Design and Build a Mobile-Based Healty Home Information Information System Using Prototype Method (Case Study: Candinata Village)

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Habitable housing plays a crucial role in community development. In Candinata Village, Kutasari District, Purbalingga Regency, the PKK (Family Welfare Movement) is responsible for monitoring the feasibility of healthy homes by recording house conditions in 12 neighborhood units (RW) and 24 community units (RT). The monitoring is conducted through direct visits, but manual recording takes a long time as data must be written down before being entered into a computer. To address this issue, a recording system based on the prototype method was developed. The development stages include communication to gather requirements, quick plan as the initial design, modelling quick design to represent the user interface, construction of prototype to build the application, and deployment delivery & feedback for evaluation by the PKK secretary. The application has been tested using blackbox testing to evaluate its functionality and user acceptance testing to assess its usability. The test results yielded a score of 78.39%, indicating that the application is categorized as "Good" and is suitable for use by PKK cadres in Candinata Village.

Keywords: prototype, system design, blackbox, user acceptance testing, Candinata Village, healthy home

I. INTRODUCTION

Habitable housing plays an essential role in creating a healthy and sustainable community. According to the Indonesian Ministry of Health Decree of 1999 [1], a house must meet health standards, including access to clean water, sanitation, ventilation, and proper waste management. Houses that do not meet these standards are more vulnerable to environmental diseases such as acute respiratory infections (ARI) and diarrhea [2]. In Candinata Village, the PKK (Family Welfare Movement) is responsible for recording and categorizing habitable and non-habitable houses. Out of 1,530 houses, 1,161 are classified as healthy, while 369 are deemed unhealthy. The recording process is carried out manually by PKK cadres in 12 neighborhood units (RW), which is often time-consuming, prone to errors, and difficult to manage for large amounts of data [3]. To address these issues, a mobile-based data recording system was developed for Android and iOS platforms using React Native. This technology enables cross-platform development with a single codebase, Virtual DOM, hot-reloading, and a component-based architecture [4][5].

The Prototype Method was used in the application development due to its iterative nature, allowing user feedback to refine the system and accelerate feature testing [6]. Previous studies have proven that this method improves development efficiency and system alignment with user needs [7]. The developed application is expected to enhance data recording by PKK cadres, speed up the process, improve accuracy, and support faster and more precise decision-making. The implementation will be carried out by PKK cadres in Candinata Village, followed by an evaluation of the system's effectiveness in supporting the recording of healthy and unhealthy houses.

II. THEORITICAL REVIEWS

A. Family Welfare Movement (PKK)

The Family Welfare Development is a national movement in community development that grows from the grassroots, where its management is carried out by the local community for collective well-being [8].

B. Healty House

A healthy and simple house is built with a basic construction while still meeting health, safety, and comfort standards, taking into account local potential and socio-cultural aspects. In addition to serving as a residence, such a house supports the physical, mental, and social well-being of its occupants [9].

C. *REST API*

REST API consists of two terms: *REST* and *API*. *REST* is a communication architecture standard used in web service and application development, while *API* functions as a connector that enables applications to interact and share data [10].

D. *UML*

Unified Modeling Language (UML) is an object-based information system design tool that assists in the planning and development of systems based on object-oriented programming [11]. Some commonly used information systems include:

a. *Use Case Diagram*

A *use case diagram* is a visual representation that illustrates how a system operates from the user's perspective. This diagram utilizes a series of steps to describe the interactions between users and the system, including the actions performed by users on the system and the system's responses to those actions [12].

b. *Sequence Diagram*

A *sequence diagram* is used to represent interactions between objects within a system with a high level of detail. This diagram illustrates the steps that occur in response to an event to produce a specific output [13].

c. *Activity Diagram*

An *activity diagram* is a diagram that illustrates the flow of various activities within a designed system, including how processes begin, possible decisions made, and how the system concludes. [14]. Table 2.4 represents the symbold used in *activity diagram* modelling:

d. *Class Diagram*

A *class diagram* is a diagram that visualizes and describes classes, attributes, and objects along with their relationships. This diagram serves to illustrate the types of objects within a system and their associations with other objects [15].

e. *Prototype*

The *Prototype Method* is an approach in software engineering that utilizes an iterative process to develop a system through the creation of an initial prototype. This prototype serves as an early model that allows users to provide feedback, enabling developers to better understand user requirements[7].

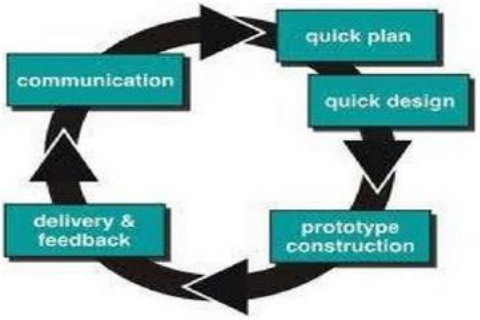


FIGURE 1 *PROTOTYPE MODEL*

Figure 1 represents the *prototype model*, which consists of several stages, including:

1. *Communication*

At this stage, developers hold meetings with stakeholders to establish the main objectives, identify desired requirements, and determine the necessary elements for the next phase [16].

2. *Quick Plan*

After completing the Communication phase, the developer moves on to the Quick Plan phase. In this phase, the design is created rapidly and represents all known aspects of the software. This design serves as the foundation for building the prototype [16].

3. *Modelling Quick Design*

At this stage, developers focus on representing aspects of the software that are visible to users. *Modeling Quick Design* is primarily oriented toward prototype development [16].

4. *Construction of prototype*

After completing the *Modeling Quick Design* phase, the next step is Construction of Prototype. In this phase, developers create the initial structure or design of the system to be developed [16].

5. *Deployment Delivery & Feedback*

The final stage is deployment delivery & feedback. In this stage, the developer delivers the completed prototype to stakeholders for evaluation. The stakeholders then provide feedback, which is used to revise the software requirements for further development [16].

a.

E. *Blackbox*

Blackbox testing focuses on evaluating the functionality of software without considering its internal structure. This testing aims to detect errors in functions, interface interactions, data structures, system performance, and errors that occur during program initialization and termination [17].

F. *User Acceptance Testing (UAT)*

User Acceptance Testing (UAT) is a testing process that involves direct interaction between end users and the system to ensure that features function according to user requirements. UAT is part of the final stage of system testing and serves as a crucial evaluation step before further development and deployment of the software [18].

III. METHOD

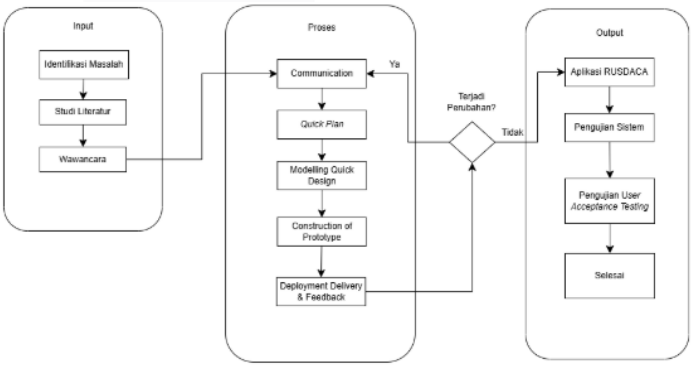


FIGURE 2 RESEARCH FLOW DIAGRAM

Figure 2 illustrates the research process flow in this study. The research flow diagram consists of three main parts: the application of the Prototype Method for system development, Blackbox Testing for system functionality testing, and *User Acceptance Testing* (UAT) to evaluate user satisfaction with the developed system.

A. Input

The initial step in the research flow is input, which includes problem identification, literature review, and interviews. Below is an explanation of each step in the input phase:

1. Problem Identification

   At this stage, the problem is identified and formulated. It was found that PKK cadres must manually record household data through direct visits, and the data collection process has not yet been digitized.

2. Literature Review

   The literature review is conducted to gather and analyze relevant sources to strengthen the research foundation.

3. Interviews

   The interview was conducted with the PKK secretary, Mrs. Rini Kurniasari Farida, S.Pd.I, to gather information about healthy housing and the challenges faced by PKK cadres in Candinata Village.

B. Process

The next step is the process, which involves the system development phase using the Prototype Method. Below are the steps in the Prototype Method:

1. *Communication*

   The interview was conducted with the PKK secretary, Mrs. Rini Kurniasari Farida, S.Pd.I, to identify the problems. It was found that the recording of healthy and unhealthy houses is still done manually, which poses a risk of data loss.

2. *Quick Plan*

   The researcher designed a quick solution by proposing the development of an Android and iOS-based application to digitize the recording of healthy and unhealthy houses.

3. *Modelling Quick Design*

   At this stage, the researcher designed the system using *Unified Modeling Language* (UML), including use case, sequence, activity, and class diagrams to visualize the application's workflow.

4. *Construction of Prototype*

   he user interface design and admin website were created using Figma, based on the UML design that had been developed.

5. *Deployment Delivery & Feedback*

   The researcher implemented the design using React Native for the admin website. Mrs. Rini Kurniasari Farida, S.Pd.I, was involved to ensure that the system met the needs of PKK cadres.

C. Output

The final step is the output, which consists of the RUSDACA application, system testing, and user acceptance testing. Below is the explanation.

1. RUSDACA Application

   The RUSDACA application is the result of system development using the prototype method. Its functionality is tested using blackbox testing, while user satisfaction is evaluated through User Acceptance Testing (UAT).

2. System Testing

   Testing is conducted using blackbox testing to ensure that the system functions properly and to detect errors in the interface, data structure, software performance, initialization, and termination.

3. *User Acceptance Testing*

   User Acceptance Testing (UAT) is conducted to ensure that the application meets user requirements and functions as expected.

IV. RESULT AND DISCUSSION

A. *Use Case Diagram*

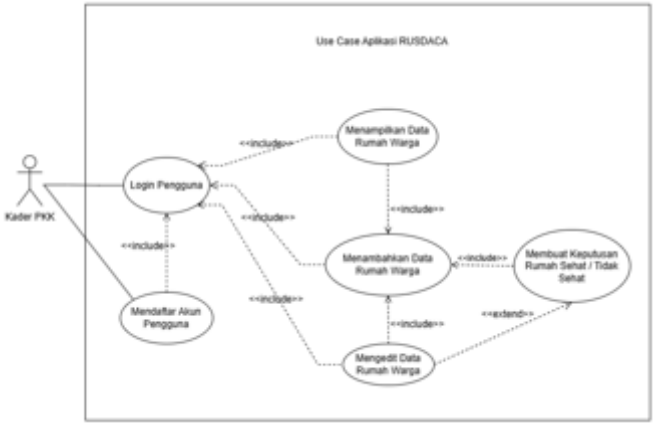


FIGURE 3 *USE CASE* RUSDACA APLICATION

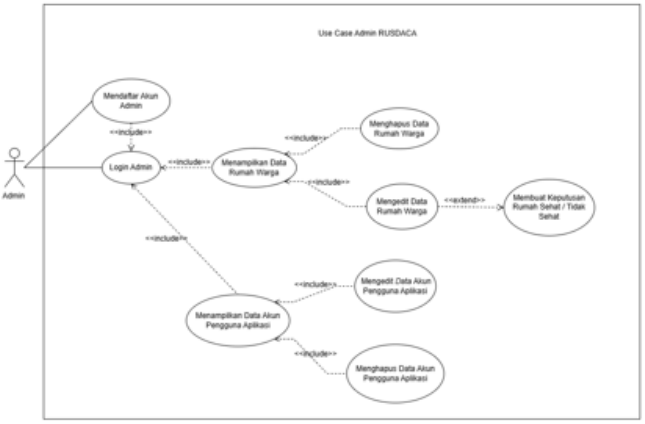


FIGURE 4 *USE CASE* RUSDACA ADMIN

B. *Sequence Diagram*

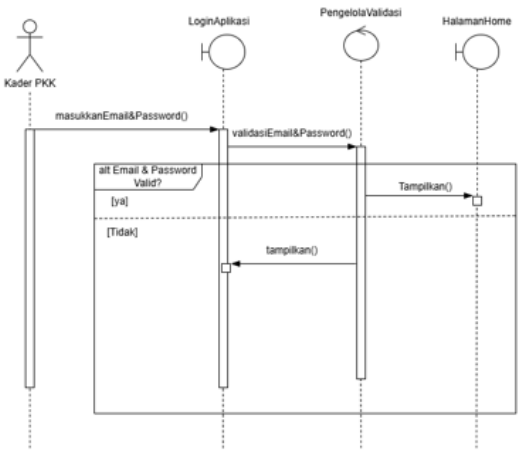


FIGURE 5 *SEQUENCE* APPLICATION LOGIN

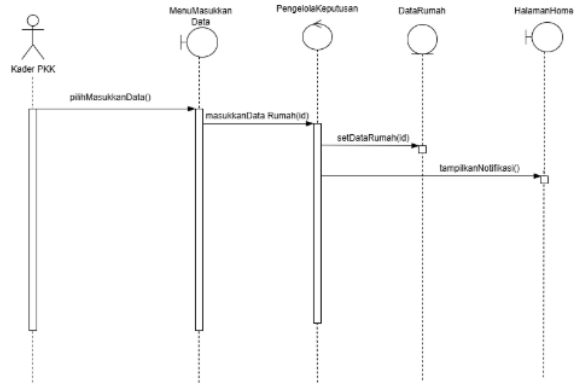


FIGURE 6 *SEQUENCE* INPUT DATA

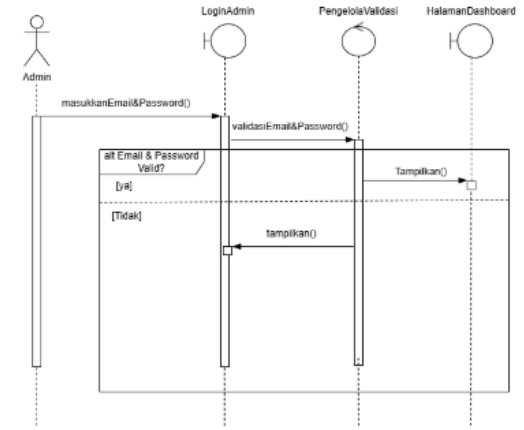


FIGURE 7 *SEQUENCE* ADMIN LOGIN

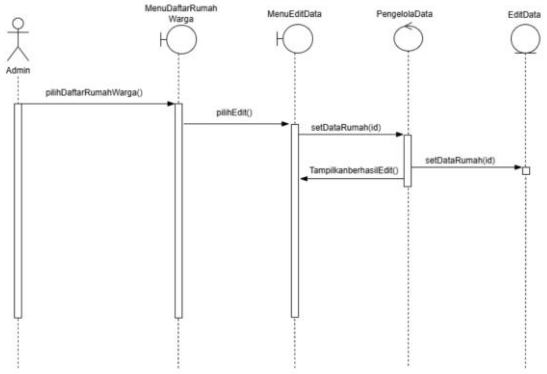


FIGURE 8 *SEQUENCE EDIT* RESIDENT'S HOUSE DATA

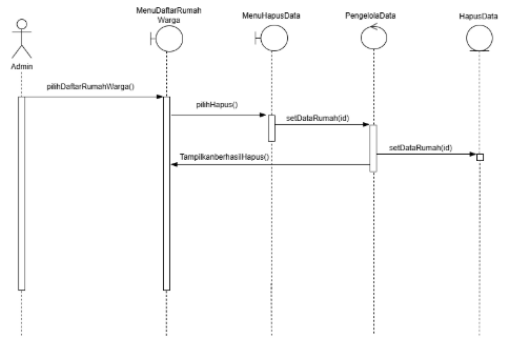


FIGURE 9 *SEQUENCE* DELETE RESIDENT'S HOUSE DATA

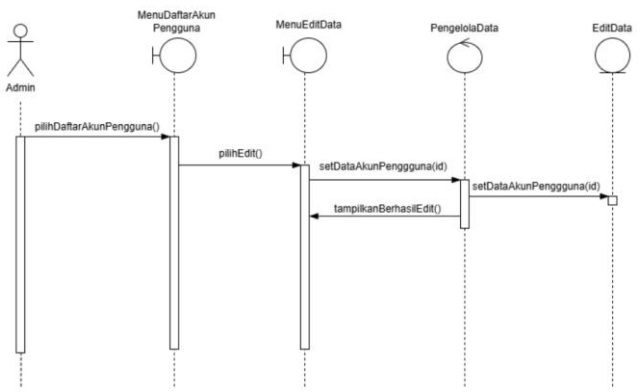


FIGURE 10 *SEQUENCE* EDIT USER ACCOUNT DATA

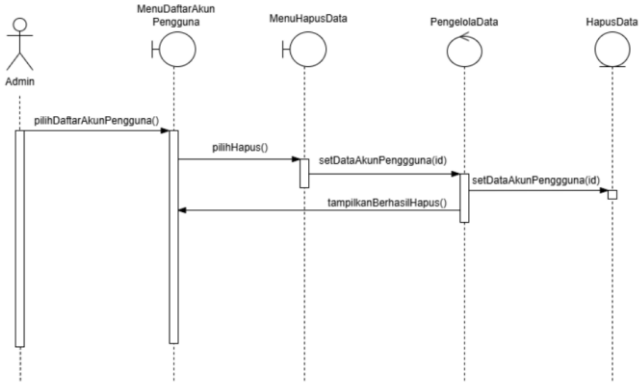


FIGURE 11 *SEQUENCE* DELETE USER ACCOUNT DATA

C. *Activity Diagram*

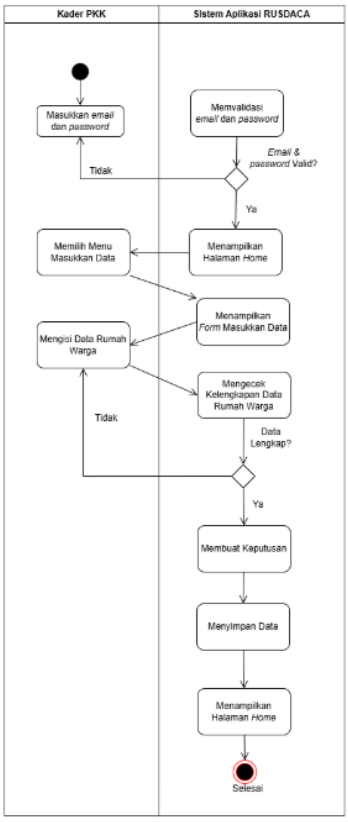


FIGURE 12 *ACTIVITY* INPUT RESIDENT'S HOUSE DATA

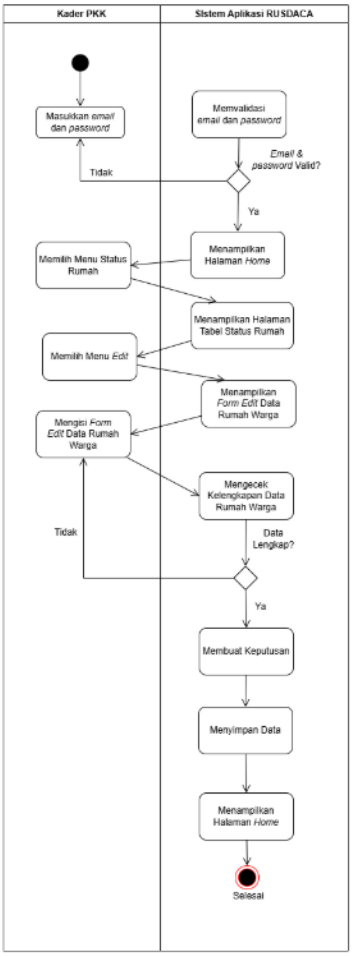


FIGURE 13 *ACTIVITY EDIT* RESIDENT'S HOUSE APPLICATION

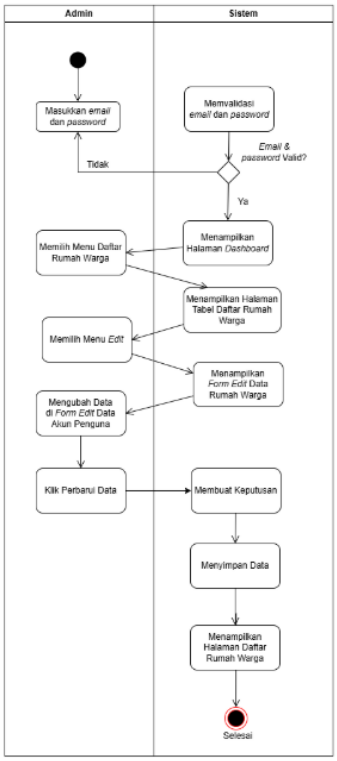


FIGURE 14 *ACTIVITY* EDIT CITIZENTS HOUSE DATA WEB

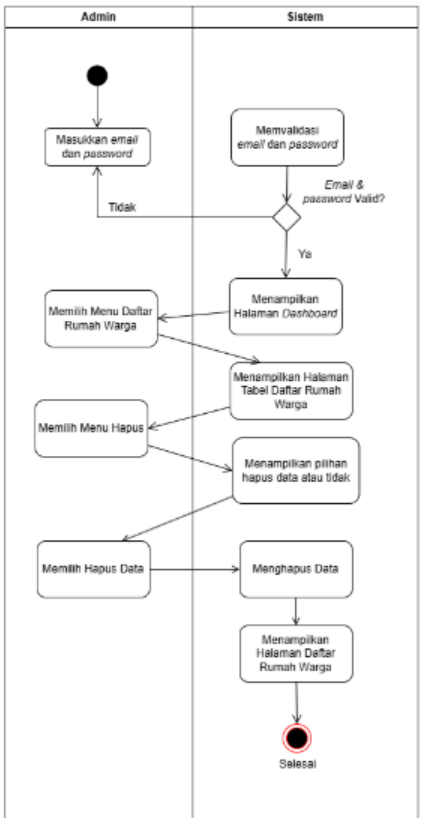


FIGURE 15 *ACTIVITY* DELETE CITIZEN HOME DATA WEB ADMIN

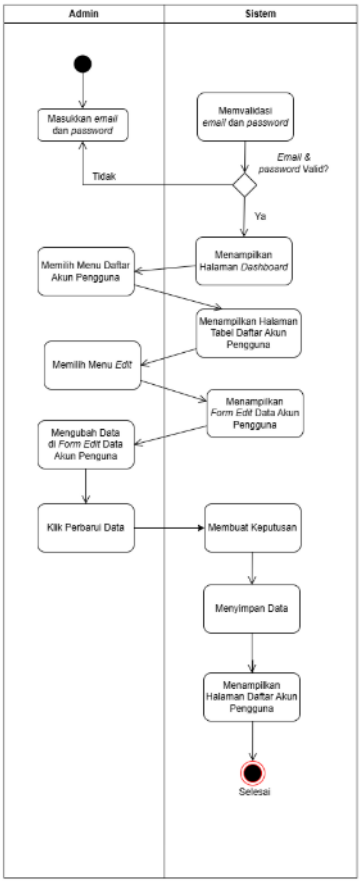


FIGURE 16 *ACTIVITY* EDIT WEB ADMIN USER DATA

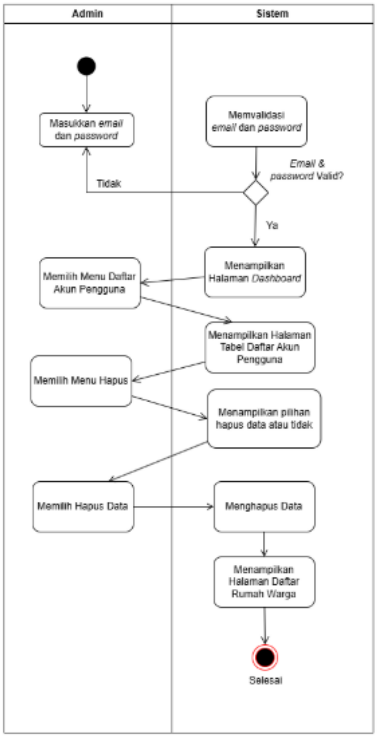


FIGURE 17 *ACTIVITY* DELETE USER DATA in WEB ADMIN

E. *Class Diagram*

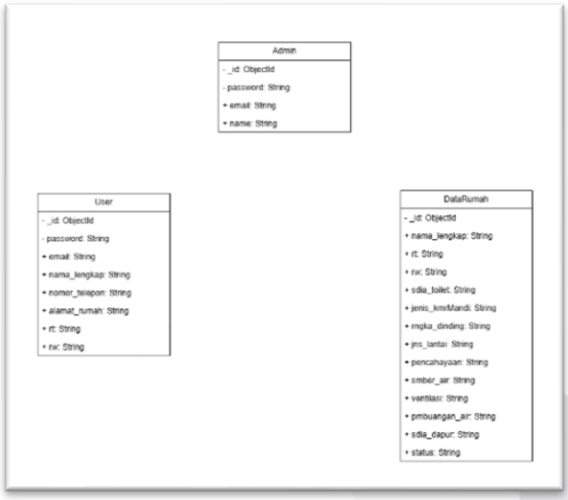


FIGURE 18 CLASS DIAGRAM

E. Desain Antarmuka

FIGURE 19 *WIREFRAME* APPLICATION LOGIN

FIGURE 20 *WIREFRAME* APPLICATION ACCOUNT REGISTRATION

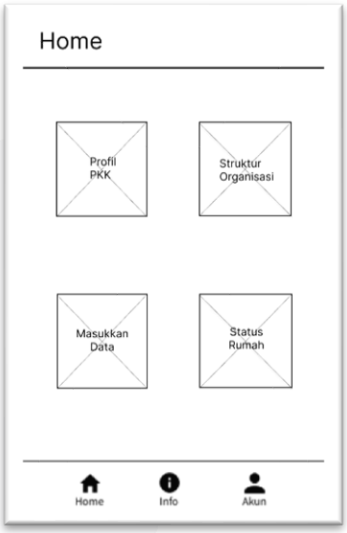


FIGURE 21 *WIREFRAME HOME* APPLICATION

FIGURE 22 *WIREFRAME* APPLICATION INFO

FIGURE 23 *WIREFRAME* APPLICATION USER ACCOUNT

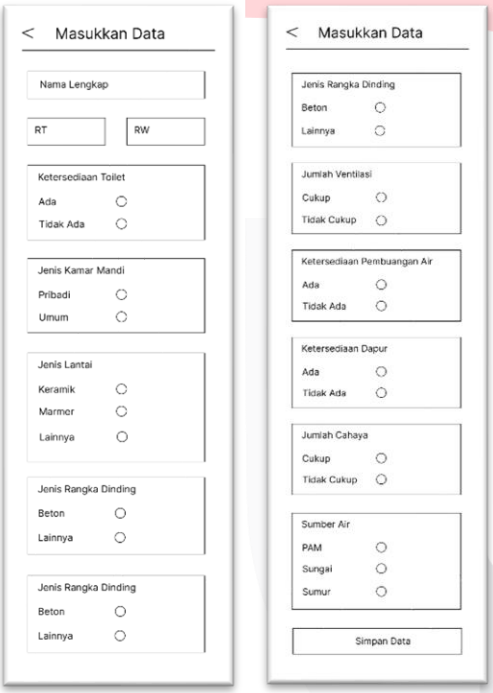


FIGURE 24 *WIREFRAME* INPUT DATA in APPLICATION

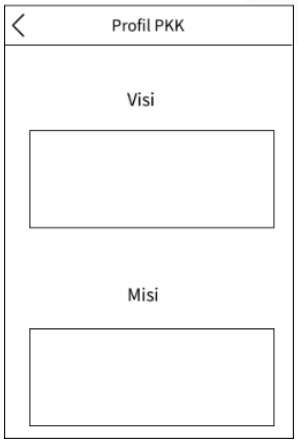


FIGURE 25 *WIREFRAME* APPLICATION PROFILE

FIGURE 26 *WIREFRAME* APPLICATION ORGANIZATIONAL STRUCTURE

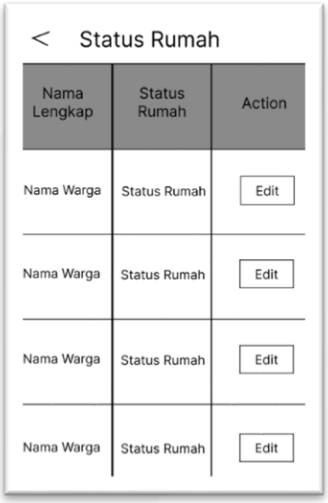


FIGURE 27 *WIREFRAME* APPLICATION HOME STATUS

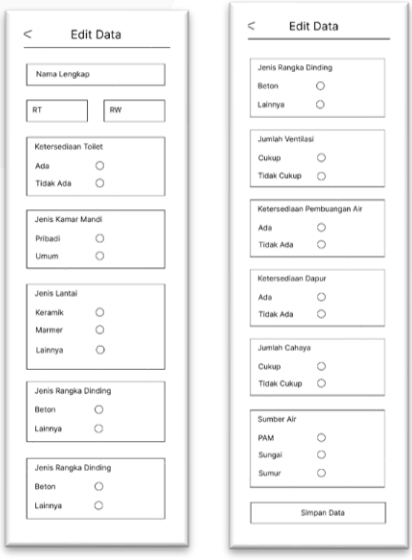


FIGURE 28 *WIREFRAME* EDIT APPLICATION DATA

B. *Wireframe* Admin RUSDACA

FIGRUE 29 *WIREFRAME LOGIN WEB* ADMIN

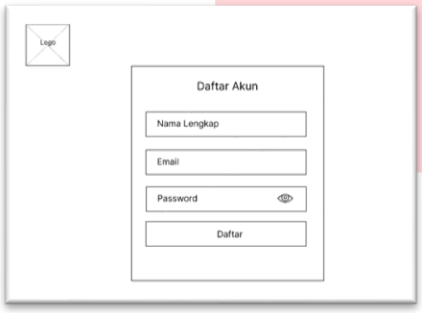


FIGURE 30 *WIREFRAME* WEB ADMIN ACCOUNT REGISTRATION

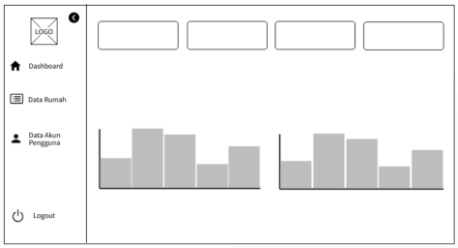


FIGURE 31 *WIREFRAME DASHBOARD WEB* ADMIN

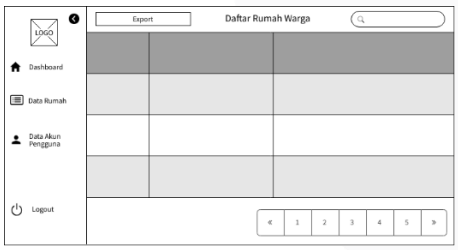


FIGURE 32 *WIREFRAME* WEB ADMIN CITIZENS' HOUSE LIST

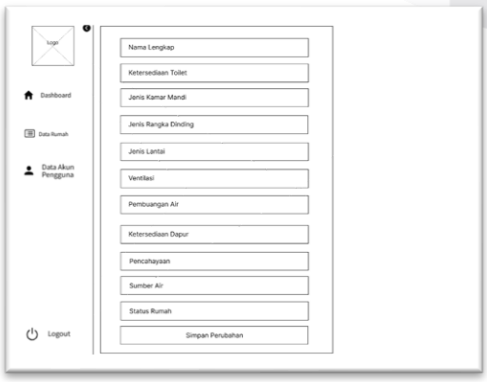


FIGURE 33 *WIREFRAME EDIT* WEB ADMIN CITIZEN' HOUSE DATA

FIGURE 34 *WIREFRAME* REGISTER ACCOUNT on WEB ADMIN

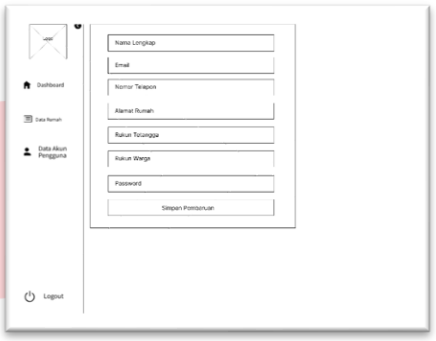


FIGURE 35 *WIREFRAME* EDIT WEB ADMIN USER ACCOUNT DATA

F. Aplikasi and *Web* Admin Implementation

FIGURE 36 RUSDACA APPLICATION LOGIN PAGE

FIGURE 37 ACCOUNT REGISTRATION PAGE in RUSDACA APPLICATION

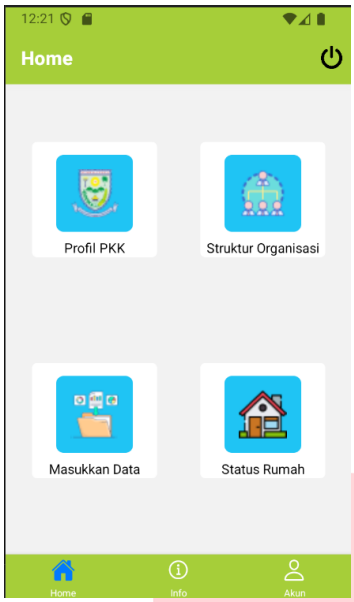


FIGURE 38 RUSDACA APPLICATION HOME PAGE

FIGURE 39 PKK PROFILE PAGE RUSDACA APPLICATION

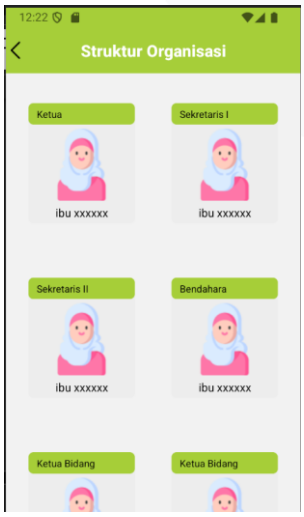


FIGURE 40 RUSDACA APPLICATION ORGANIZATIONAL STRUCTURE PAGE

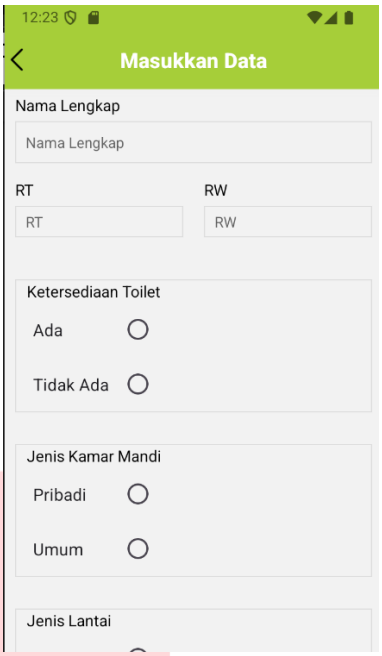


FIGURE 41 RUSDACA APPLICATION DATA ENTRY PAGE

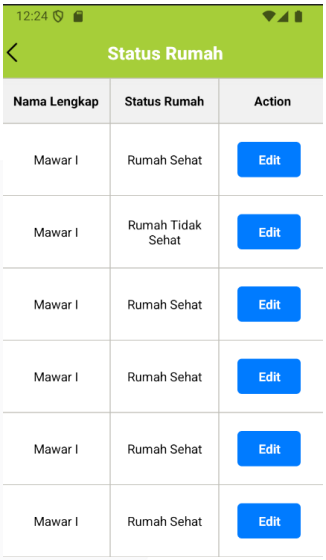


FIGURE 42 RUSDACA APPLICATION HOME STATUS PAGE

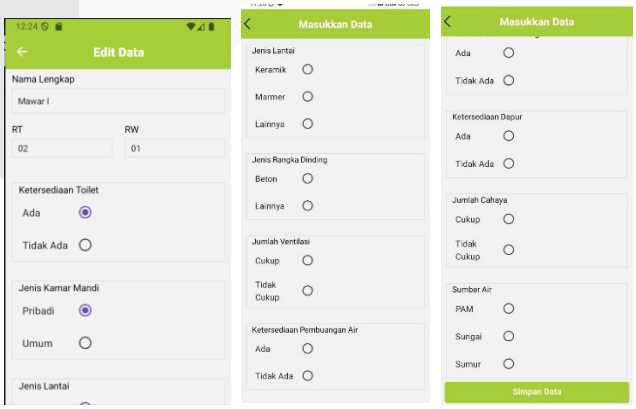


FIGURE 43 RUSDACA APPLICATION DATA EDIT PAGE

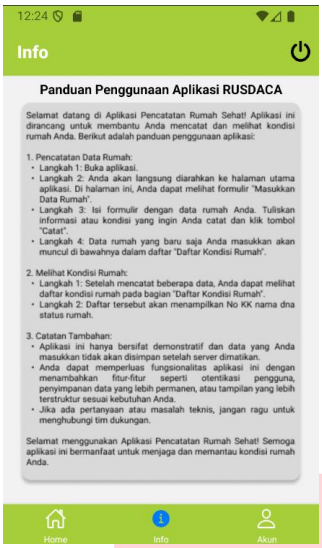


FIGURE 44 RUSDACA APPLICATION INFO PAGE

FIGURE 45 RUSDACA APPLICATION ACCOUNT PAGE

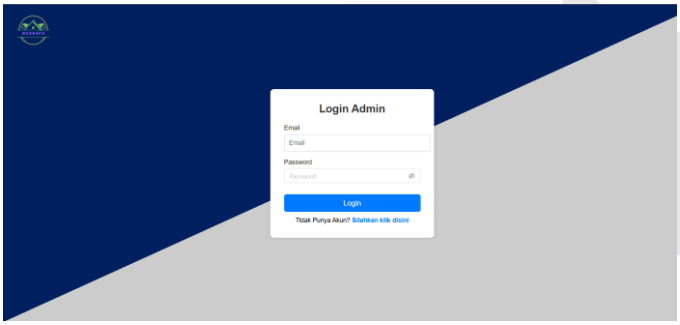


FIGURE 46 ADMIN ACCOUNT LOGIN PAGE

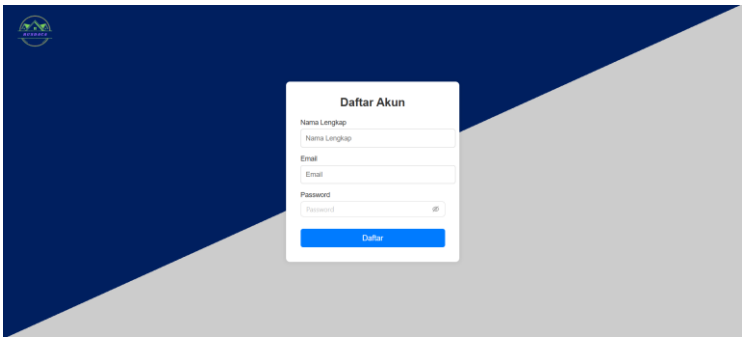


FIGURE 47 ADMIN ACCOUNT REGISTRATION PAGE

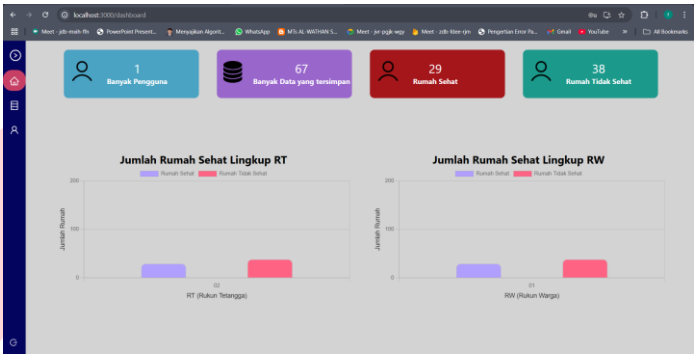


FIGURE 48 ADMIN DASHBOARD PAGE

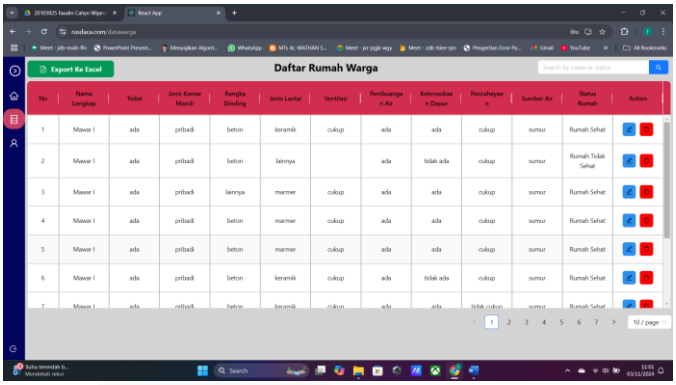


FIGURE 49 ADMIN CITIZENS' HOUSE LIST PAGE

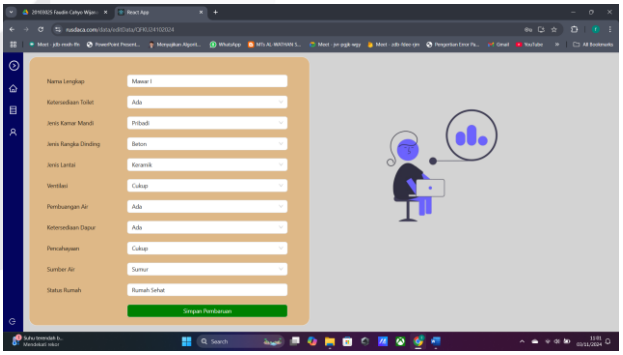


FIGURE 50 ADMIN CITIZEN HOUSE DATA EDIT PAGE

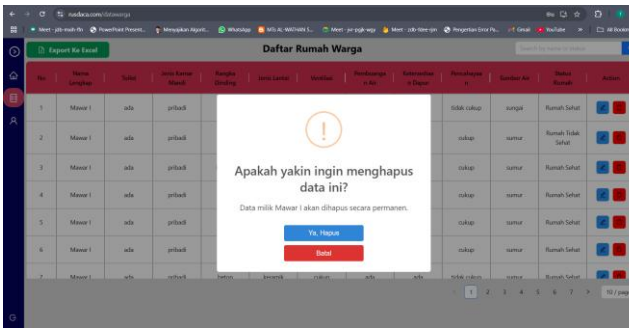


FIGURE 51 DELETE ADMIN CITIZEN HOUSE DATA

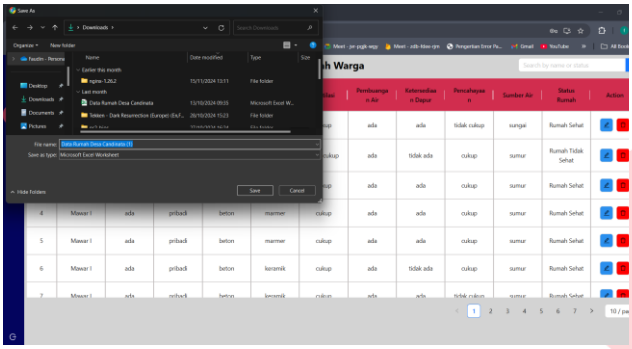
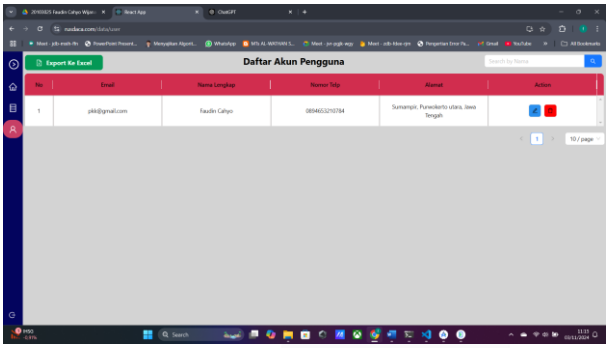


FIGURE 52 EXPORT DATA OF CITIZENS' HOUSE



FUGURE 53 USER ACCOUNT DATA PAGE in ADMIN

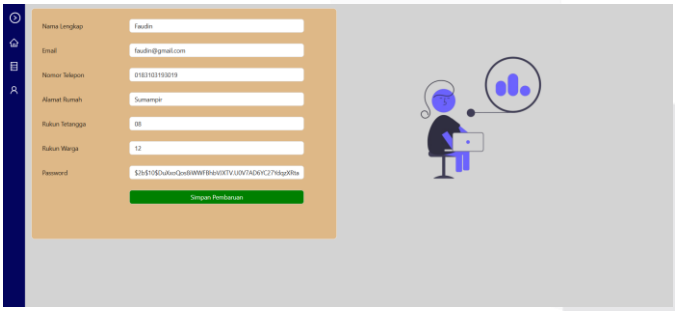


FIGURE 54 USER ACCOUNT DATA EDIT OAGE in ADMIN

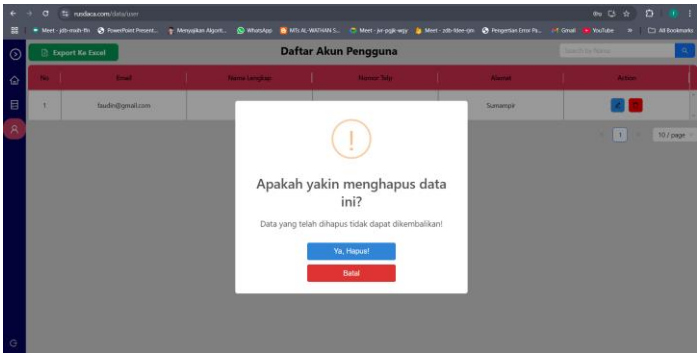


FIGURE 55 DELETE USER ACCOUNT DATA

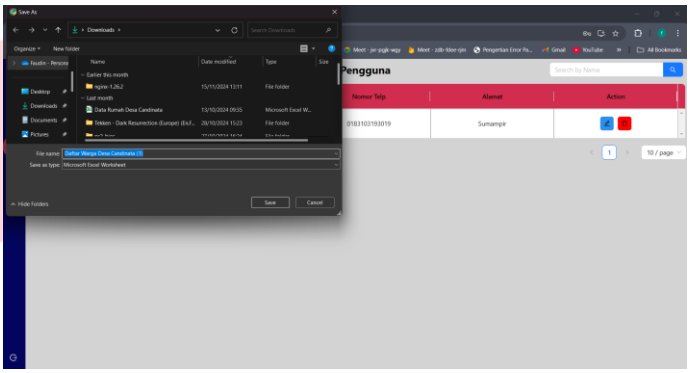


FIGURE 56 *EXPORT* USER ACCOUNT DATA

G. *Black Box Testing*

TABLE 1 *BLACK BOX TESTING*

No	Testing Scenario	*Test Case*	Expected System Respond	Detail
1	Login Page Validation Testing	*Input email*	The system will display an error message if the input does not match the email format, such as missing @ or .com	Invalid
2	Login Page Validation Testing	*Input password*	The system displays an error message if the password is not entered	Invalid
3	Testing the navigation of the registration page	Registration page navigation.	The system displays the registration page when the user clicks on the text "Belum Punya Akun?	Sesuai

No	Testing Scenario	*Test Case*	Expected System Respond	Detail
			Silahkan klik disini".	
4	Validation testing	Account Registration Form	The system displays an error notification when the user has not filled in all the inputs in the Account Registration Form	Invalid
5	Validation testing	Account Registration Form	The system will open the Home page and display a "Registration Successful" notification when the user has filled in all inputs	Valid
6	Login Page Validation Testing	Login button	The system displays an error message if the email and password are not entered	Invalid
7	Login Page Validation Testing	Login button	The system displays the home page with a "Login Successful" notification if the email and password are correct	Valid
8	Home Page Navigation Testing	PKK Profile Menu	Displays the PKK Profile page	Valid
9	Home Page Navigation Testing	Organizational Structure Menu	Displays the Organizational Structure page	Valid
10	Home Page Navigation Testing	Enter Data Menu	Displays the Enter Data page	Valid

No	Testing Scenario	*Test Case*	Expected System Respond	Detail
11	Home Page Navigation Testing	Home Status Menu	Displays the Home Status page	Valid
12	Bottom Menu Navigation Testing	Home Menu	Displays the Home page	Valid
13	Bottom Menu Navigation Testing	Info Menu	Displays the Info page	Valid
14	Bottom Menu Navigation Testing	Account Menu	Displays the Account page	Valid
15	Data Entry Form Validation Testing	Save Data Button	Displays an error notification "Please Complete the Data" if all required fields are not filled	Valid
16	Data Entry Form Validation Testing	Save Data Button	Displays a home status notification such as "Healthy Home" or "Unhealthy Home" when data is successfully saved	Valid
17	Data Entry Page Navigation Testing	Navigation	Displays the Home page when the home status appears	Valid
18	Home Status Page Testing	Home Status Table	Displays the full name and home status data	Valid
19	Navigation Testing	Edit Button	The system displays the Edit Data form when the user clicks the Edit button	Valid
20	Validation Testing	Edit Data Form	The system displays an error notification if the user does not fill	Invalid

No	Testing Scenario	*Test Case*	Expected System Respond	Detail
			in all the input fields	
21	Validation Testing	Edit Data Form	The system displays the "Successfully Updated" notification and the Home Status page	Valid
22	Account Page Testing	User Data on Account Page	The system displays full name, phone number, home address, and email	Valid
23	Admin Login Validation Testing	Admin Login Form	The system displays an error notification when all input fields are not filled	Valid
24	Admin Login Validation Testing	Admin Login Form	The system displays the Dashboard page and a "Login Successful" notification if the admin enters the correct email and password	Valid
25	Dashboard Page Testing	Dashboard Content	The system displays a histogram based on stored database data	Valid
26	Home Data Page Testing	Resident Home List Table	The system displays a table containing stored resident home data	Valid
27	Home Data Page Testing	Edit Button	The system displays the Edit Data page	Valid
28	Form Validation Testing	Edit Data Form	The system displays an error notification	Valid

No	Testing Scenario	*Test Case*	Expected System Respond	Detail
			when the admin does not change any data	
29	System Testing	Edit Data Form	The system displays a home status notification such as "Healthy Home" or "Unhealthy Home" and displays the Home Data page	Valid
30	Data Deletion Testing	Delete Button	The system deletes the selected data when the admin clicks the delete button	Valid
31	User Account Data Page Testing	User Account List Table	The system displays a table containing registered user accounts in the RUSDACA application	Valid
32	Navigation Testing	Edit Button	The system displays the Edit Data page when the admin clicks the Edit button	Valid
33	Validation Testing	Edit Data Form	The system displays an error message when the admin clicks the "Save Changes" button without modifying any data	Valid
34	System Testing	Edit Data Form	The system displays a "Data Successfully Updated" notification	Valid

No	Testing Scenario	*Test Case*	Expected System Respond	Detail
			when modifying any data	
35	Data Deletion Testing	Delete Button	The system deletes a user account data entry corresponding to the delete button clicked	Valid
36	Data Export Testing	"Export to Excel" Button	The system generates an Excel file containing the User Account List table, which can be downloaded to a local computer	Valid
37	Data Export Testing	"Export to Excel" Button	The system generates an Excel file containing the Resident Home List table, which can be downloaded to a local computer	Valid
38	Logout Testing	Logout Button	The system redirects to the RUSDACA admin login page, and users cannot access other pages without logging in again	Valid

H. *User Acceptance Testing*

Table 2 *User Acceptance Testing* for The Application

No	Average	Percentage	Evaluated Variable	Description
1	176/45 = 3,91	(3,91/5)100 = 78,22%	Design	Percentage of Question No.1
2	178/45 = 3,95	(3,88/5)100 = 79,11%		Percentage of Question No.2
3	176/45 = 3,91	(3,91/5)100 = 78,22%	Navigation Functionality	Percentage of Question No.3
4	175/45 = 3,88	(3,88/5)100 = 77,77%	Account Functionality	Percentage of Question No.4
5	177/45 = 3,93	(3,93/5)100 = 78,66%		Percentage of Question No.14
6	175/45 = 3,88	(3,88/5)100 = 77,77%		Percentage of Question No. 6
7	178/45 = 3,95	(3,95/5)100 = 79,11%	Data Functionality	Percentage of Question No.7
8	175/45 = 3,88	(3,88/5)100 = 77,77%		Percentage of Question No.8
9	176/45 = 3,91	(3,91/5)100 = 78,22%		Percentage of Question No.9
10	177/45 = 3,93	(3,93/5)100 = 78,66%		Percentage of Question No.12
11	175/45 = 3,88	(3,88/5)100 = 77,77%		Percentage of Question No.13
12	176/45 = 3,91	(3,91/5)100 = 78,22%	Error Validation	Percentage of Question No.10
13	176/45 = 3,91	(3,91/5)100 = 78,22%		Percentage of Question No.5
14	177/45 = 3,93	(3,93/5)100 = 78,66%	Notifications	Percentage of Question No.11
15	177/45 = 3,93	(3,93/5)100 = 78,66%	User Friendliness	Percentage of Question No.15

Table 2 shows the percentage results of the user acceptance test for the RUSDACA application, conducted with 45 PKK (Family Welfare Development) cadres, with a total average of 78.39%. Based on categories, design and user-friendliness received 78.66%, navigation functionality 78.22%, account

functionality 78.06%, data functionality 78.30%, error validation 78.22%, and notifications 78.66%. These results indicate that the RUSDACA application received a "Good" rating according to the scoring criteria in Table 4.4.

V. CONCLUSION

The user acceptance test conducted with 45 respondents from PKK cadres on the RUSDACA application resulted in an average percentage of 78.66% for design, 78.22% for navigation functionality, 78.06% for account functionality, 78.30% for data functionality, 78.22% for error validation, 78.66% for notifications, and 78.66% for user-friendliness, with an overall total of 78.39%. These results indicate that the RUSDACA application received a "Good" rating based on the scoring criteria in Table 4.3.

The Healthy and Unhealthy Housing Information System, implemented in the RUSDACA application, operates according to the designed plan and enables digital recording of housing data for residents of Candinata Village. Usability measurement was carried out through user acceptance testing involving 45 PKK cadres from Candinata Village, which resulted in a score of 78.39%. Therefore, it can be concluded that the RUSDACA application has a "Good" level of feasibility in supporting the digital recording of healthy and unhealthy housing**.**

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