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Web-Based Village Administrative Information System Design Using the Design Thinking Method in Bandar Labuhan Village

Ahmad Hamzah*, Muhamad Alda
Departement Information Systems, State Islamic University of North Sumatera, Medan, Indonesia
Email: [1] ahmadhamzahh14@gmail.com , [2] muhamadalda@uinsu.ac.id
(* : ahmadhamzahh14@gmail.com)
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Abstract− The Village Government is one of the governmental institutions responsible for providing services to the community, including delivering proper administrative services. Bandar Labuhan Village is one of the government offices that still employs a manual administrative system. As a result, data processing becomes slow and prone to errors, leading to delays and inefficiencies in population data management. Furthermore, manual services increase the risk of losing important data. Consequently, the community experiences delays in obtaining services, must travel long distances to access them, and is unable to receive accurate and timely information. Therefore, improvements and reforms in village public administrative services are needed to enhance efficiency, effectiveness, and service quality. The design of this village administrative system is an appropriate solution to address the issues faced by the Bandar Labuhan Village Government. The *Design Thinking* method was chosen due to its *user-centered* approach, which includes the stages of *empathize*, *define*, *ideate*, *prototype*, and *test*. This ensures that the system developed truly aligns with the needs of its users, including both village officials and the community.

Keywords: administration system; village administration; information technology; design thinking

1. INTRODUCTION

The rapid development of information technology has transformed the way individuals and government institutions obtain, manage, and deliver information. Technology has become an essential component for supporting efficiency in administrative activities, particularly within village-level government, which is responsible for managing population data and providing public services [1],[2],[3]. Accurate, integrated, and up-to-date data is crucial to ensure effective decision-making and high-quality public service delivery.

Bandar Labuhan Village is one of the government offices that has not yet fully utilized information technology to support its administrative processes. Current administrative activities still rely on manual record-keeping and non-integrated data management systems, leading to problems such as slow data processing, high error rates, data redundancy, limited access to information, and increased risk of data loss [4],[5]. These limitations significantly impact service quality, causing delays for residents who must travel directly to the village office to obtain administrative information or submit document requests.

Several studies have proposed the development of village administrative information systems to address similar problems. Previous works include the design of an Android-based population administration system, which demonstrated improved employee performance through Black Box testing [6], a web-based population administration service system using the Design Thinking method [7], and a village administration information system developed using the Extreme Programming (XP) method [8]. These studies highlight the importance of adopting digital solutions to enhance administrative workflows. However, differences exist in methodology and case context.

To address the specific problems faced by Bandar Labuhan Village, this research adopts the Design Thinking methodology, a human-centered design approach that emphasizes understanding user needs through five stages: empathize, define, ideate, prototype, and test [9]. The use of Design Thinking enables the development of a system that not only solves technical issues but also aligns closely with the expectations and experiences of the village officials and residents as end-users.

Based on these considerations, the authors designed a web-based Village Administrative Information System for Bandar Labuhan Village. This system aims to improve administrative service efficiency, accelerate data processing, and provide residents with easier access to information and services anytime and anywhere.

2. RESEARCH METHODOLOGY

2.1 Research Stages

This section explains the stages of the research that describe the sequence of activities carried out, the application of the method used, and the testing procedures performed to obtain results that align with the research objectives. The research was conducted using the Design Thinking method, which consists of five main stages: Empathize, Define, Ideate, Prototype, and Test. The overall research flow can be seen in Figure 1.

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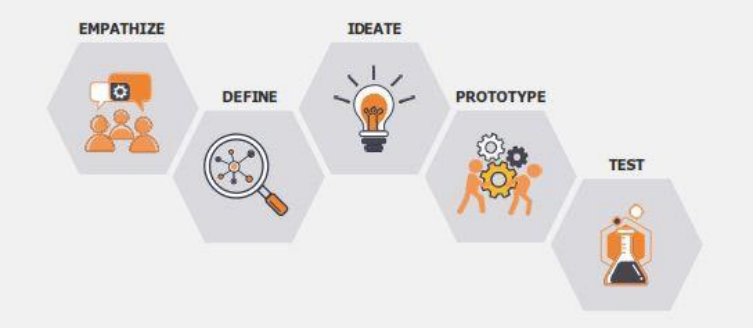

Fig 1. Stages *Design Thinking*

Design Thinking is a problem-solving method that focuses on human needs and integrates them with innovation to create optimal solutions[10]. By combining user experience analysis with creativity and innovation, *design thinking* allows us to better understand user needs and expectations. *Design thinking* can be the key to creating solutions that are more in line with user needs and expectations, thus creating a better experience[11].

2.1.1 Empathize

Empathize is the initial stage where the researcher approaches the user to obtain information related to what they want [12]. In this process, observations and interviews are carried out to find out the needs of users, understand their perspective on the problems they face. By exploring the problem from the user's perspective, the solution formulated will be more appropriate and in line with their actual conditions and needs.

2.1.2 Define Level

Stages *define* involves data analysis to understand the problems faced and determine the direction of the concept to be developed[13]. The define process is carried out after understanding the specific needs of the user through the analysis of the observation results in the Emphatize process, to identify the focus of the problem faced. In short, the define phase is the stage of summarizing the findings into a clear, sharp, and user-oriented core problem, which then becomes the basis for producing creative solutions in the ideate phase.

2.1.3 Ideat

Ideat the stage where all ideas are collected and developed to solve problems that have been determined in the previous stage which is used as a basis for designing *Prototype*[14]. In summary, this ideate phase is a stage of creative exploration that aims to produce new and innovative ideas as the basis for creating solutions that will be tested in the next stage, namely the prototype stage.

2.1.4 Prototype

Prototype is an initial model developed to test the design concept that has been designed. Initial design *testing* is carried out to obtain feedback from users and improve the design to better suit their needs[15]. The prototype stage can also be referred to as the process of quickly and simply creating an initial representation of a solution to be tested, validated, and improved before going into final development.

2.1.5 Test

Test, is a thorough and rigorous testing phase. This phase can be repeated several times to ensure that the proposed solution truly meets expectations and is error-free. Thus, the test stage can be said to be the process of testing prototypes with users to collect feedback, validate solutions, and make improvements so that the final result is completely in accordance with the user's needs.

3. RESULTS AND DISCUSSION

This section presents the analysis, results, and discussion obtained from the research stages using the Design Thinking method. The explanations are supported by data, figures, and tables based on research findings.

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3.1 Analysis of Design Thinking Stages

The results and discussion in this subsection refer to the five stages of the Design Thinking method applied in developing the Web-Based Village Administrative Information System in Bandar Labuhan Village.

3.1.1 Emphatize

This stage is the activity carried out by the author to obtain problems directly experienced by users through a series of observation and interview activities. This observation activity was conducted at the Bandar Labuhan Village Office and directly interviewed two people as respondents: a village official as resource person 1 and a resident as resource person 2. The table below is the results of the interviews to determine user needs.

Table 1. Process *Emphatize*

No	Reserch Question	Resource Person 1	Source 2
1	How is the administrative process at the Bandar Labuhan village office currently?	Currently, we still use manual notebooks and Excel files to store data. This process is time-consuming and often results in errors due to the data not being integrated.	-
2	What are the biggest challenges faced in managing village administration?	Data irregularities. For example, population data is not updated, and information is often difficult to track.	-
3	What do you need to improve quality of village services?	-	More efficient systems and easy data access.
4	What difficulties do you face in accessing? village information and services?	-	Delays, difficulty in accessing data, and having to travel long distances.
5	How do you access village information and services?	-	Come directly to the village office or contact the village officials.

3.1.2 Define

Stages *define* is a further stage of *empathize*. This stage is carried out to identify the core issues or main problems to be defined. Based on the table below, the author determines that the core issues are inefficiency, lack of transparency, and limited access in village administration. Table 2 explains the core issues as concluded based on Table 2.

Table 2. Process *Define*

It is difficult to manage data manually	Resource Person 1
The process is slow, error-prone and poorly integrated.	Resource Person 1
It is difficult to process letters because of the manual process.	Resource Person 2
Must come to the village office directly	Resource Person 2
Need fast access to information and online services that can be done anywhere and anytime.	Resource Person 2

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3.1.3 Ideas

Stages*define* is a further stage of *empathize* This stage is carried out to identify the core issues or main problems to be defined. Based on the table below, the author determines that the core issues are inefficiency, lack of transparency, and limited access in village administration. Table 2 explains the core issues, as summarized in Table 3.

Table 3. Process *Ideas*

Problem	***Solution***
Village officials have difficulty managing data manually.	Develop an integrated information system to manage data.
The process is slow, error-prone and poorly integrated.	Provides auto-mail features and quick search features to access data.
It is difficult to process letters because of the manual process.	Provides a letter submission system*online* with a letter template feature that can be filled in automatically based on citizen data.
Must come to the village office directly.	Provides a mail monitoring feature where users can monitor the status of mail that has been submitted.
Need access to information and services*online* which is fast and can be done anywhere.	Setting up the system*website* It can be accessed anytime, anywhere with 24-hour online access. It features a lightweight and fast-access interface.

3.1.4 Prototype

Prototype is the system design stage, namely by creating *design prototype* then make *website* which is in accordance with the problems that have been determined.

a. Menu *Login* Administrator
As seen in the image below, before managing mail, to enter the system*admin* required *login* first by filling *username* And *password* first.

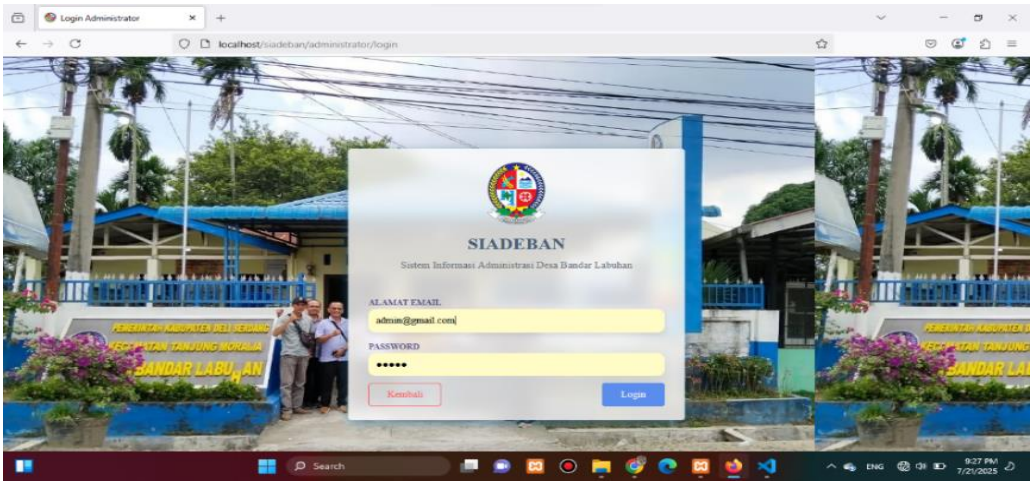

Fig 2. Login Admin

b. Mail Verification Display
This menu displays the status of each letter request submitted by the letter.

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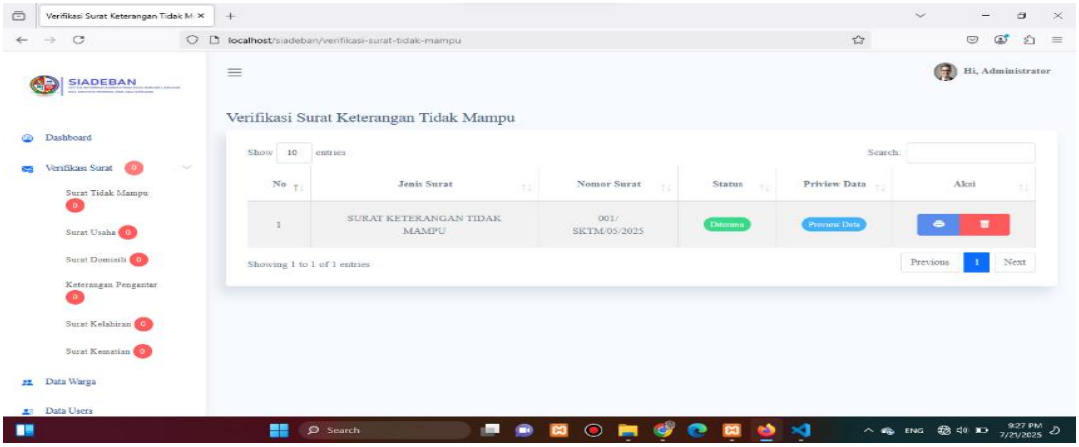

Fig 3. Mail Verification Menu

c. Citizen Data Menu

This menu is usedadmin To add citizen data, you can edit, delete, and detail actions from this menu.

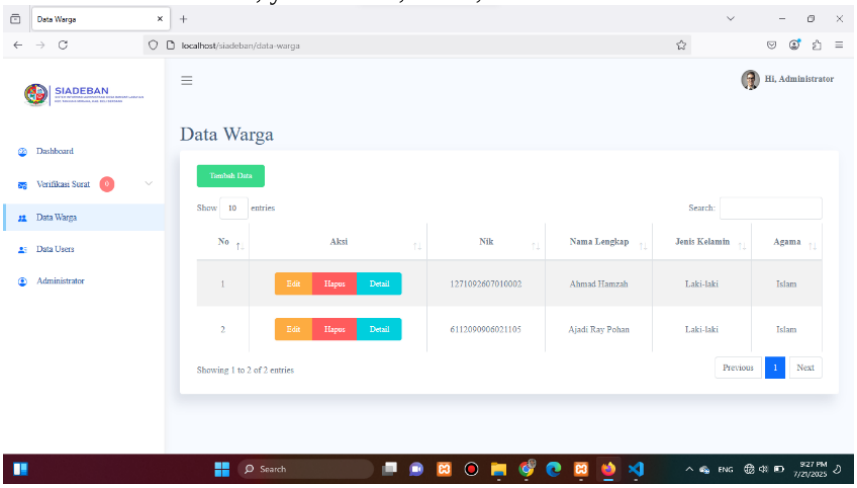

Fig 4. Citizen Data Menu

d. Menu *Dashboard User*

Menu view dashboard user starting with a welcome and SOP from letter submission. This display consists of several menus such as letter services and letters.

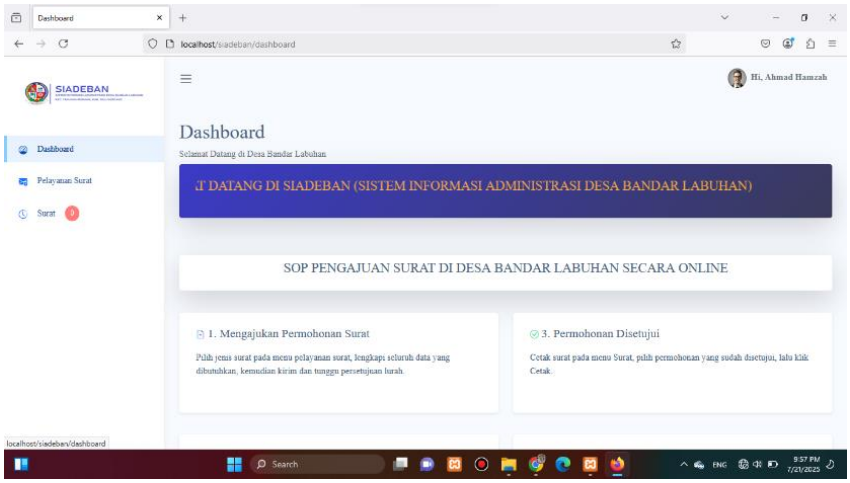

Fig 5. *User Dashboard* Menu

e. Mail Service Menu

This menu displayslist from several letter applications that can be made, such as a domicile certificate, business certificate, certificate of poverty, cover letter, death certificate and cover letter for birth certificate.

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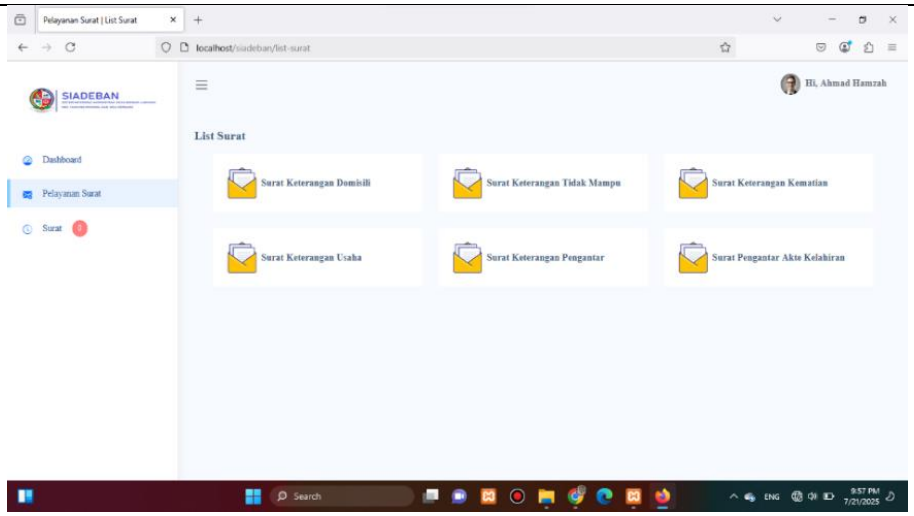

Fig 6. Mail Service Menu

f. Mail Menu Display

This menu displays a list of the history of letters that have been submitted.

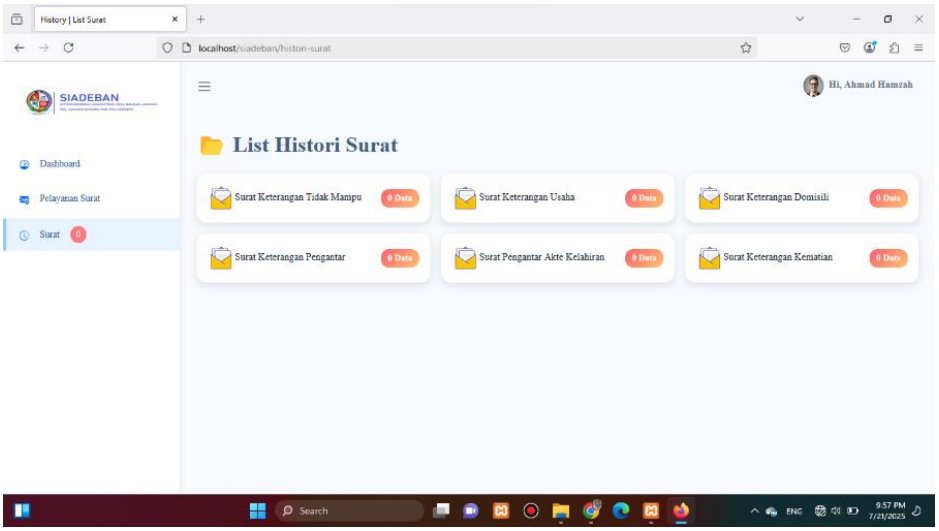

Fig 7. Mail Menu

3.1.5 Test

a. Testing Blackbox

Testing on the Bandar Labuhan Village system was carried out using the method blackbox to evaluate whether the input provided can produce resultsoutput which is in accordance with expectations. Testing blacbox testing can be seen in the table below.

Table 4. Testing Blackbox

The function that Tested	Testing Scenario	The Results expected	Results Testing
Login	Enter*username* And *password* Which valid, then click "*Login*"	The system displays*dashboard* user	In accordance
Login with *Password* Wrong	Enter*username* And *password* Which wrong, then click "*Login*"	The system displays an error message*login*	In accordance

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Mail Verification Menu	Click the letter verification menu and select the letter type.	Letter successful verified and the status changed to Accepted	In accordance
Data Menu Inhabitant	Access the "Data" menu Inhabitant"	The system displays the entire list of citizen data	In accordance
Mail Service Menu	Click the Mail Services Menu and select the mail type.	The system displays*dashboard* in accordance role	In accordance

b. Testing UAT

Testing UAT This was done by asking users to fill out a questionnaire that assessed the Bandar Labuhan Village information system. The questionnaire was filled out by 10 respondent consisting of village officials and local residents. Each question has 5 responses including Strongly Agree (SS), Agree (S), Neutral (N), Disagree (TS). Test ResultsUAT can be seen in the table.

Table 5. Testing UAT

Question	Responsi				Amount Answer n	Presentation
	SS	S	N	TS		
This system has an attractive and easy to use interface. understood by users.	8	2	-	-	10	95%
This system presents a menu display that meets user expectations.	6	3	1	-	10	87.5%
All menus in this system work well.	10	-	-	-	10	100%
This system is simple to use understandable and easy to understand by users.	8	2	-	-	10	95%
This system helps make it easier for the village office to manage*website.*	4	-	-	-	4	100%
This system is able to speed up the process of managing data information.	4	-	-	-	4	100%

It can be concluded that by conducting *UAT testing* which obtained a presentation of 96.25%, it can be said that the Bandar Labuhan Village system can run well.

3.2 Flowchart of the System Process

This section explains the system workflow by converting the Use Case Diagram and Activity Diagrams into a structured flowchart description. The flowchart illustrates the sequence of processes performed by the admin and users when interacting with the Web-Based Village Administration Information System.

1. *Use Case* Diagram

Use Case Diagram shows the functional system, whileuse case It itself explains the interaction between actors and systems[16]. Actors, which can be humans or technology, interact with the system to carry out certain tasks. The system below includes 2 actors, namely admin as village officials anduser as a citizen. Use case d*iagram can be seen in picture 2.*

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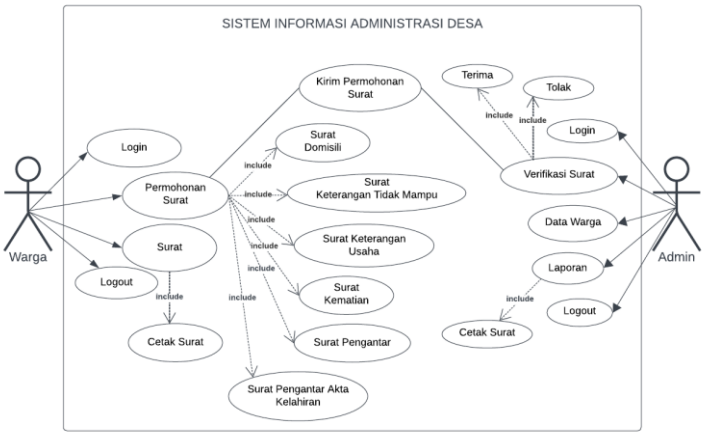

Fig 8. *Use Case* Diagram

2. Activity Diagram

Activity diagram using a series of processes related to a particular operation and can be applied to various activities. In this application, activity diagrams are designed for two main roles, namely employees and citizens. Activity diagrams can also be used to model the effects that occur during a process. By using activity diagrams, we can visually depict the sequence of steps in a process and the relationships between those activities[17]. The following is an activity diagram *admin* And *user*.

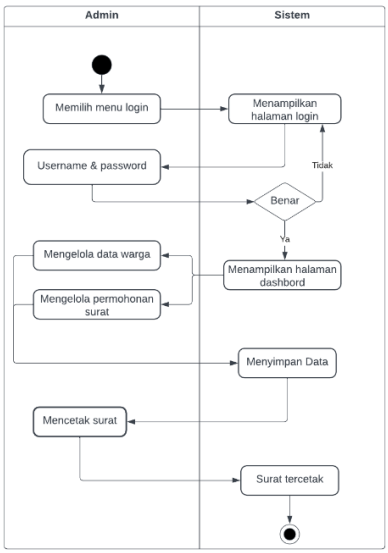

Fig 9.Activity Diagram Admin

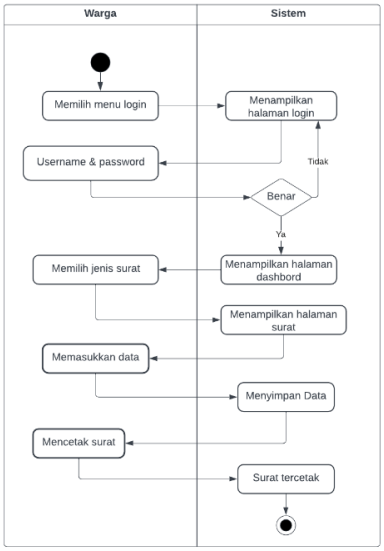

Fig 10.Activity Diagram User

4. CONCLUSION

Based on the design and testing results, it can be concluded that the web-based village administration information system developed for Bandar Labuhan Village using the *Design Thinking* method effectively met user needs. The design process, which involved five stages of *Design Thinking*: *Empathize*, *Define*, *Ideate*, *Prototype*, and *Test*, enabled the development team to understand existing problems in the field and generate appropriate solutions. This system is designed to simplify the management of village administration data, such as correspondence services, population data collection, and activity reporting. The success of this system is also evidenced by the results of the *User Acceptance Test (UAT)*, which showed a very high level of user satisfaction. As many as 95% of respondents stated that the system has an attractive and easy-to-understand interface, 87.5% felt the menu display met expectations, and 100% stated that all menus in the system functioned well. Furthermore, 95% of respondents considered the system simple and easy to understand, and all respondents (100%) stated that the system was able to help speed up the information management process and support the village office's work in website management. Thus, this information system is deemed suitable

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for use and capable of improving the efficiency and quality of administrative services in Bandar Labuhan Village. This system also has the potential for further development and implementation in other villages with similar needs as part of the digital transformation of village government.

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