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# Village Information System Design with Mobile Development Life Cycle Approach

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**Abstract**

Mobile technology can provide great opportunities for village governments to improve public services and make village governance more transparent. Lolo Kecil Village still faces several problems in services, such as manual and time-consuming administrative processes, low public access to village information and activities, and low citizen participation in the decision-making process. This hampers service performance and makes the community less trusting of the village government. This study aims to design a mobile-based village information system using the Mobile Development Life Cycle (MDLC) approach. The MDLC approach is structured through the stages of planning, needs analysis, system design, and mobile application development. This system is intended to facilitate village administration processes such as delivering letters and other public services online, as well as increasing transparency through access to village information and activities. Through the complaint feature and discussion forum, the village information system can help the community communicate with the village government and provide direct input to village officials. The results of the system design implementation show that MDLC works well to create a stable, responsive, and easy-to-use mobile application. As a result, this application can function as a strategic tool to accelerate the digital transformation of villages, increase the accountability of village governments, and strengthen the relationship between village officials and the community through more open and clear communication. As a result, the level of public satisfaction with the services provided by the village government increased.

Keywords: Village, Information, Mobile, MDLC, Services



## 1. Introduction

Village government is the smallest government structure, playing an important role in national development. Villages not only run the government, but also provide public services to the community. Therefore, the success of development and the quality of life of residents depend greatly on how effective village governance is. The use of manual systems can have an impact on services [1], [2]. This causes many problems, such as late administration, data recording errors, and unclear village financial management [3]. Optimizing access to information and effective communication media, manual systems also reduce community participation in the village decision-making process. This condition causes less than optimal services, as well as communication between village officials and residents, which can cause distrust and hinder progress[4].

Digital transformation is a strategic choice to overcome these obstacles, along with the growth in information and communication technology. Mobile applications have great potential to improve the efficiency and transparency of village governance due to the increasing use of smartphones in rural areas [5],[6]. The Village Information System (SID) can help in the digitization of population data and village administration, as well as provide information and monitoring of village development programs. This can increase the accountability of the village government and increase community participation in decision making.[7].

Village digital transformation is one of the national priorities, with the aim of improving the quality of life of rural communities through the use of inclusive and easily accessible information technology. This policy provides important value for village governments to implement mobile technology in modern governance [8]. The use of mobile applications in village government can improve the efficiency and quality of services [9]. Mobile applications increase transparency in the use of Village Funds and reduce complicated bureaucracy [10]. Mobile-based information systems

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accelerate administrative services and reduce the level of public complaints.[11].

Lolo Kecil Village is a village located in Kerinci Regency, the village government provides services to the community but there are still problems such as administration and information services, this is because the process of submitting letters is still done manually, in providing information is also limited. Therefore, it is necessary to develop services in the utilization of information technology.

Adoption of technology in villages still faces many problems. Government applications must be designed to be user-friendly and provide adequate training so that they can be used optimally [12]. The main obstacles in development are limited internet infrastructure, lack of digital literacy among village officials and residents, and lack of human resource readiness to operate the technology.[4],[13].

Development of village information systems using the Mobile Life Development Cycle development method. The Mobile Application Development Life Cycle (MADLC)-based software development method has proven successful in creating mobile applications that are appropriate and responsive to user needs. [14].The planning, design, development, testing, launching, and maintenance processes are carried out iteratively and structured through this method, which allows for rapid adjustments to user input and changing needs [15]. Mobile applications help accelerate access to public services . The mobile application can also be an important tool for increasing transparency and accountability of the village budget through interactive monitoring features. Data security and privacy are also major concerns when creating mobile applications for village government. Protection of citizen data is essential to making the village information system trustworthy and safe to use [16]. Accelerating coordination and decision-making based on accurate data, the village information system must be integrated with other digital government services [9]. In addition, mobile applications can support community empowerment through interactive digital education features and participation, which increase the active role of citizens in village development [17]. The purpose of this study was to develop a mobile-based village information system using the Mobile Application Development Life Cycle (MADLC) approach. By using this approach, it is hoped that this system can support inclusive and sustainable village development by increasing the efficiency of administrative services, increasing transparency of financial management, and increasing community participation.[18].

## 2. Research methodology

This study uses the *Mobile Application Development Life Cycle* (MDLC) approach as a framework in the process of developing a mobile-based Village Information System. MADLC is a software development model specifically designed for mobile applications, with systematic and iterative stages to ensure that the resulting product meets user needs and functions optimally. [18]The MDLC approach used consists of several main stages, namely planning, needs analysis, system design, development, testing, and maintenance. Each stage is carried out sequentially but still allows for iteration to make improvements based on user input and test results. The research stages can be described in Figure 1.

Figure 1 explains the research stages process in developing a mobile-based village information system. These stages include:

1. Planning and Needs Analysis

This initial stage focuses on data collection and identification of the needs of the system to be developed. Data collection methods are carried out through field observations, interviews with village officials, and surveys of the community as application users. The goal is to understand the current condition of village governance and the main needs in administrative services and transparency that can be accommodated by mobile applications.

2. System Design ( *System Design* )

Based on the results of the needs analysis, a mobile application architecture design was carried out, including a user interface design *that* is easy to use by people with various technological backgrounds. This design also includes application workflow, security systems, and integration with databases.[19].

3. Development

The development stage involves the process of coding and creating mobile applications using the flutter framework.[20].

4. Testing

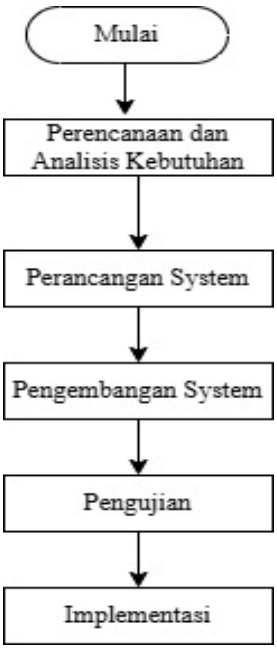


Figure 1. Research Flow

System testing is done to ensure all application functions run as needed and are free from bugs. Testing includes functional testing, usability testing, and security testing. At this stage, testing is also carried out by end users, namely village officials and the community, to get feedback for improving the application.[21].

## 3. Results and Discussion

Research produces information systems through needs analysis, design, implementation, testing, and maintenance are the main stages of the Life Cycle of Mobile Application Development (MADLC) approach used in the development of this Mobile-based village information system. The purpose of this approach is to improve ease of access and efficiency of data management and village administration services.

### 3.1 Needs Analysis Stage

The needs analysis was conducted based on the results of interviews and observations of village officials and residents. Currently, the village administration process is carried out manually using notebooks and spreadsheets. The problems found include (1) The difficulty for villagers to access information and administrative services quickly, (2) The slow process of submitting letters and reporting problems (3) Management of resident data and village activities that is not structured enough, and limited monitoring of village programs and report management. From the results of this analysis, the main needs of the system were found to be: (1) A mobile-based system that is easy for residents and village officials to use, (2) Digital recording of resident data and administrative transactions, (3) Online letter submission and village problem reporting features, (4) Real-time monitoring and report generation for village officials and village heads, (5) Automatic notifications for follow-up submissions or reports.

### 3.2 System Design Stage

This mobile-based village information system is designed using the Flutter framework to facilitate access from various devices. Some of the main features of the system are User registration and login (Residents, Village Apparatus, Village Head, Field Officers). Submission and management of village administrative letters. Reporting village problems by uploading photos and descriptions. Notification of submission and report status. Real-time monitoring and reporting of village programs. Management of citizen data and village master data. System modeling uses *the Unified Modeling Language* (UML) to model interactions between users and systems including:

1. Use Case Diagram

The mobile-based Village Information System involves several main actors who interact directly with the system. Each actor has a different role and responsibility according to the function and needs of village administration management and services for residents. The following is a description of the actors and their roles that can be presented in the use case diagram in Figure 2.

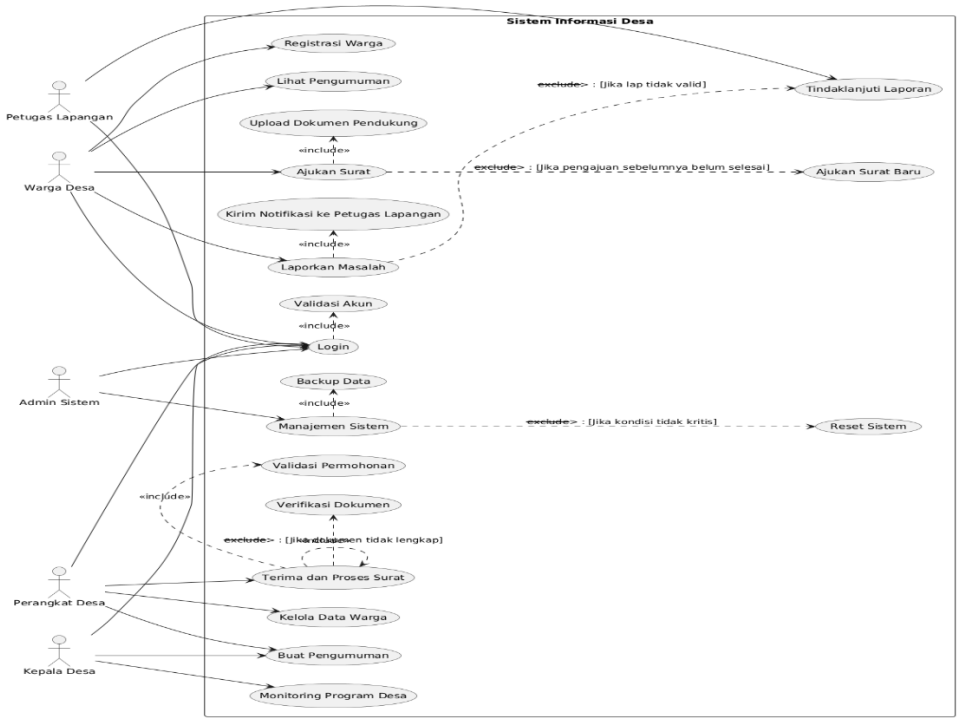



Figure 2. Use Case Diagram of Village Information System

Each actor has a different role and responsibility according to the function and needs of village administration management and services for residents.

a. System Admin

The system admin acts as the main manager of the village application. His/her job is to ensure that basic village data and systems are available and can be used by all users. The roles and responsibilities of the Village System Admin include adding and managing user accounts (Village Apparatus, Village Head, Field Officers, and Residents). Managing village master data such as resident data, village area, types of administrative letters, and service categories. Backing up and restoring data to maintain system security and consistency. Monitoring overall application performance and security.

b. Village Apparatus

Village Apparatus is the most active actor in managing village administration through the system. The main role is to process citizen requests and manage village data. The responsibilities of Village Apparatus include: receiving and processing administrative letter submissions from residents. Managing citizen data and village administration data. Making and announcing official village announcements. Making reports and recapitulations of village activities in real-time. Monitoring incoming village problem reports and distributing them to field officers.

c. Village Head

The Village Head is tasked with supervising and making strategic decisions in village management. The role of the Village Head includes: Accessing monitoring and reporting of village programs as a whole. Providing approval or direction for the submission of important letters and village activities. Making official announcements and strategic information for residents. Supervising the follow-up of community reports and complaints.

d. Field Officer

Field Officers act as technical implementers who follow up on reports or problems submitted by residents. Field Officer Responsibilities: Receive notification of problem reports from residents. Take action or coordinate improvements according to the report. Update the follow-up status into the system so that residents and village officials can monitor the progress.

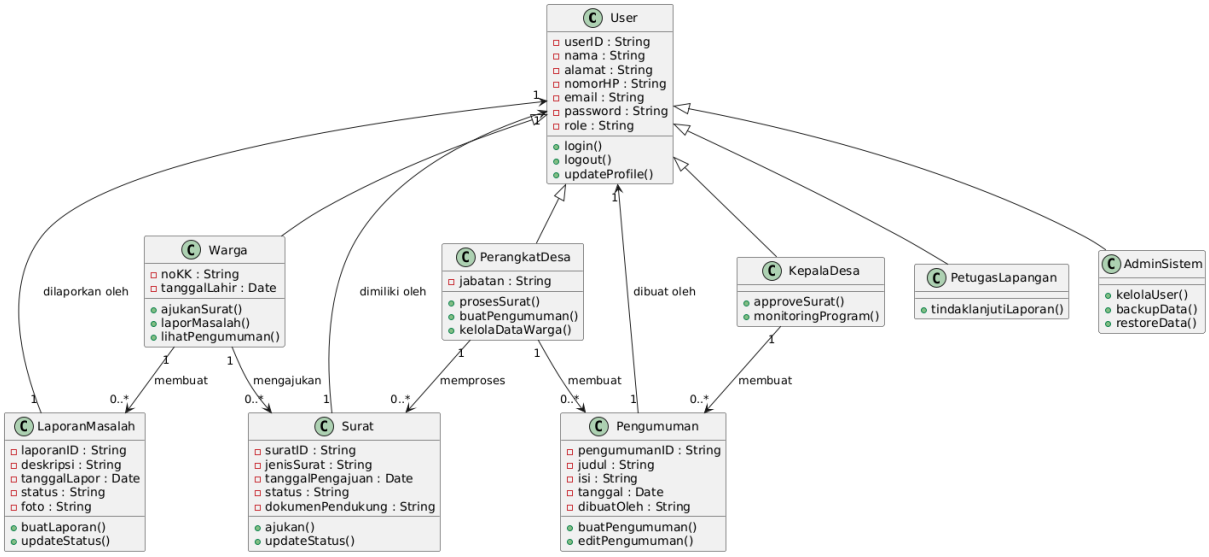
e. Village Residents

Villagers are users of services provided by the system through a mobile application. The roles of residents include: Registering and logging in to the application. Submitting village administrative letters online (such as certificates, domiciles, etc.). Reporting problems or complaints related to village facilities and services. Viewing announcements and important information from the village. Receiving notifications of application or report status.

2. Class Diagram

The structure of the village information system consists of main classes, as well as relationships between classes

and their attributes, namely data and methods. In the process of developing a mobile-based village information system, class diagrams are used to model entities and relationships. Class diagrams are also used to model processes related to village administration management, letter submission, problem reporting, and management of citizen data and village announcements.




Village Information System Class Diagram

The class diagram image, can be seen the main components that form the system, how data is organized, and how interactions between entities occur. Figure 3 shows a class diagram of the Village information system.

a. User Class: The User Class represents all users of the system, including devices, village heads, field officers, residents, and system admins.
b. Citizen Class: The Citizen class stores the details of the villagers who use the system services. This includes personal data and administrative status.
c. Letter Class: The letter class is an important part of the system and is used to record all administrative letters submitted by residents and processed by village officials.
d. Problem Report Class: This class is used to record reports or complaints about problems submitted by villagers regarding environmental conditions or village facilities.
e. Announcement Class: Village officials and village heads provide and store official information or notifications to residents.

### 3.3 System Implementation and Testing

The purpose of the implementation and testing process of the design results of the mobile-based Village Information System is to ensure that village administration, communication and information access services can run better and more efficiently. The main focus of this testing process is to ensure that the system can be easily accessed and has optimal functions for each user. The interface display, also known as UI, is an important component that is tested because the interface functions as a direct path between the user and the system. The village information system becomes easy to use by various parties, such as villagers, village officials, village heads, and field officers. With an easy-to-use and responsive interface design, it is hoped that this system can improve the user experience and support smooth village administration and reporting processes. An overview of the village information system interface can be seen in Figure 4.

Figure 4 is a display of the initial page on the mobile-based village information system, the interface consists of several main pages such as the home page, village profile, contacts, and a button to login. On the login page, users are asked to enter data in the form of a Username and Password as a requirement to access the system.

To be able to use the village administration and data processing services, users must first log in to be properly authenticated. After successfully logging in, users will be directed to the homepage which functions as a system dashboard to access various system features.

In addition to the login and homepage interface designs, the testing process was also carried out on the Village Information System Profile page. An overview of the user-friendly and functional dashboard page display can be seen in Figure 5.

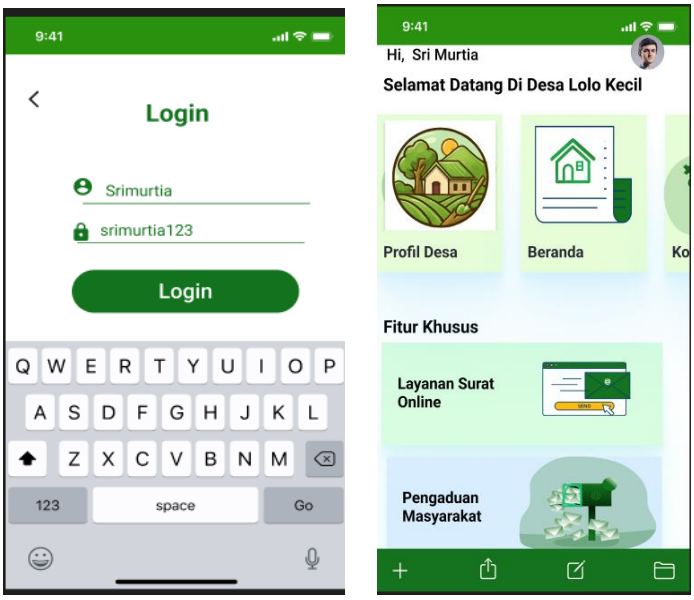



Figure 4. Village Information System Homepage

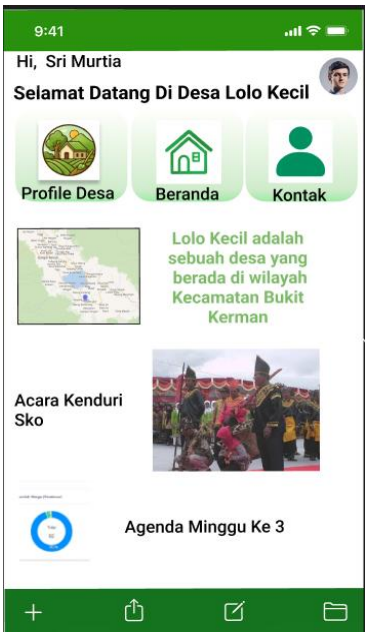



Figure 5. Village Profile Page

Figure 5 is a display of the village profile menu page. The Village Profile Menu is one of the features in the Village Information System that functions as the main information page about the village. This menu provides a complete and official picture of the village to application users, both residents and outsiders who want to know the condition and potential of the village quickly and accurately.

Table 1. Details of test results

| No | Case/Tested | Test Data | Expected results | Test Results |
|---|---|---|---|---|
| 1 | Login | Did not enter Username and Password | The system displays the notification "Username is not registered in our database." | Succeed |
| | | Entered wrong username, correct password | The system displays the error "Username is not registered in our database." | Succeed |
| | | Entered username is correct, password is incorrect | The system displays the error "Wrong password, try again." | Succeed |
| | | Enter the correct username and password | The system directs to the Dashboard page according to the user's role. | Succeed |

| | | | | |
|---|---|---|---|---|
| 2 | Citizen Data Management | View citizen data | The system displays detailed citizen data | Succeed |
| | | Editing citizen data | The system displays the citizen data edit page | Succeed |
| | | Deleting citizen data | The system immediately deletes citizen data from the database. | Succeed |
| | | Adding citizen data | The system displays new citizen data in a table. | Succeed |
| 3 | Village Device Data Management | Adding village device data | The system displays the new device data in the table. | Succeed |
| | | Editing village device data | The system displays the village device data edit page | Succeed |
| | | Deleting village device data | The system deletes village device data from the database | Succeed |
| 4 | Administrative Letter Management | Adding a letter submission | The system successfully added the letter submission data | Succeed |
| | | Editing mail status | The system displays a form to update the letter status. | Succeed |
| | | Delete letter submission | The system deletes the letter data from the database. | Succeed |
| 5 | Problem Report Management | Create a problem report | The system displays a report input form with photo uploads. | Succeed |
| | | Updating report status | The system updates the report status according to the action. | Succeed |
| 6 | Citizen Dashboard Menu | View announcements and application status | The system displays the latest announcements and status of the application. | Succeed |
| | | Uploading proof of submission or report | The system displays the upload form and successfully saves the file. | Succeed |

Table 1 describes all the test scenarios carried out on the system. Most of the functions in the Village Information System run well as expected. Some technical constraints such as the application response time when accessing letter submission data are a little slow on low internet connections, but these problems have been fixed and retested. With satisfactory final test results, this system is declared suitable for use as a digital solution to support efficient and transparent village administration and service management.

## 4. Conclusion

The mobile-based Village Information System has been successfully designed and developed to meet the needs of digital village administration and service management. This system provides key features such as citizen data management, administrative letter submission, village problem reporting, announcement making, and user management with different levels of access according to role. All system features have been tested using the *black-box* testing method and show results that are in accordance with the needs of village users. Through the *Mobile Application Development Life Cycle* (MADLC) approach, it has proven effective in building a system systematically, from needs analysis to testing and implementation stages. With this system, the village administration process becomes more efficient, structured, and digitally documented, while increasing transparency and ease of access to services for all residents and village officials, as well as providing satisfaction to the community.

## Author Contributions Statement

| Name of Author | C | M | So | Va | Fo | I | R | D | W |
|---|---|---|---|---|---|---|---|---|---|
| Sri Murtia | ✓ | ✓ | | | ✓ | ✓ | | ✓ | ✓ |
| Riki Saputra | | ✓ | | | | ✓ | | | ✓ |
| Niska Ramadani | ✓ | | ✓ | ✓ | ✓ | | ✓ | | |

## Conflict of Interest Statement

Authors state no conflict of interest.

## Informed Consent

We have obtained informed consent from all individuals included in this study.

## Data Availability

The data that support the findings of this study are available from the corresponding author, [M], upon reasonable request.

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