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DIGITALIZATION OF THE AERODROME CONTROL TOWER OPERATION LOGBOOK BASED ON THE WEBSITE

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Abstract

This research focused on digitalizing a web-based Operational Logbook system for the Aerodrome Control Tower used by Air Traffic Controllers (ATC) at the Biak Sub-branch. The current manual Operational Logbook system, which relies on physical books and handwriting, is inefficient due to the need for substantial storage space and the susceptibility to damage. This research aimed to address these issues by providing a web-based application that facilitates easier, faster, and more efficient data entry and retrieval. This research method employed Rapid Application Development (RAD), effectively developing systems quickly and under urgent needs. The RAD process includes three stages: planning, system design, and implementation. The planning phase involved identifying user needs and application objectives. The system design phase encompasses the overall system architecture, while the implementation phase involves developing and testing the application. Results indicated that the web-based Operational Logbook application significantly simplifies the recording and reporting processes for ATC personnel, reduces errors in data entry, and enhances data accessibility. The digital logbook supports high mobility, eliminating the need for physical books and associated storage space, and provides a secure and easily accessible archive of records, minimizing the risk of data loss and misuse. In conclusion, the digitalization of the Aerodrome Control Tower Operational Logbook is crucial for ATC officers at the Biak sub-branch. This web-based application improves the efficiency and effectiveness of record-keeping and reporting processes, aligning with the demands of the digital era and reducing operational inefficiencies.

Keywords: *Digitalization, ATC, RAD, Logbook*

Introduction

Air Traffic Controllers (ATC) carry out their duties and responsibilities in operating rooms or air traffic guidance towers to see the state of the movement area at the airport and the surrounding airspace of the Aerodrome Control Tower unit (Sabur, 2023). The Airfield Control Tower was created to give aircraft traveling through the airfield air traffic guidance. ICAO Annex 14, Vol. 1 stated all aircraft passing through the maneuvering area and flying close to an airport are called aerodrome traffic. Runways and taxiways make up the maneuvering area, and the apron is not included.

Aircraft near an airport means flying in or out of the aerodrome traffic circuit. The aerodrome traffic circuit can be understood as the flight path pattern that aircraft will use on the runway for landing or take–off (Jatmoko et al., 2021). Based on KP 241 Tahun 2014 concerning guidelines for the operation, maintenance, and reporting of aviation security facilities, the maintenance of aviation security equipment must be documented in the form of a history of aviation security equipment and a maintenance logbook.

The Maintenance Logbook records every preventive maintenance and repair activity. However, the manual logbook has several disadvantages, including requiring a large space to store and being easily damaged. In addition, if there is an electronic activity, such as sending a report via e-mail, it is necessary to rewrite it with electronic media. With technology becoming increasingly sophisticated, it is necessary to implement this technological development with the existing manual Operational Logbook system into a web-based electronic Operational Logbook. An application is software programmed to perform a specific task based on input from the user or users (Irviani & Setiawan, 2017a).

The current situation at the Biak sub-branch Airnav for the operational logbook usage system still uses a manual system, namely books and handwriting. All ATC personnel on duty must complete the operational logbook during the morning and noon shifts. The remarks column in the Operational Logbook is used when there are events during the service, such as aircraft experiencing divert, go around, RTB, etc.

In addition to the quick advancement of computer and information technology, digitalization has made it possible to apply technology systems in various fields. The growth of information technology and the environments where most operations are conducted at airports are two technological advancements in air transportation (K Kustori, 2017). Nowadays, practically everyone uses digitalization through computers, laptops, cell phones, and other gadgets. Digitalization allows human labor to be done more quickly, effectively, and efficiently. Undoubtedly, the swift advancement of technology leads to modifications that promote automated tasks (Fauzan & Afrianto, 2023).

The needs analysis that has been carried out requires the creation of an electronic-based application program that is useful for maintaining record keeping, which has now entered the digital era of 4.0. The current manual Operation Logbook is considered inefficient because if the Manager or Supervisor requests data such as the go-around aircraft incident six months earlier, it takes a long time and is quite draining to look for the data. With the web-based Electronic Operation Logbook application, it is hoped that it can overcome the weaknesses of the logbook that have been used so far. The advantages of web-based applications are that they can easily update information and announcements, making it easier for users to access existing information and reporting anywhere and anytime (Irviani & Setiawan, 2017b). The purpose of this research was that after the development of this electronic-based application program, it is hoped that it can assist ATC personnel in carrying out the maintenance record-keeping process so that errors do not occur and in presenting appropriate data information so that errors in the recording report are minimized and significantly reduced.

Methods

This research used the Rapid Application Development (RAD) research method which is an information system

development method with a short time so that it is considered appropriate to use in building this application. The RAD method is also the most appropriate for software development with limited time or urgent needs (Andriani & Qurniati, 2018). Rapid Application Development (RAD) is the method of choice since it can lower the likelihood of errors and offers other benefits, such as a faster development cycle, greater flexibility, and improved user interaction. The System Development Life Cycle (SDLC), which has numerous uses today to replace outdated procedure when still utilizing this conventional way, is one of the methods that supports the Rapid Application Development (RAD) method.

The application of the RAD Method is adapted to software systems for urgent needs and short time. The approach with this object-oriented method is to produce a system that shortens the time needed to create applications and fast processes by empowering the software system. The RAD method has three stages, namely with the drafting process schemes: planning, system design and implementation(Wahid, 2019). The scheme is presented in the Figure 1.

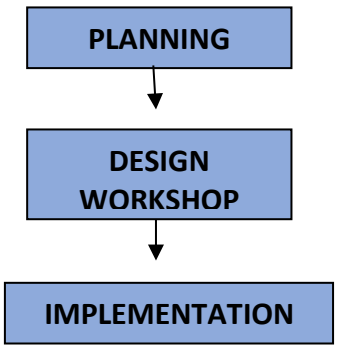

Figure 1. RAD Method Stages

First, Reqruitments Planning, at this stage the user and analyst conduct a meeting to identify the purpose of the application or system and identify the information needed to achieve the goal. At this stage, the most important thing is the involvement of both parties, not just approval of the proposal that has been made. Problem solving is the orientation in this step which involves the identification of the problem at hand, in-depth analysis of the causes of the problem, and development of effective strategies to address the problem. The goal is to find a solution that can effectively address the problem and avoid similar problems (Sirait et al., 2023).

Furthermore, user involvement is not only from one level of an organization, but several levels of the organization so that the information needed for each user can be fulfilled properly (Hariyanti et al., 2021). Design Workshop, The modeling stage aims to design all activities in the overall system architecture and improve understanding of the problem based on the analysis carried out. (Putri & Effendi, 2018) said at this stage, the activeness of the users involved also determines to achieve the goal. Because in this process the design process is carried out and improvements are made if there is still a mismatch between the user and the analyst. A user can directly comment if there is a discrepancy in the design, design the system by referring to the documentation of user needs that have been made. The output of this stage is a software specification that includes the general system organization, data structure and others (Wahyuningrum & Januarita, 2014).

Implementation, which is the stage of application and at the same time testing for the system based on the results of analysis and design (Maulana & Simanjorang, 2021) After the design of the system to be created has been approved by both users and analysts, at this stage the programmer develops the design into a program. After the program is complete, partially and as a whole, the process of testing the program is carried out to determine whether there are errors before being applied to an organization. In this phase, the analyzer worked with the users intensively during the workshop and designed several aspects and nontechnical requirements (Susilowati et al., 2018). At this time the user can provide feedback on the system that has been made and approval of the system. The implementation stage also aimed to implement methods and programs according to system requirements. Activities are carried out by the building system following the built model (Rini, 2017).

Results And Discussions

The initial planning process is to create a flow chart of the e-logbook website design from start to finish. The flowchart of the e-logbook website design will provide a clear picture of all the stages that must be passed, from identifying user needs, designing interfaces, and back-end development to the testing and implementation stages. With the flowchart, developers can understand each step systematically and anticipate potential problems or obstacles that may occur (Agner et al., 2013). Moreover, the flowchart is a valuable communication tool, facilitating collaboration and ensuring all team members are aligned and working towards the same goals. It provides a shared understanding of the project's scope, requirements, and milestones, enabling effective coordination and task allocation among the team members (Tsang et al., 2018). The flow chart is presented in Figure 2.

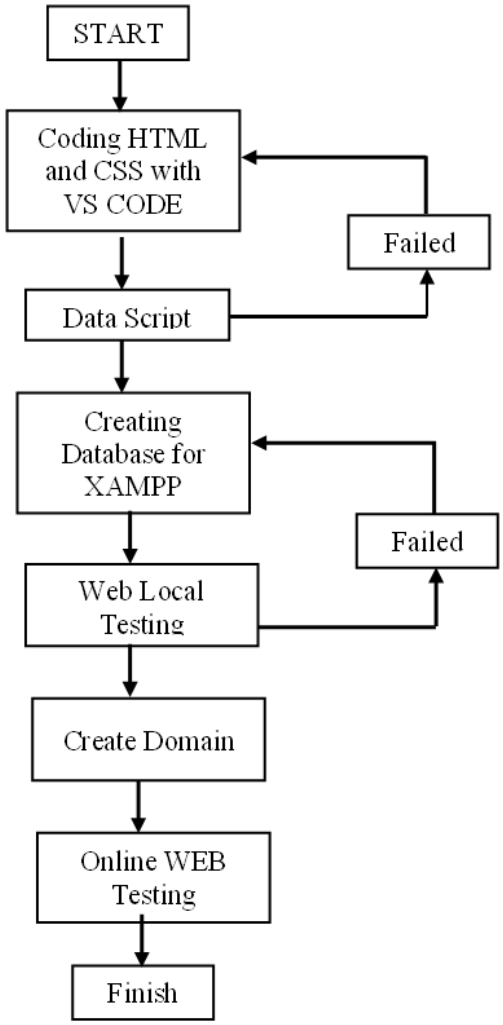

Figure 2. Planning Flow Chart

Input System: this input system consists of the design of the Admin and Operator input systems. This input system design is a stage to provide data information to the website, which will then be stored in the database. *Output System Planning*: the output system is the opposite of the input system conveyed earlier. Suppose the input system works by entering logbook data into the database. In that case, the output system is the opposite, issuing logbook data from the database so users can download it. *Database*: A database is a set of interconnected groups of data (archives) that are organized in such a way that in the future. The database is also a part that functions to store all the data that will be displayed on the website. For this reason, this e-logbook web requires a database to accommodate all existing data. The goal is not only to accommodate data but also to facilitate data processing and code generation.

In this e-logbook website, 6 (six) types of databases will be created. The first database

is the user database, where this database serves to accommodate user information used in the Login process. The second is the Equipment database, which accommodates equipment data. The third is the news database, which functions to accommodate news data. The fourth is the task database, which contains data about tasks. The fifth is the technician logbook database, which is a database that holds technician logbooks. Finally, there is the equipment logbook database, which contains equipment logbook data. Each database has some differences, such as different types and values.

Access Rights and Login: *Access rights* are all the authority given by the administrator to the user with the aim that a user can carry out management according to their respective functions. This E-Logbook website has two types of users with different access rights. The two types of users are Administrators and Operators. *Login* is a process to enter an online service that contains a name and password. The login page can be done on a website or application page. Technically, logging in can be done variably, starting from using e-mail and cellphone numbers or using social media integrated into the system. Login, also called "logon" or "sign in" is a term in terms of computer security, which is the entrance process for users to access computer systems. *Login* is intended to manage the identification process. The Login process at least consists of a username/user account and password to get access rights. When used for login, the username and password must be precise not to be mistyped because both are interrelated and cannot be separated. A login system requires the user to enter the identity of an account to enter or access data on the web.

So when opening this e-logbook web, before being able to access the leading web, users are required to Log in to enter the e-logbook web. The primary purpose of the login system is security and user identification. Users who cannot log in will not be able to access the web and will return to the Login page. The e-logbook login flowchart is presented in Figure 3.

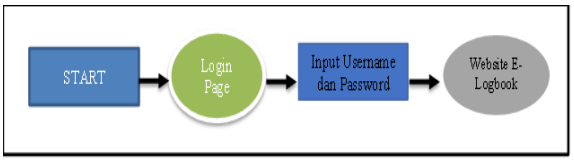

Figure 3. *Login E-logbook*

The Login page is the first page that will appear when this website is opened. This page will appear as a form of protection and user identification by entering the username and password of the admin or operator created as a login access to the website. Users who do not have access rights will not be able to enter the website's main page.

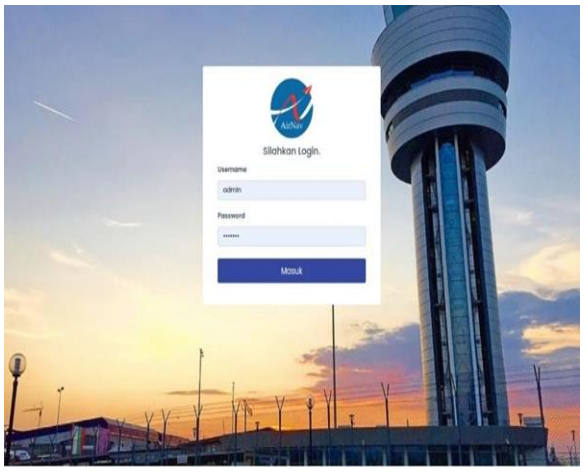

Figure 4. Login Page

An archive for an organization is essential because the archive contains important information and has value for the organization. In addition, because humans have limited memory, the archive is a memory center that will not forget all the information. Archives are records of activities or events in various forms and media following the development of information and communication technology made and received by each work institution (Bahrudin, 2020). The presence of archives in electronic format offers several conveniences and opportunities that physical archives previously lacked in management (Diah et al., 2023). Based on the previous research, the benefits of a digitized logbook align with the research, which argues that collecting, evaluating, and analyzing manual logbooks at the end of graduation is complex and not helpful in conducting feedback. Digital-based

logbooks can overcome problems related to the accumulation of evaluations.

The research and design results of the web-based electronic Operation Logbook application are expected to overcome the weaknesses of the logbook that has been used so far. This E-Operation Logbook is digital, so its mobility is very high, so ATC no longer needs to use physical books that require storage space and tables when the book is used. Also, this research can make it easier for ATC and authorized superiors to access and can be used as an archive to avoid being easily lost and misused.

Conclusion

Based on the discussion above, it can be concluded that the Digitalization of the Web-Based Aerodrome Control Tower Operation Logbook is needed by Air Traffic Controller officers of the Biak sub-branch to help record while working. This research requires several design support applications, including Xampp, VS Code, and phpMy Admin. The purpose of this research is that after the development of this electronic-based application program, it is hoped that it can assist ATC personnel in carrying out the maintenance record-keeping process so that errors do not occur and the presentation of appropriate data information so that errors in the recording report are minimized and significantly reduced.

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