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Smart Village: Mobile-Based Community Reporting Application

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Abstract

Smart Village innovatively uses information technology to improve quality of life and efficiency. This study seeks to cover research gaps, contribute to the research field, and serve as a platform for primary probabilistic research by overcoming a proposed concept about The Community Reporting application as a solution for mobile phones. This application development uses the DART language with the Flutter Framework. The research stages are divided into four parts: problem analysis, literature study, system development, and report writing. The UAT test on the community reporting application got a score of 81.43% from community respondents. Furthermore, the community reporting administration system scored 88.3% of the village apparatus respondents. Therefore, the developed application could be well received. The government and community should contribute to implementing government and developing villages based on information technology.

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INTRODUCTION

The development of information technology today is relatively rapid. All aspects of life, such as communication, work, and information delivery, have taken advantage of this development [1]. That is also one of the indicators of a country's progress [2]. Based on the development of information technology, the government, especially in Indonesia, has utilized it to implement government and public services based on information technology infrastructure [3]. This is applied by the central government and local governments [4], [5].

Smart City is a concept of integrating information technology into government aspects [6]. In line with the development of the Smart City concept, for a smaller scope, namely, the village began to develop the Smart Village concept [7]. Smart Village is a concept where towns innovatively use information technology to improve the quality of life, efficiency, competitiveness in economic, social, and environmental aspects [8], [9]. There are three main elements to realizing a smart village: smart government, smart community, and smart environment; these three elements are the basis for realizing smart relationships [10].

Runanto et al. designed the classification models of the smart village – a smart economy with deep learning methods [11]. The model which can classify the potential of a smart village – smart economy with deep learning method has successfully been made [11]. Another research focused on the spirit of innovation, entrepreneurship, productivity, transforming ability, image and trademark, and flexible labor market, where smart cities focused on implementing an economic strategy based on digital [12]. According to some studies about the smart village in the past, their studies aimed to analyze the potential application of smart village based on big data analytics in Indonesia [13].

Community reporting is recorded on big data analytics as a public service. The government can use it as a reference in correcting the shortcomings of village activities and as a means for the community to

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contribute to village development [14]. If this is not managed correctly, events related to the lack of infrastructure, information associated with the occurrence of a disaster, or social problems such as commotion will be challenging to handle because it is not appropriately monitored [15]. However, the research still focused on data reporting in Cloud Computing rather than visualizing on the mobile phone.

According to the problem and previously conducted research, this study seeks to cover research gaps and contribute to the research field and serve as a platform for primary probabilistic research by overcoming a concept proposed about The Community Reporting application was developed using the DART programming language with the Flutter Framework as a solution to the problems that arise above. This application has a mobile base so that people can access the application through smartphones. On the village government side, a website was developed to process report data using the PHP programming language with the CodeIgniter Framework.

METHOD

The stages of the study can be seen in the flow chart. The research stages are divided into four parts: problem analysis, literature study, system development, and report writing. The flow chart of the research work can be seen in Figure 1.

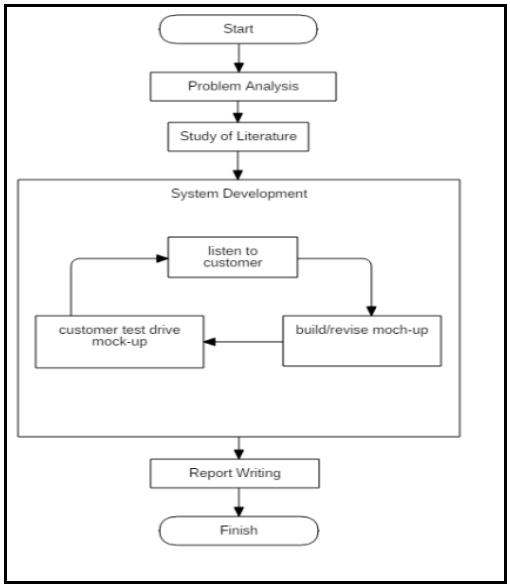


Figure 1. Flow Chart of Research Work

Problem Analysis

At this stage, the researcher analyzes the problem to determine the application to be developed based on the background. At this stage, the researcher also determines the limitations related to application development.

Study of Literature

In the second stage, researchers conduct literature studies through books, journals, conference articles, and previous research to understand the concept of a smart village and look for references for the development of community reporting applications.

System Development

In the third stage, application development is carried out using the prototype method. The stages in the prototype method are listening to the customer, building/revising the mock-up and using the customer test drive mock-up.

Listen to Customer

At this stage, determine information related to the application to be developed. The output at this stage is the functional needs of the system and non-functional ones.

Build/Revise mock-up

At this stage, application design is carried out based on preliminary information and coding of the application prototype. The output at this stage is the design of the Use case Diagram, Activity Diagram, ER Diagram, and interface design. The coding of the application is carried out based on the design of the diagrams made. Coding a mobile-based community reporting application using the DART programming language with the Flutter Framework and coding a website-based community reporting administration system using the PHP programming language with the CodeIgniter Framework.

Customer test drive mock-up

At this stage, application prototype testing is carried out, and evaluation is carried out. The output of this stage is the Black Box Testing Equivalent Partitioning test scenario and user acceptance testing. Black Box Testing Equivalent Partitioning is a software test in terms of functional specifications to determine

whether the system is running accordingly [16]. The test scenario can be seen in table 1.

User Acceptance Testing is a test carried out to determine whether the system can be accepted by the user and is in accordance with user expectations and the purpose of the system. The use case can be seen in Figure 2. One of the ways used to get UAT conclusions is to survey users. The survey contains questions about the system as well as answers in the form of strongly agree (SA), agree (A), neutral (N), disagree (D), and strongly disagree (SD) [17]. The UAT test scenario can be seen in table 2.

Table 1. Black Box Testing Equivalent Partitioning Test Scenario

No	Test Class	Test Scenario	Expected Result
1	Login Process	Enter registered NIK	Login Successfully, show the main page

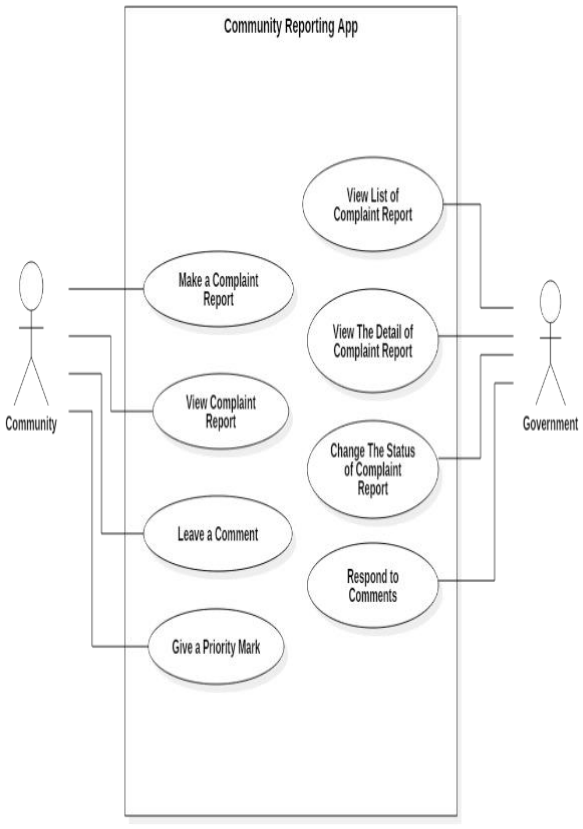


Figure 2. Use case Diagram

Report Writing

In the last stage, a report is written where the researcher writes down the steps taken during the study, which aims to provide documentation related to the research so that the next researcher can utilize it.

RESULTS AND DISCUSSION

Implementation Result

The results of this study are creating a mobile-based community reporting application for the community and a web-based community reporting administration system for the village government. Both applications are integrated with rest-API as a database link [18]. The following is an attachment of the implementation results in pictures and explanations. Furthermore, the community will be called the user, and the village apparatus will be called the admin.

Mobile-based Community Reporting Application

Figure 3 is the initial view when the application is accessed. The application will display the splash screen and then the login page. For the login process, the user only needs to fill in the Population Identification Number (NIK) according to the ID card.

Figure 4 is the main page after the user successfully logs in. On this page, there is a navigation bar that displays all existing reports based on the type of report. In the apps bar, there is a button to display the main navigation bar of the application on the left edge. In this panel, their user information is used, and there are several access pages, namely the user profile page. To create a new report, the user only needs to press the floating button below to go to the report form page.

Table 2. User Acceptance Testing Test Scenario

No	Question
1	Is the appearance of this application attractive?
2	Is it possible to use this application without a guide?

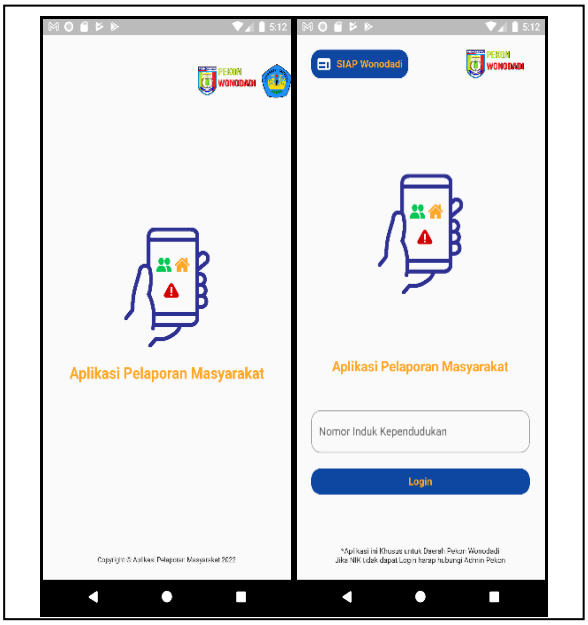


Figure 3. Splash screen and Login Page

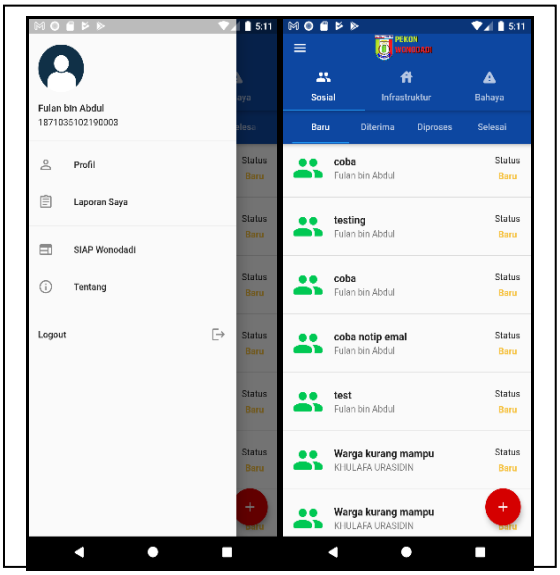


Figure 4. Main Page

Figure 5 is the response given by the application when the user presses one of the existing reports to view the report's details. This page displays an image of the report filled in by the user, the subject of the report, a description of the report, the address of the report, and a map of the location of the reported incident. Users can leave comments by pressing the comment icon, which will go to the comments page, and there is a priority icon with a function to indicate that the report is essential.

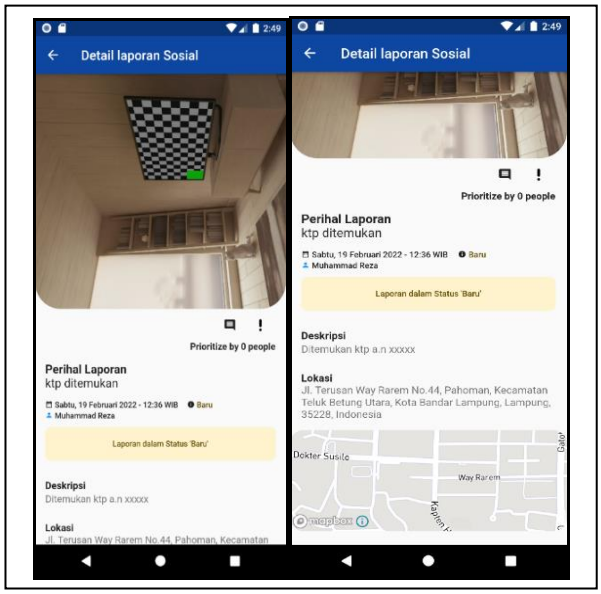


Figure 5. Report Details Page

Figure 6 is a page of the report form. The user first chooses the type of report to be made. There are three report types: infrastructure, social, and hazards. The user must fill in the fields regarding the report, the description of the report, and the image taken directly from the camera. When everything is filled in, the user needs to press the submit button then the report will be recorded in the database.

Web-Based Community Reporting Administration System

Figure 7 is the login page. Admins must enter a username and password to access the system [19]. If the username and password entered do not match, the system would notify that the composition of the username and password is wrong and will again display the login page. If successfully logged in, the system will display a dashboard page [20].

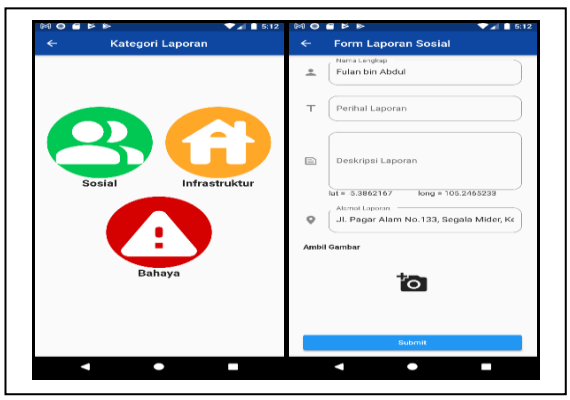


Figure 6. Report Form Page

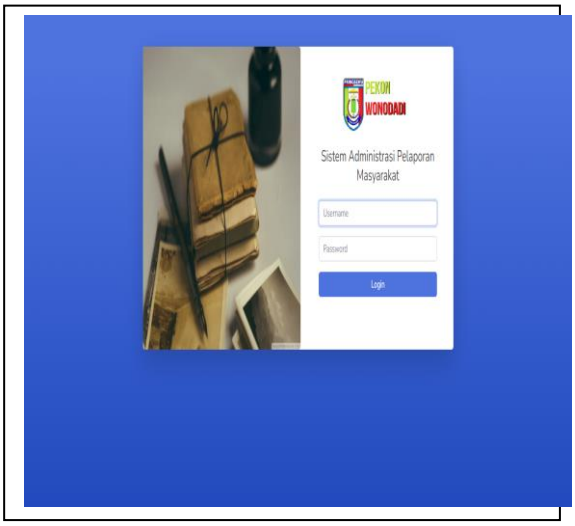


Figure 7. Login Page

Figure 8 is a dashboard page displaying the total complaints based on the report's status. Display the complaint report page can be done by pressing the menu on the sidebar.

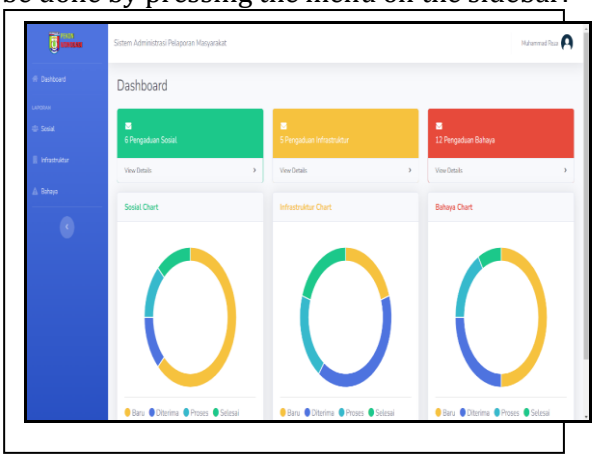


Figure 8. Dashboard Page

Figure 9 is a complaints page. This page displays all incoming complaints. There is a report number, the reporter's name, the report's address, the report's location, and the report's status. To view the report's details, admins can press the green button.

Figure 10 is the report detail page. On this page, admins can see the entirety of the reports that have been created. There are images related to the complaint, maps of the location of the complaint, and a description of the complaint. On this page, the admin can also change the status of the complaint, whether it has been processed or has been completed. Admins can also communicate with users through the comment column.

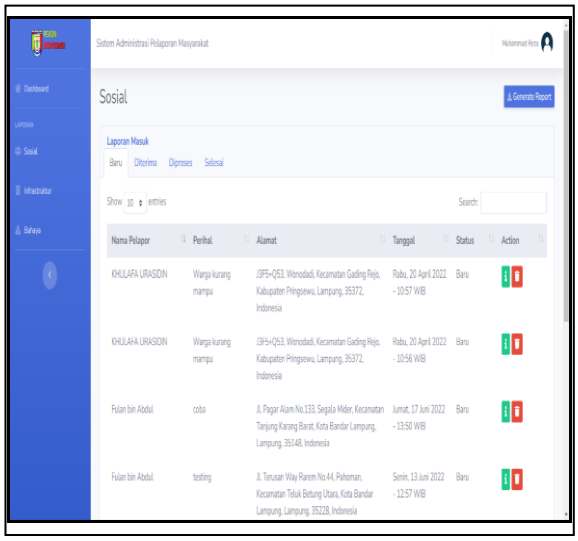
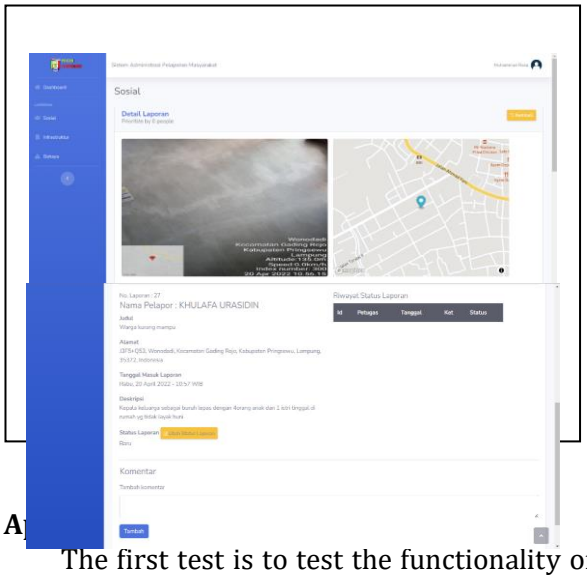


Figure 9. Complaint Report Page



A

The first test is to test the functionality of the community reporting application and the community reporting administration system using the black box testing equivalent partitioning method. This test is carried out to ensure that the developed application can run properly and follow its functionality. Researchers and several student representatives from the Department of Computer Science FMIPA Unila carried out this test. Based on the results of the tests that have been carried out, it can be concluded that the output of the application functionality has gone well and as expected.

The second test was carried out using the UAT method. This test is divided into two parts. The first is the mobile Community Reporting Application test carried out by ten residents/villagers of Pekon Wonodadi by installing the application and providing

responses through Google Forms. The results of the first test of UAT can be seen in table 3.

User Acceptance Testing (UAT), also known as beta or end-user testing, is defined as testing the software by the user or client to determine whether it can be accepted. This testing mainly aims to validate the software against the business requirements. This validation is carried out by the end-users familiar with the business requirements.

Based on the respondents' answers, then analysis was carried out by calculating the average answers based on the scores obtained. The answers from the ten respondents can then be calculated as the highest and lowest scores as follows: Highest value =10x7x5=350 (if all respondents answered SA). Ideally, all the critical business functionality should get validated, but it is not practical to do it all for various reasons, including time. Therefore, a meeting or two with the client or the users who will be involved in this testing can give us an idea of how much testing will be involved and what aspects will be tested.

The calculation states that the highest value is 350; the percentage can be searched as follows: 285/350x100%=81.43%. The final testing is performed once the functional, system, and regression testing are completed. From this percentage, it can be concluded that the application is being developed based on user perception. This result can be well received [21].

Table 3. UAT Test Results for Mobile-based Community Reporting Application

No	SA	A	N	D	SD
Q1	0	0	1	4	5
Q2	0	0	2	5	3
Q3	0	1	2	5	2
Q4	0	0	2	4	4
Q5	0	0	3	5	2
Q6	0	0	3	4	3
Q7	0	0	2	5	3
Total answer (TA)	**0**	**1**	**15**	**32**	**22**
Score	**1**	**2**	**3**	**4**	**5**
TA x S	**0**	**2**	**45**	**128**	**110**

Table 4 shows the UAT Test Results for the Mobile-based Community Reporting Administration System. Based on the results of the respondents' answers for the Mobile-based Community Reporting Administration System, then analysis was carried out by calculating the average answers based on the scores obtained. The answers from the ten respondents can then be calculated as the highest and lowest scores as follows: Highest value = 10 x 7 x 5 = 350 (if all respondents answered SA). Based on the calculation, which states that the highest value is 350, the percentage can be found as follows: 309 / 350 x 100% = 88.3%. From these percentages, it can be concluded that the application developed based on user perception is highly accepted.

This testing plays an important role in validating if all the business requirements are fulfilled before releasing the software for market use. Live data and real use cases make this testing an important part of the release cycle. The UAT test plan should be prepared and communicated to the team well before beginning this test. This will help them with test planning, writing test cases & test scripts, and creating a UAT environment.

Table 4. UAT Test Results for Mobile-based Community Reporting Administration System

No	SA	A	N	D	SD
Q1	0	0	0	1	9
Q2	0	0	0	7	3
Q3	0	0	1	5	4
Q4	0	0	1	6	3
Q5	0	0	1	8	1
Q6	0	0	1	4	5
Q7	0	0	0	2	8
Total answer	**0**	**0**	**4**	**33**	**33**
Score	**1**	**2**	**3**	**4**	**5**
TA x S	**0**	**0**	**12**	**132**	**165**

CONCLUSION

The UAT test on the community reporting application got a score of 81.43% from community respondents. Furthermore, the community reporting administration system scored 88.3% of the village apparatus respondents. Therefore, the developed application could be well received. The government and community should contribute

to implementing government and developing villages based on information technology.

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