Stok Barang Menggunakan Metode Weighted Moving Average (WMA) pada Metrojaya Komputer. *Jurnal Informatika: Jurnal Pengembangan IT*, *4*(2), 100–105. https://doi.org/10.30591/jpit.v4i2.1373

Sugandi, M. A., & Halim, R. M. N. (2020). Analisis End-User Computing Satisfaction (Eucs) Pada Aplikasi Mobile Universitas BiSugandi, M. A., & Halim, R. M. N. (2020). Analisis End-User Computing Satisfaction (Eucs) Pada Aplikasi Mobile Universitas Bina Darma. Sistemasi, 9(1), 143. https://doi.org. *Sistemasi*, *9*(1), 143.

Witama, I. M. S., & Nugraha, W. (2023). Analysis ARFF Personel Knowledge In Efforts to Handle Emergencies In Waters. *Proceeding of International Conference of Advanced Transportation, Engineering, and Applied Social Science*, *2*(1), 448–453.