

# Design and Build of Operational Activities Application of PKP-PK Hang Nadim (KapakNadim) Hang Nadim International Airport Batam

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## Abstract

KapakNadim application is designed and built to support daily operational activities in the ARFF unit of Hang Nadim International Airport Batam. This application allows users to access information related to the world of Airport Rescue and Fire Fighting (ARFF), regulations, materials to increase personnel knowledge, standard operating procedures at work, and operational activity schedules. This application also provides a real-time vehicle maintenance checklist feature that can assist in checking the feasibility and completeness of vehicles with effective and efficient features in 1 (one) platform. In its development, the Research and Development (R&D) method is used with the ADDIE (Analysis-Design-Develop-Implement-Evaluate) instructional design model created by Dick and Carry (1996) with procedures that allow creators to speed up the design process and minimize errors. The problem in this topic is how ARFF personnel can easily access various knowledge in 1 (one) platform, therefore the author makes the KapakNadim application that can be installed on an android smartphone. The final result of this product development is the KapakNadim application which is equipped with 9 (nine) main features.

**Keywords:** Applications, Android, Operations, Personnel

## INTRODUCTION

The rapid progress in the field of air transportation has also increased people's interest in choosing airplanes as their favorite means of transportation [1]. Airplanes are one of the most popular modes of air transportation today [2]. People choose airplanes as a means of travel for reasons of safety, comfort, and timeliness [3].

As a service provider [4], PT Angkasa Pura I (Persero) as a state-owned company responsible for air traffic services and airport management in Indonesia, has not only experienced significant progress in the field of air transportation modes [5]. They have also presented new innovations in every airport they manage [6]. One example is Batam Hang Nadim International Airport which has implemented a number of innovations, especially in the provision of services at the airport [7].

The emergence of generation Z was born in the era of technology or what is often referred to as digital native. Generational research shows that the influx of generation Z can be classified into certain generational groups, as seen in the table below [8]:

Table 1. Generational Differences [9]

Birth Year	Generation Name
1925 - 1946	Veteran generation
1946 - 1960	Baby boom generation
1960 - 1980	X generation
1980 - 1995	Y generation

1995 - 2010	Z generation
2010 +	Alpha generation

A digital platform is a container that offers advanced functions that can use applications that support community needs such as electronic books [10], electronic mail [11], various services [12], and others. Therefore, improving human resources is a necessity that must be implemented in the development process in a planned and structured, directed, and efficient manner in the hope that it can make its best contribution [13].

One of the air transportation service units at the airport, precisely in the darurat situation assistance unit in this case the PKP-PK unit personnel, there are many things that can be utilized in supporting operational activities [14]. Along with the rapid development of the times, all work should be completed quickly, smoothly, and efficiently in terms of time [15]. The smoothness and preparedness of the operational activities of PKP-PK unit personnel have an impact on aircraft flight safety [16].

Currently the PKP-PK unit of Hang Nadim International Airport Batam implements a vehicle maintenance checklist in the form of a checklist form on the paper provided and is carried out in the morning every shift change of personnel is still conventional by checking the checklist form using a pen [17]. The need for a product to optimize these activities in the application in the PKP-PK unit is due to [18]: (1) In principle, the presence of the application is to help facilitate work and automatically become an archive when carrying out

vehicle maintenance checklists, (2) The features available in the KapakNadim application make information search and access to regulations, materials, and standard operating procedures (SOPs) on 1 (one) platform making it easier for personnel who are carrying out daily operational activities.

The presence of digital platform applications is also an effective solution for PKP-PK units to facilitate the performance of personnel functions [19]. The importance of implementing a platform or implementing digital applications in the scope of work [20]:

Table 2. Presence of Digital Applications in the Work Environment [21]

No Digital Apps	With Digital Apps
Information conveyed through mouth to mouth seems to take a long time, for example wordof-mouth.	The management and delivery of digital material or content via another application to the user's device, e.g. on-demand services.
Provides communication services in the form of paper letters delivered by the sender to the recipient, for example: postal media.	Provide and operate electronic mail communication services, and in the form of digital platforms, such as social media.
Information services are available in the form of manual books or hard files, for example books and magazines.	Electronic information provision services in the form of text and games, such as search engines.

The use of applications in the office world is an important innovation along with the development of digital technology as an application to support operational activities that only capitalize on internet networks, it can help the daily activities of application users without worrying about space and time wherever and whenever it can be accessed to facilitate activities and daily work. Based on the explanation above, the author tries to create a new digital application design in the form of the KapakNadim application at Hang Nadim International Airport Batam as a means of supporting work initiated and designed on an android-based application.

As for the formulations in this study: 1) How is the use of KapakNadim application in supporting the operational activities of PKP-PK unit of Hang Nadim International Airport Batam, and 2) How big are the benefits of application-based design in the service of PKP-PK unit of Hang Nadim International Airport Batam.

The research objectives of this study are to find an application model in the form of KapakNadim to support daily operational activities at the PKP-PK unit of Batam

International Airport and to find out the benefits of implementing an application model in the form of KapakNadim at the PKP-PK unit of Batam International Airport.

## THEORETICAL REVIEW

In the implementation of operations at the PKP-PK unit has shift working hours which have been divided into several shifts and each shift has a standard of duty personnel who work to maintain work safety and security. Design can mean the process of planning a structure [22].

Design is a method stage with the aim of describing the results of examining a framework into a programming language to describe the parts of the framework. While the definition of building or building a framework is the movement of creating another framework or supplying or improving an existing framework either as a whole or limited [23].

Applications are considered software programs that have benefits to assist in various activities carried out by users. Applications are also often referred to as programs that are deliberately created and developed to meet user needs in carrying out certain tasks [24].

There is a need for technology and electronic devices that are easier and more useful to use. The use of worksupporting applications can also increase the efficiency of users and companies if they can implement them. The use of digital applications can help improve work efficiency, because when people in this case the application users involved master the technology in their work, their work can be completed in less time and with fewer obstacles, providing opportunities to do more [7]. That digital technology has a major impact on the workplace, because if workers can control the technology used in the workplace, their work can be completed in less time.

## METHODS

### Research Design

In this study, researchers used the Research and Development (R&D) research method. The ADDIE (Analysis-Design-Develop-Implement-Evaluate) design model developed by Dick and Carey in 1996 is a design model that can be used generically in the development of applications or training programs.

This model is designed to build a training program infrastructure for more operational activities that are efficient, effective, dynamic, and can support the performance of the application. The following is a flowchart of the ADDIE model:

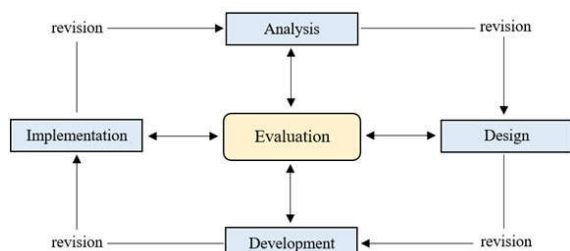


Figure 1. ADDIE Research Flowchart

## Application Design

Contains a design of the work process of the application that shows the flow in making the application. This system is made using the web as the basis for making it with the support of an internet connection, this system can be accessed anytime and anywhere. Researchers use modeling techniques by using Unified Modeling Language (UML) notations.

## Population and Sample

The population to implement the development stage of this research model and the target of this design product is cadets of the Aviation Rescue and Firefighting (PPKP) study program at Palembang Aviation Polytechnic who use the KapakNadim application and a sample of 45 (forty-five) cadets was taken.

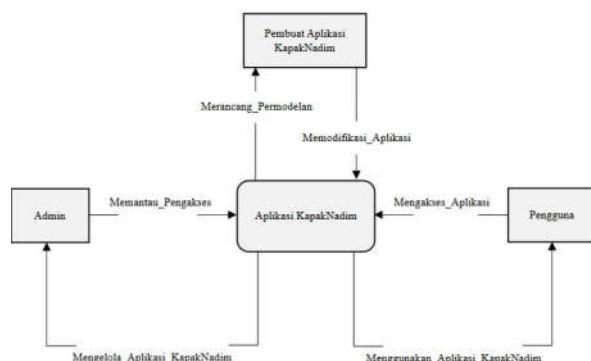


Figure 2. DFD of KapakNadim Application

The UML technique produces a design model that is shown by the application of the Data Flow Diagram. Data Flow Diagram (DFD) is a structure of several analysis tools and organized design activities that allow researchers to visually analyze and understand systems and subsystems as a series of interconnected data flow diagrams. Based on the DFD diagram, the connection with this system consists of the following three:

- KapakNadim app creators modified the App for app users.
- Admin, managing the KapakNadim application for users.
- User, use KapakNadim application and input personal data.

## Data Collection

In this research, the data collection methods used are questionnaires and observation. Questionnaires involve questions that must be answered by respondents to obtain the necessary information [25]. The questionnaire is used to test aspects of usability, functionality (functional suitability). Observation to directly observe the work process [26]. The data collection method is by observing the research subject directly, in addition, observation is also used in testing compatibility and performance efficiency.

## Data Analysis Technique

Methods used in data analysis and material testing [25]:

- Functional Suitability Aspect Analysis, The test applied to the usability section is an explanation check using the following calculations:

$$X \text{ value} = \frac{\text{Score obtained}}{\text{Expected score}}$$

- The analysis of the compatibility aspect involves the use of Android smartphones with various screen sizes. In this test, several Android-based smartphone devices such as Redmi Note 9 Pro, Samsung A33, and Realme C17 were used. Data was taken from several samples of Android devices, and the results were calculated using average values. The compatibility testing component uses the testdroid cloud testing tool.

$$\text{Feasibility} = \frac{\text{Total Test Value}}{\text{Maximum Testing Value}} \times 100\%$$

- Analysis of usability aspects, in this assessment, a Likert scale is used to measure respondents' reactions in the instrument. Information is analyzed by calculating responses based on scores on each question in the USQ survey that has been filled out by respondents after the use of the application.

Table 3. Likert Scale Question

Alternative Answer	Value
Strongly Disagree	1
Disagree	2
Disagree	3
Agree	4
Strongly Agree	5

After obtaining the score, the feasibility percentage was calculated:

$$\text{Feasibility} = \frac{\text{Score Earned}}{\text{Expected Score}} \times 100\%$$

The usability testing research instrument was carried out with the UEQ (User Experience Questionnaire) questionnaire as many as 30 questions which were divided into 4 main points of questions, namely: 1) Usefulness; 2) Ease of use; 3) Ease of learning; and 4) Satisfaction.

- Analysis of performance efficiency aspects, Utilizing the testdroid application, efficiency performance testing is carried out. Combining access speed and information handling speed while the application is running.

## Tools and Materials

### 1) Hardware

Therefore, the hardware used when making the KapakNadim application is useful for knowing and testing possible bugs or errors when the application is in the application trial stage as follows: a) 4 GB RAM Lenovo laptop, b) Intel Core I5 CPU processor 2.67 GHz, c) 256 color monitor with a resolution of 1366 x 768, d) Windows 11 operating system, e) Redmi Note 9 Pro mobile phone, f) Android version 11RP1A.200720.011, and g) MIUI Global version 12.5.6 stable.

### 2) Software

The existence of software will help coding programming language scripts such as: a) Kodular Premium Platform, b) Flaticon website, c) Spreadsheet, d) Quiz, e) Google Drive, and F) CorelDraw Graphics Suite 2021.

## RESULTS AND DISCUSSION

### Design Results

Based on the design done by KapakNadim application researchers to support daily operational activities, the results of the research and discussion will be described at each stage of ADDIE.

- 1) Results Analysis This stage is the first step of development research. Analysis serves as a measure of the current level of KapakNadim application problems. For now, in the PKP-PK unit service at Hang Nadim Batan International Airport, there are still no facilities for personnel to access information about the PKP-PK world, especially regulations, materials, and vehicle maintenance checklist forms in 1 platform.
- 2) The results of the following design stage will display the system flowchart and display of the design process of using the KapakNadim application by users and the system.

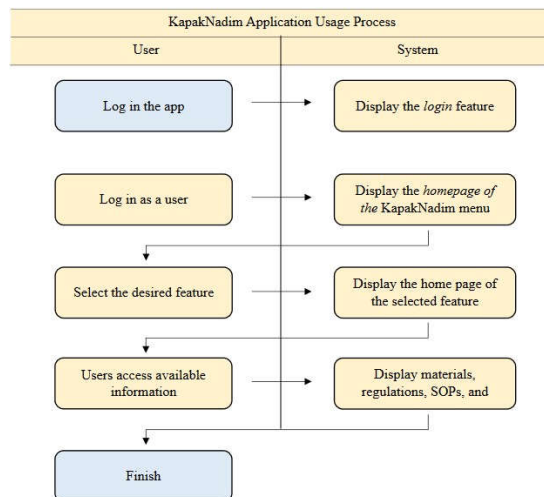


Figure 3. Flowchart of KapakNadim Application Access Process

The design of the KapakNadim application feature display is as follows:



Figure 3. Application view

### 3) Development Results

In the development stage or commonly referred to as the application development stage, researchers create applications that will be used as information media in terms of regulations, materials, standard operating procedures, and vehicle maintenance checklist forms. This application development uses the Content Management System.

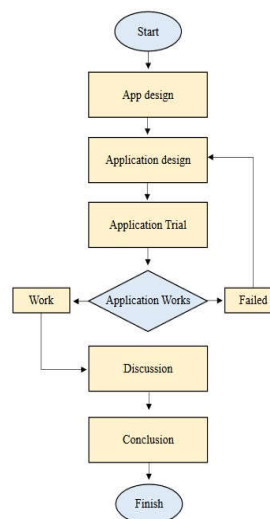


Figure 4. Flowchart of Application Design

- 4) Implementation results, after the KapakNadim application becomes a product that is considered feasible after going through the development stage, the next stage is validation by material experts and media experts. Furthermore, 45 PPKP03 Alpha and PPKP03 Bravo cadets were tested. The product trial aims to evaluate the responses and responses of cadets as users after using the KapakNadim application, as well as to test the feasibility of the application based on user assessment.
- 5) Evaluation Results, in this test, the validator will provide suggestions and opinions for future system development. The results of validation by experts are obtained: a) Anton Abdullah, S.T., M.M as Lecturer as Material Expert, b) Wildan Nugraha, S.E., MS.ASM as Lecturer as Material Expert, c) Zulkarnain, S.Kom as ARFF Operation Manager as Material Expert, d) Wahyudi Saputra, S.SiT., M.T as Young Expert Learning Technology Developer as Media Expert, e) Gulfi Oktarina, S.Kom. as Data Analyst as Media Expert with an assessment by these experts "the application is suitable for use without revision".

### Testing Functional Suitability Aspects

From the scores obtained, a total score of 78 was found. The calculation for the suitability aspect of functionality by media experts is as follows:

$$X \text{ value} = \frac{78}{78} = 1$$

Referring to the calculations previously described, an X value of 1 was obtained to evaluate the suitability of functionality by media experts. Based on the value conversion for the suitability of functionality by media experts, the data obtained is then converted to qualitative data. The conversion results show a level of "Very Good"

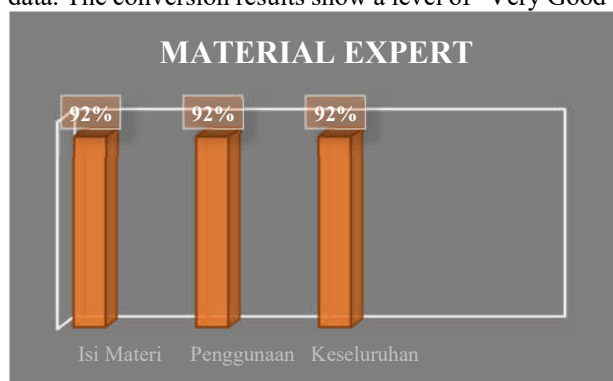


Figure 5. Diagram of Material Expert Assessment

The test results on the aspect of Functional Suitability by media experts, obtained a score of 60 out of a maximum score of 66. The X value is then converted into qualitative data based on the score conversion table of the functionality suitability aspect by media experts, which

shows that the usability and function of the KapakNadim application on a Kodular-based Android is able to operate properly and can understand commands and respond to instructions made by the application user. Meanwhile, the test results and also the results of data analysis obtained from the assessment by the material expert validator, testing the quality of the material content obtained an average score of 4.6 which is included in the good category with a value of 92%. Meanwhile, the aspect of using learning obtained an average score of 4.6 which was also included in the good category with a value of 92%. So obtained, the assessment by material experts which includes testing the content of the material and testing the use of there is an average score of 4.6. If converted, the score is in the good category with a value of 92%.

### Compatibility Aspect Testing

Compatibility testing was conducted to verify whether the app can function properly on different screen sizes and types of Android devices. Some of the devices tested include Xiaomi Redmi Note 9 Pro with a 6.67-inch screen, Samsung Galaxy A33 with a 6.4-inch screen, and Realme C17 with a 6.5-inch screen. The test results listed in Table IV.4, page 45, show that the three devices can run the application without any error messages.

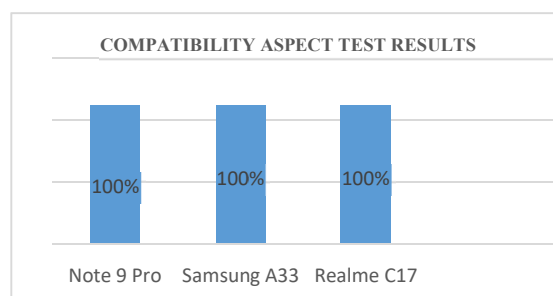


Figure 6. Diagram of Percentage Results of Compatibility Aspect Testing

The percentage calculation of the Results of Data Analysis Based on Media Expert Assessment, obtained a total score of 3 out of a maximum score of 3, without any failures, which resulted in a percentage of 100%. Based on the conversion using the compatibility aspect on page 21, the eligibility category related to the compatibility aspect is "very feasible".

### Usability Testing

Based on the test results, the usability aspect of the KapakNadim application tested by 45 users shows that the usefulness indicator obtained a score of 1562 out of a maximum score of 1665, with a percentage value of 93.81%. The usability indicator can be categorized as the result of the "Very Feasible" test and experiment.

Furthermore, the ease of use indicator obtained a score of 1945 out of a maximum score of 2035, with a

percentage value of 95.57%. The percentage conversion using shows that the ease of use indicator is also included in the "Very Feasible" category.

Furthermore, the ease of learning indicator obtained a score of 713 out of a maximum score of 740, with a percentage value of 96.35%. The percentage conversion using Table III.3 on page 22 shows that the ease of learning indicator is also included in the "Very Feasible" category.

Finally, the user satisfaction indicator scored 1075 out of a maximum score of 1110, with a percentage value of 96.84%. The percentage conversion using Table III.3 on page 22 shows that the user satisfaction indicator is also included in the "Very Feasible" category. The total score calculated from all indicators is 5295 out of a maximum score of 5550, so that the usability aspect gets a percentage value of 95.40%. Thus, based on the value conversion using Table III.3 on page 22, the usability aspect of the KapakNadim application on the Android platform in classroom activities can be categorized as "Very Feasible".

### Performance Efficiency Aspect Testing

This aspect obtained the results of testing the performance efficiency of the KapakNadim application with the Android Test application on a smartphone. When testing, the time required by the smartphone to install the application is 46 seconds, launching the application is 3 seconds, test execution takes 5 minutes, and the application successfully passes the test cases application.

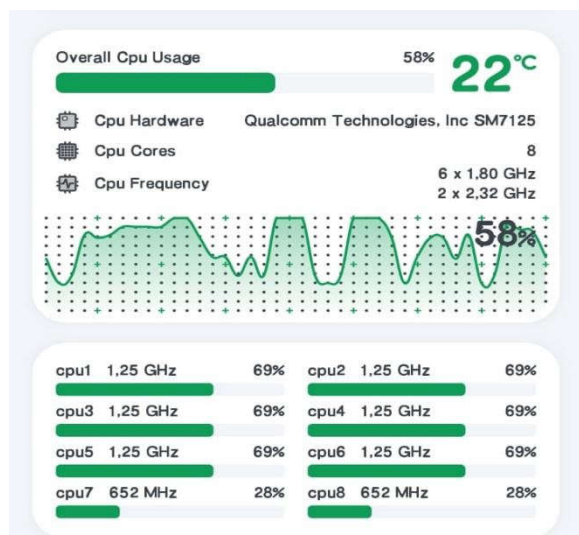


Figure 7. CPU Trial

In addition, from the storage space test, the memory usage results show that the average memory usage of the application is below 200 MB, so that during the test there is no lack of storage space that can cause the application to stop due to memory leak. The average CPU usage of the app was 58%, which is still below the safe limit set by Little Eye, a mobile app analysis tool.

The results of the time execution aspect when testing, CPU, and memory. The results of the analysis show that the Kodular-based KapakNadim application for the Android platform in classroom activities meets the standards set, so it can be said to have a good level of performance efficiency aspects. Thus, from four aspects including: 1) Functional suitability, 2) Compatibility, 3) Usability, and 4) Performance efficiency, it can be concluded that the KapakNadim application has met the quality standards of ISO 25010 Year 2011. Therefore, this KapakNadim application as a supporting application at PKP-PK Hang Nadim Batam unit.

## CONCLUSIONS AN RECOMMENDATIONS

### Conclusions

Based on the formulation of the problem, the conclusion is obtained:

- 1) Utilization of the KapakNadim Application can be used as an application model with an adjusted appearance such as features in the application that are easy to understand and grouping of regional and international regulations as evidenced by the testimonials conducted received a positive response by PKP-PK unit personnel at Hang Nadim International Airport Batam and PPKP study program cadets.
- 2) The development of the KapakNadim application at the PKP-PK unit can be utilized in increasing knowledge to support shift operational activities, especially Aviation Accident Relief and Fire Fighting (PKP-PK) services at Hang Nadim International Airport Batam. Such as the daily schedule that has been listed on the KapakNadim application and vehicle maintenance checklists that no longer need to use stationery.

### RECOMMENDATIONS

From the conclusions that have been stated, the authors provide the following suggestions:

- 1) It is hoped that with the presence of this KapakNadim application, it can be applied to shift operational activities so that it can be utilized during activities such as classroom discussion of material, and standard operating procedures as well as making it easier to find out the daily activity schedule and assist personnel work when implementing maintenance checklists for main vehicles and supporting vehicles.
- 2) Until now the KapakNadim application which has become the final application and can be operated during operational activities can only be used on Android-based smartphones, it is hoped that continuous development will later produce a version

that can be used on all iOS-based devices, including those produced by Apple and others.

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