



DESIGN AND BUILD A FLUTTER-BASED PKKMB APPLICATION WITH A QR CODE FEATURE AT NAROTAMA UNIVERSITY

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Abstract

Introduction to Campus Life for New Students (PKKMB) at Narotama University is a mandatory activity for new S1 students to get to know the academic and non-academic aspects as a condition for submitting a thesis proposal exam. The success of PKKMB is measured by the completion of tasks by participants, but manual recording for attendance, task grades, and compliance violations is prone to errors and fraud. This study uses a qualitative method that includes views, opinions, experiences, and open-ended questions to obtain the perspective of the respondents. Interviews with the chairman of the committee and participants of PKKMB 2023 were conducted to determine application features through the stages of requirements, design, implementation, testing, and maintenance. After determining the features of the application, the next step is to collect data through observation, interviews, and documentation, which are then analyzed through the stages of examination, classification, and drawing conclusions. The implementation of the PKKMB application includes splash screen pages, logins, participant homepages, participant assignments, graduation announcements, participant personal data, committee homepage, committee attendance, committee duties, and committee violations. The application was tested using the System Usability Scale with 30 respondents, resulting in a final score of 82.5 for the committee and 83 for the participants, which shows that the system is easy to use. The app is designed with Flutter, QR Code features, Laravel, and interface design from Figma.

Keywords: App, PKKMB, Flutter, Qr Code

INTRODUCTION

The transition from high school to college brings many changes, requiring students to adapt to new environments and different cultures [1]. To accelerate adjustments and ensure the success of education, the Ministry of Education, Culture, Research, and Technology instructed universities to organize an Introduction to Campus Life for New Students (PKKMB). At Narotama University, PKKMB, formerly known as the Student Orientation Period (MOM), is a mandatory requirement for new students or those who have not participated in PKKMB classes A, B, and C strata 1 (S1) before submitting a thesis proposal exam or final project[2], Under the auspices of the Directorate of Student Affairs, Alumni, Tracer Study, and Narotama Career Center of Narotama University, the purpose of holding PKKMB at Narotama University is to equip new students with a deep understanding of the values of Pancasila, the 1945 Constitution of the Republic of Indonesia, and the spirit of defending the country.

However, the implementation of PKKMB at Narotama University still faces problems, especially related to manual processes such as attendance, calculation of assignment values, and recording violations. These manual processes are prone to errors, resulting in inaccurate, time-consuming data and increasing the risk of fraud.

The rapid development of technology in the era of the 5.0 revolution offers solutions through technical optimization based on information technology [3]. Mobile apps can speed up attendance recording, task assessment, and violations, improve security with encryption and

authentication, and leverage QR codes for real-time recording [4]. It is hoped that this technology will improve the efficiency and security of PKKMB Narotama University.

Based on the existing problems, the title raised is "Implementation of Campus Introduction Mobile Application During the Covid-19 Pandemic." This research explains the implementation of mobile applications designed to help students get to know the campus during the pandemic. Previous applications experienced limitations such as reduced data accuracy when the network was unstable, but it could help students find the location of campus facilities and read room detail information. This research uses the Extreme Programming method in software development and is built using JavaScript with the React Native framework[3]

Another relevant research is the development of a mobile student attendance application using Flutter, which discusses the Presense application. The app was created to address the efficiency and accuracy issues of conventional attendance methods, using the Scrum method as an SDLC and fingerprint biometrics for attendance, although this feature is a drawback if the user does not have fingerprint biometrics[5].

In addition, the creation of Android-based E-Tatib applications using the Dart programming language also has limitations, requiring feature development and interface updates with the Waterfall method for more organized development[6].

METHODS

This research aims to collect data related to the PKKMB of Narotama University through interviews with various parties involved, including Student Affairs staff, committee chairs, and PKKMB 2023 participants. Through this interview, the researcher seeks to understand the background of the underlying problem that underlies the need for a data collection system and identify the features needed in the PKKMB mobile application. The results of the interview will be the basis for designing an application that suits the needs and expectations of users. This stage is an important first step in the design of the PKKMB Mobile Application, ensuring that the application developed can provide maximum benefits for all parties involved.

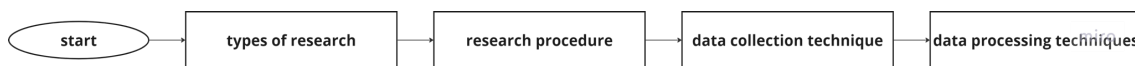


Fig. 1. The proposed method

1. Type of Research

This study uses qualitative research methods. This research method is used to describe and analyze phenomena, events, beliefs, attitudes, and social activities individually and in groups.

2. Research Procedure

a. Requirement

In this stage, the researcher collected data on the problems experienced by the PKKMB activities of Narotama University through interviews with Mr. Tahegga Primananda Alfath, S.H., M.H. (Director of Student Affairs), Ilda Annisa Afifah (Chair of the 2023 PKKMB Committee), and Dicky Tri Pranata (PKKMB 2023 participant). The results of the interview identify problems and group the needs of features and technologies to be developed in the system. This system will include the committee and participants of PKKMB Narotama University, using Flutter, Laravel, and QR Code as development technologies. Development is carried out in the form of a mobile application to improve efficiency and user security.

b. Research Design

The purpose of the design stage is to design the system structure, database structure, and interface to be developed. In this step, researchers divide users based on the features to be developed. The researcher also designed the necessary overall system structure,

based on the results of an analysis of interviews with the Director of Student Affairs, the Chairman of the Committee, and the 2023 PKKMB Participants.

- c. Implementation
Penelitian ini merancang aplikasi mobile PKKMB Universitas Narotama menggunakan bahasa pemrograman Dart yang diimplementasikan melalui Visual Studio Code. Bagian back end akan menggunakan framework Laravel, sedangkan front end akan menggunakan Flutter. Untuk sistem superadmin dan penambahan data dalam database, peneliti akan menggunakan sistem berbasis website yang disinkronkan dengan aplikasi mobile PKKMB. Dengan demikian, data yang muncul pada aplikasi mobile akan sama dengan data pada sistem website secara realtime.
 - d. Testing
To find out if users feel comfortable and easy to use the mobile application that has been developed, the test will be carried out offline on 30 people. After collecting data from respondents, then the data was calculated using the System Usability Scale.
 - e. Maintenance
Maintenance or system updates are expected to be carried out every day while PKKMB is ongoing, this is done to check the correctness of the data and identify possible errors in attendance input and violation recording. In an emergency or if a significant fault is found, system repairs should be made immediately to keep the system running smoothly.
3. Data Collection Techniques
This study uses various methods to collect data, namely:
 - a. Observation
The researcher made observations on the 2023 Narotama University PKKMB activities. The researcher observed how the flow of PKKMB activities went. So that the researcher gets some data that can later be used for consideration in making the PKKMB mobile application.
 - b. Interview
In the interview technique method, the researcher conducted an interview process with the committee in charge of PKKMB Narotama University Surabaya. Interviews were also conducted with the Director of Student Affairs who oversees PKKMB activities and to PKKMB 2023 participants. This interview was conducted to further convince the authors that the data obtained by the authors about the observation techniques were correct and appropriate.
 - c. Documentation
Documentation is data that comes from notes, books, minutes, or existing documents in writing. In this study, the document was found in the PKKMB guidebook from the Ministry of Education and Culture and Technology and the Narotama University PKKMB guidebook that had been made by the Committee. In addition, documentation was obtained by the researcher from the minutes of observation data collection techniques and interviews that had been conducted previously.
 4. Data Processing Techniques
The stages of data processing include editing, classifying, and conclusion:
 - a. Editing
The inspection stage is a re-check of data that has been collected previously in data collection. The vetting process involves reviewing previously collected data to ensure that its meaning is clear, appropriate, and relevant to other data. Data obtained from observation findings and previous interviews were evaluated in this study. Because these two data will be the author's reference during this study.
 - b. Classifying
-

Classification is the process of grouping all previously collected data through observation and interviews. All of this data is further understood and researched, so that it can be grouped and sorted out which ones can be used and which ones are not.

c. **Concluding**

The last stage in the data processing process is the conclusion stage. The results of this conclusion stage will be the reference for researchers to conduct this research. The results are the results of the previous stages of data processing that have been combined and sorted so that they become the existing conclusions.

Abbreviations and Acronyms

PKKMB

PKKMB (Pengenalan Kehidupan Kampus Bagi Mahasiswa Baru) is an activity that aims to form and develop the character of new students, increase awareness of the nation, state, environment, defense of the country, and society [7] PKKMB helps new students prepare for the transition to become more mature and independent individuals, accelerate adaptation to a new environment, and provide provisions for success in higher education. This activity serves to foster idealism, nationalism, and concern for the environment, with the aim of producing a generation that is religious, nationalist, independent, mutual cooperation, and characterful.

QR Code

Quick Response Code (QR Code) is an evolution of barcodes that can store information horizontally and vertically, allowing for more data storage [8]. QR Code, a two-dimensional symbol, was created by Denso Wave in 1994. The QR Code's square structure consists of a pattern of functions and coding regions, with a quiet zone boundary surrounding the symbol on all four sides. The four types of function patterns in QR Codes are finder patterns, separators, timing patterns, and alignment patterns[9]

API

An API (Application Programming Interface) is a set of tools that allow unrelated systems or software to interact with each other. APIs are often used in software development that requires integration with external software systems that are not open. With the advancement of the internet, APIs can be implemented on the server side and accessed by various applications connected to the server using specific protocols[10]

Units

The Directorate of Student Affairs is one of the work units owned by Narotama University. Which is under the auspices of the Vice Chancellor I for Academic and Student Affairs. Initially, the Directorate of Student Affairs only provided services to students who were focused on academics. However, as students spend time and needs, the focus expands to become broader and includes student well-being, self-development, and career preparation. Led by Mr. Tahegga Primananda Alfath, the student affairs of Narotama University continue to adapt to the times and the needs of students as well as the relationship between the university, students, and alumni. The structure of the work units of the Directorate of Student Affairs, Alumni, Tracer Study, and Narotama Career Center in 2024 is as follows:

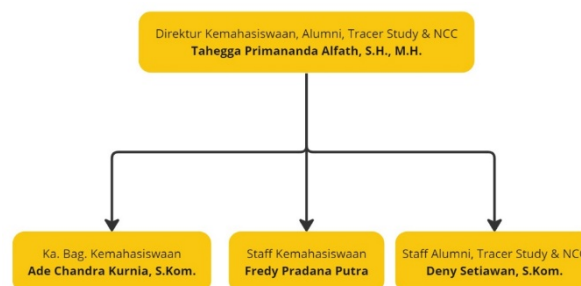


Fig. 2. The proposed method

Equations

To find out if users feel comfortable and easy to use the mobile application that has been developed, the test will be carried out offline on 30 people. After collecting data from respondents, the data is then calculated using the System Usability Scale. There are several rules in calculating the System Usability Scale score, including:

- a. For each odd-numbered question, the score of each question obtained from the user's score will be subtracted by 1
- b. For each even-numbered question, the final score is obtained from the value of 5 minus the question score obtained from the user.
- c. The SUS score is obtained from the result of summing the scores of each question which is then multiplied by 2.5.

For the next calculation, the SUS score of each respondent is found to be the average score by adding up all the scores and dividing by the number of respondents and will be calculated using the following formula:

$$x = \frac{\sum x}{n}$$

x = Average score
 $\sum x$ = Total SUS score
 n = Number of respondents

Using the Usability Scale System applied to Google Form media to make it easier for ordinary users. The Google Form will contain several questions that can be answered with a choice of scale from 1 to 5 which indicates:

- a. Point 1 indicates that they strongly disagree.
- b. Point 2 indicates disagreement.
- c. Point 3 indicates neutral.
- d. Point 4 signifies agreement.
- e. Point 5 indicates that they strongly agree

From the results of the calculation of the System Usability Scale will be summed up and produce an average of 0-100 with the interpretation scale of the System Usability Scale Score [11]:

- a. < 51 is very difficult to use
- b. 51 - 69 difficult to use
- c. 70 - 79 neutral
- d. 80 - 89 easy to use
- e. 90 - 100 very easy to use

The scale will be obtained through a list of 10 frequently asked questions about the System Usability Scale [11] that will be given to users, namely:

Table 1. The scale of 10 frequently asked questions about the System

No.	Questions
1.	I'm thinking of using this system again
2.	I find this system complicated to use
3.	I find this system easy to use
4.	I need help from others/technicians in using this system
5.	I feel that the features of this system are working properly
6.	I feel like there are a lot of inconsistencies (incompatible with this system)
7.	I feel like others will understand how to use this system quickly
8.	I find this system confusing
9.	I feel that there are no obstacles in using this system
10.	I need to get used to it first before using this system

RESULT AND DISCUSSIONS

Testing was carried out using the Usability Scale System which was applied with Gform with 15 respondents each as the Committee and 15 respondents as Participants, so that there were a total of 30 respondents.

A. Testing Results

The calculation of the System Usability Scale will be divided into 2, namely the Committee and the Participant, so that both have different points and have accurate results. The results of the calculation can be grouped into several categories based on the points obtained. The following are the calculations resulting from the System Usability Scale questionnaire that has been carried out.

B. Committee Testing Results

From the respondent's answer, each point from the answer to the question that shows the advantage will be subtracted by 1, while the point from the answer that shows the weakness of the system will be the reduction number of 5.

The following are the results of the calculation of the System Usability Scale by the Committee

Table 2. Calculation of The System Usability Scale

Calculation Score										Total
Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	
5	2	5	1	5	1	5	1	5	3	37
5	2	4	3	5	4	3	3	4	5	24
5	1	5	1	4	1	5	1	5	2	38
5	1	5	1	5	5	4	1	5	3	33
5	1	5	1	5	2	4	1	4	1	37
4	3	4	3	4	3	4	3	4	2	34
4	3	4	3	4	3	3	3	4	2	33
4	2	4	3	4	2	3	3	4	1	30
4	3	4	3	4	3	3	3	4	2	33
4	3	4	3	4	3	4	3	4	0	32
4	4	3	3	4	4	4	4	3	4	37
3	3	3	3	3	3	3	3	3	3	30
4	3	3	3	3	3	3	3	3	3	31
4	4	3	3	4	3	4	3	3	3	34
3	4	4	4	3	3	3	3	4	3	34

The total score of each respondent is multiplied by 2.5 and then calculated as an average of the whole. The final result of the Committee's System Usability Scale is 82.5 which is in the Acceptable category of the System Usability Scale and shows that the system is easy to use.

Tabel 3. Final Result of System Usability Scale Committee

Total Score x 2,5	Total	Average
37	92.5	82.5
24	60	
38	95	
33	82.5	
37	92.5	
34	85	
33	82.5	
30	75	
33	82.5	
32	80	
37	92.5	
30	75	
31	77.5	
34	85	
34	85	

C. Participant Testing Results

From the respondent's answer, each point from the answer to the question that shows the advantage will be subtracted by 1, while the point from the answer that shows the weakness of the system will be the reduction number of 5. The following are the results of the calculation of the System Usability Scale by Participants.

Tabel 4. Score of Participant Calculation Results

Calculation Score										Total
Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	
4	3	4	3	4	3	4	3	4	2	34
4	3	4	3	4	3	3	3	4	2	33
4	2	4	3	4	2	3	3	4	1	30
4	3	4	3	4	3	3	3	4	2	33
4	3	4	3	4	3	4	3	4	0	32
5	2	5	1	5	1	5	1	5	3	37
4	2	4	3	4	2	3	3	4	1	30
4	3	4	3	4	3	4	3	4	0	32
5	1	5	1	5	5	4	1	5	3	33

5	1	5	1	5	2	4	1	4	1	37
4	3	4	3	4	3	4	3	4	2	34
4	3	4	3	4	3	3	3	4	2	33
4	2	4	3	4	2	4	3	4	0	30
5	1	5	2	5	1	5	3	5	1	37
4	3	4	3	4	3	4	3	4	2	34

The total score of each respondent is multiplied by 2.5 and then calculated as an average of the whole. The final result of the Participant's System Usability Scale was 83 which entered the Acceptable category of the System Usability Scale and showed that the system was easy to use.

Tabel 5. Final Results of the Participant Usability Scale System

Total Score x 2,5	Total	Average
34	85	83
33	82,5	
30	75	
33	82,5	
32	80	
37	92,5	
30	75	
32	80	
33	82,5	
37	92,5	
34	85	
33	82,5	
30	75	
37	92,5	
34	85	

The development of the system was done using Laravel and the interface design was created using Figma. And the system has gone through a trial with 30 respondents which are divided into 15 respondents with committee roles and 15 respondents with committee roles and scored 82.5 for participant role testing and 83 for participant role testing from the System Usability Scale which belongs to the Acceptable category which shows that the system is easy to use by users.

CONCLUSIONS

The PKKMB mobile application of Narotama University is designed and built using Flutter and Dart and goes through several stages. Analysis of the needs of the required features produces a

QR Code feature to record attendance and violations. From the results of the analysis, a research design was produced that contained User Identification, Feature Menu Identification, Functional Needs, Usecase Diagram and Activity Diagram. The development of the system was done using Laravel and the interface design was created using Figma. And the system has gone through a trial with 30 respondents which are divided into 15 respondents with committee roles and 15 respondents with participant roles and scored 82.5 for participant role testing and 83 for participant role testing from the System Usability Scale which belongs to the Acceptable category which shows that the system is easy to use by users.

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Slamet Winardi obtained a Bachelor of Engineering degree at ITATS in the field of Electrical and Computer in 1997, then obtained a master's degree at ITS in the field of Control in 2003, Then the author developed the field of electronics and continued in the field of Internet of Things (IoT) and Mobile Technology. The results of research are mostly used by the industry or the world of education. In 2024, it will combine IoT and agriculture using Propagation technology (IoT).