Design of e-government mobile application for certificate issues in Sukapura village

Mushlih Nur Islam [1], Savira Denisa Syazwani [1], Muhammad Rizky Wibowo[1], Burhanuddin Dirgantoro[1], Reza Rendian Septiawan[1], Umar Ali Ahmad[1]
[1] Department of Computer Engineering, Telkom University, Bandung, Indonesia

ABSTRACT

This study presents the research, which seeks to digitize public services in Sukapura Village through a mobile application to address current conventional service challenges. The research introduces a village service digitization system integrated with the OpenSID system. The system offers accessibility for both the community and village officials. The research's aims include problem identification, effective solution provision, and implementation of digitized public services via mobile apps. Test involves two distinct methods: alpha and beta testing. Alpha testing employs automation tests to examine mailing services, while beta testing uses Google forms for user acceptance tests. The alpha testing analyzes the flow of letter submissions encompassing various types. Pre-established objectives guide testing, considering 0.7 as the minimum reliability coefficient. Analysis of both testing methods indicates promising results in terms of user interface and experience, as sufficient data was gathered from the conducted tests.

Corresponding Author:
Mushlih Nur Islam
Department of Computer Engineering
School of Electrical Engineering, Telkom University
Bandung, Indonesia
Email: mushlihnur@student.telkomuniversity.ac.id

1. INTRODUCTION

Public service is an activity or series of activities in the context of fulfilling service needs in accordance with statutory regulations for every citizen and resident for goods, services, and/or administrative services provided by public service providers (UU No. 25 of 2009) [1]. These new digital technologies may reach the primary goals of digital government, which include improving efficiency and service quality by shortening service lead times, increasing transparency, and making service provision seamless across organizations [2]. So that the digitization of public services is the process of managing services for the community for goods, services, and/or administrative services in electronic form. The problem of digitizing public services has been instructed by the government in Permendesa No. 1 of 2016 concerning E-Government in the Ministry of Villages, Development of Disadvantaged Regions, and Transmigration and Presidential Decree no. 95 of 2018 concerning Electronic-Based Government Systems (SPBE) [3].

Referring to the regulations above, all government activities, including public services, will undergo digital transformation. Currently there are many villages that use OpenSID. The definition of OpenSID itself is a Village Information System (SID) which is deliberately designed to be open and can be developed jointly by the SID caring community. This OpenSID already has complete features and data but still cannot be utilized optimally. By using complete population data from OpenSID, this is in line with Presidential Decree no. 39 of 2019 concerning One Data Indonesia and can make it easier to integrate data [4].

This research empowers Desa Sukapura, Dayeuhkolot Subdistrict, Bandung Regency, West Java, with the aim of providing convenience for village officials and the community through the digitization of public services using mobile applications. The problem is that the current condition of public services in Sukapura Village is still conventional and not fully digitized. Thus, the community must come to the village office if they want to get services and must previously request a cover letter from RT, RW, and so on.

Sometimes this cannot be done in one day, due to many factors and one of them is the absence of the relevant device in the office. This doesn't look like a big problem, but it makes it very difficult for the community when they need services at an urgent time. With digitalization, it can solve the main problems above, namely village services that are still conventional. Conventional village services can be completed by digitizing village services. Village services that have been digitized can make it easier for the community to submit requests and village officials to provide public services. Later, the community does not need to go to the RT, RW, or even the village office to apply for services and can apply anywhere and anytime without thinking about whether or not village officials are in the office. And village officials can still provide services to the community.

Based on the previously discussed problems, this research aims to digitize public services, especially in applying for a certificate. The digitization of public services in Sukapura Village can facilitate both parties, both from the community and village officials. The community can submit letters more easily and effectively, while the government can provide more optimal services. This is very influential in the use of digital village services. Digitalization in public services in Desa Sukapura, Kec. Dayeuhkolot, Kab. Bandung will use OpenSID as a system used by village officials and mobile applications connected to OpenSID via API for the community.

2. METHODS

This research was conducted from January to July in 2023 by visiting Desa Sukapura. Development of a *mobile* application-based digitization public service system in Desa Sukapura, Kec. Dayeuhkolot, Kab. Bandung has a system concept that focuses on developing a public service system in the form of making letters. The tests carried out consisted of two methods, namely Alpha Testing and Beta Testing.

A. Alpha Testing

Alpha testing is a type of software testing that is performed in the final stages of product development before being released to external customers [5]. This test is carried out by users or end users in a controlled development environment. The purpose of alpha testing is to ensure that the application functions properly and does not have significant application defects or failures. Alpha testing is done without the involvement of the development team. The following are the stages in alpha testing:

o The first stage is the internal alpha test, where testing is carried out by the internal team at the developer's site to ensure that the application system can be passed on to the next testing phase.

o The second stage is external alpha testing, where the application is tested as a whole by the user or end user to test all system features and identify problems that arise due to usage.

o The final stage is post-alpha testing, where issues found during testing are fixed before the application is released to external customers.

This test is used to test *Widget Testing* as part of all existing letter submission pathways, namely Certificates of Different Identity, Certificates of Domicile, Certificates of Business, Certificates of Loss, Certificates of Disadvantage, and Certificates of Parental Income. The elaboration of the test steps is based on the part being tested, namely first in creating code for a Certificate of Different Identity covering several operations that are often used in testing widgets in Flutter. In this test it is only necessary to call enterText with the appropriate arguments every time you need to test the text input. This piece of code performs testing on a dropdown widget in the app's UI, which starts by finding and clicking on the dropdown with the key 'identity card'. WidgetTester is used to simulate user interaction in this test. All in all, this code tests the calendar functionality of the widget with the 'birthday' key and ensures that the user can select the date correctly [6].

Then in making the code for the Domicile Certificate use the widget test on Flutter to ensure that the flow of the domicile certificate form works properly. So, overall, this code tests the flow of the domicile certificate form, from displaying the form to checking whether the data entered by the user appears on the preview page.

Then generating the code for the Certificate of Business, Certificate of Disadvantage and Certificate of Parental Income can use a code function to reduce code duplication in your tests and make them easier to read and maintain. You just need to call enterText with appropriate arguments whenever you need to test text input. Certificate of Loss is accomplished with a test which can reduce code duplication in your tests and make them easier to read and maintain. You just need to call enterText with appropriate arguments whenever you need to test text input.

B. Beta Testing

This test is the second stage through the beta testing method which focuses on user *acceptance testing* using the Google form [7]. Beta testing is a type of software testing that is carried out after alpha testing and involves real users or end users to test the product or application in a real environment before it is officially released to the wider community [8]. The purpose of beta testing is to collect feedback from users regarding the performance, reliability, security, and suitability of the product to user needs. Here are some important points regarding beta testing:

o   Beta testing is done after alpha testing and is usually the last stage before a product or application is officially released.

o   Tests are carried out by real users or end users in a production environment that is similar to the conditions of everyday use.

o   Beta testing users have the opportunity to test and provide feedback on the product before it is released to the general public.

o   The main purpose of beta testing is to identify bugs, performance issues, and other deficiencies that may arise when the product is used by many people.

o   The results of beta testing are used to make improvements and improvements to the product before it is officially released.

Testing was carried out using the Google Form to collect responses from participants who are residents of Sukapura Village. Following are the steps followed in this study:

o   Create Questions in Google Forms.
First of all, a questionnaire for beta testing is created using the Google Form. This questionnaire contains questions that will be asked to participants to collect their responses regarding the Sukapura Village Mobile Application.

o   Seeking Participants for Testing
Participants for beta testing were taken from the people of Sukapura Village. The target number of participants needed is 30 people, according to the validity test recommendations from Sugiono (2009). The validity test was carried out on 30 respondents because the test results were close to the normal curve.

o   Participants Tried the Sukapura Village Mobile Application
After successfully getting participants, they were asked to visit the Sukapura Village Mobile Application and explore all the available features. Participants were directed to carry out various activities, from *logging in* to trying to submit letters through the application. The goal is for participants to experience the overall experience of using the application.

o   Fill out Google Forms

o   After experiencing the experience of using the application, participants were asked to fill out a questionnaire provided in the Google Form. This questionnaire contains 27 questions related to the Sukapura Village Mobile Application and solicits input from participants regarding their experiences and perceptions of the application.

o   View Results Through Google Forms or Sheets
The results of completing the questionnaire by the participants are automatically inputted on the linked Google Form or spreadsheet. From there, the data can be viewed and analyzed to evaluate participants' responses to the application.

o   Determining the Reliability of Questions Using the Cronbach Alpha Method
To measure the reliability of the questions in the questionnaire, the Cronbach Alpha method was used. This method will calculate the extent to which these questions are reliable in collecting consistent data [9]. The reliability coefficient (r11) is calculated using the Cronbach Alpha formula. The formula is as follows:

$$r_{11} = \left[\frac{k}{k-1}\right]\left[1 - \frac{\sum \sigma_b^2}{\sigma_t^2}\right] \qquad (1)$$

The results of the beta testing will provide valuable insight into how the application might be received by potential users.

3.   RESULTS AND DISCUSSION

Test Results 4: There are 2 test results from different methods, namely alpha testing and beta testing. The results of the alpha testing process are known in the following figure.

- Certificate of Different Identity
```
I/flutter ( 809): 00:00 +0: Check Beda Identitas Flow

I/flutter ( 809): 00:11 +1: All tests passed!
```

- Certificate of Domicile
```
I/flutter ( 1232): 00:00 +0: Check domisili flow

I/flutter ( 1232): 00:03 +1: All tests passed!
```

- Certificate of Loss
```
I/flutter ( 1607): 00:00 +0: Check Kehilangan Flow

I/flutter ( 1607): 00:05 +1: All tests passed!
```

- Certificate of Parents' Income
```
I/flutter ( 1770): 00:00 +0: Check Penghasilan Orang Tua Flow

I/flutter ( 1770): 00:07 +1: All tests passed!
```

- Certificate of Disadvantage
```
I/flutter ( 1908): 00:00 +0: check the sktm flow

I/flutter ( 1908): 00:04 +1: All tests passed!
```

- Business Certificate
```
I/flutter ( 2046): 00:00 +0: Check the Usaha Flow

I/flutter ( 2046): 00:06 +1: All tests passed!
```

Figure 1. Test results for all flow of letter submissions

From the results obtained for testing all the flow of letter submissions obtained, it can be concluded that there are no problems with the components contained on each existing letter submission page, so that users can submit letters properly.

After following all the beta testing steps previously described, the test results will be processed using Excel. The following are the results of the beta testing that has been carried out. The following presents the results of UAT.

Table 1. User Acceptance Testing Results

Respondents	Question (k)							Total
	1	2	3	4	5	6	7	
1	4	5	5	5	5	5	4	33
2	5	5	4	4	5	5	5	33
3	5	4	3	5	5	5	5	32
4	4	2	3	3	3	4	3	22
5	5	4	4	5	4	5	5	32
6	5	4	5	4	5	5	4	32
7	5	5	5	5	5	5	5	35
8	5	5	5	5	5	5	5	35
9	5	5	5	5	5	5	5	35
10	4	4	4	5	4	4	4	29
11	4	5	5	5	4	4	4	31
12	5	4	4	5	4	4	5	31
13	4	4	5	4	5	5	5	32
14	4	5	5	5	4	4	4	31
15	5	5	5	5	5	5	5	35
16	5	5	4	5	4	4	5	32

Respondents	Question (k)							Total
	1	2	3	4	5	6	7	
17	5	5	4	5	5	5	5	34
18	5	4	4	4	5	5	5	32
19	3	4	4	3	3	3	4	24
20	5	5	5	5	4	4	5	33
21	5	5	4	4	5	3	5	31
22	5	5	5	5	4	4	4	32
23	5	3	5	1	3	5	5	27
24	4	4	3	4	4	4	4	27
25	5	5	4	3	5	5	5	32
26	5	5	5	4	5	5	5	34
27	4	4	5	4	5	5	4	31
28	5	4	4	4	4	3	3	27
29	4	5	3	4	5	5	5	31
30	4	4	5	4	4	4	5	30
31	3	4	3	4	4	4	4	26
32	4	5	4	4	5	5	4	31
σ_b^2	0,38	0,51	0,54	0,78	0,44	0,45	0,38	3,51
			σ_t^2					10

From these results, then the answers to these questions will be examined for the reliability of the questions. In this examination will use the Cronbach alpha method. The following is a calculation using this method. It is known that the results of these calculations show that the value of the reliability coefficient (r 11) is equal to 0.75 and this has exceeded the minimum limit for a question to be considered reliable as shown in the results of the following formula.

$$r_{11} = \left[\frac{k}{k-1}\right]\left[1 - \frac{\sum \sigma_b^2}{\sigma_t^2}\right]$$
$$r_{11} = \left[\frac{7}{7-1}\right]\left[1 - \frac{3,51}{10}\right]$$
$$r_{11} = [1,16][0,65]$$
$$r_{11} = 0,75$$

The end result of the research that has been created is a public service system in the village that has been digitized with mobile apps. With the system that we will create, the community service process in the village can run more effectively and efficiently. The main features presented are updating and integrating data, digitizing village services. So that based on the analysis of the existing problems, alternative solutions are formulated which are expected with the criteria of making it easier for the community to access village services and also village officials in implementing village services. In addition, this system can be integrated with the central government so that it can be used sustainably.

Based Based on the results above, this solution will be used, namely a digitization system that uses a mobile application that will be used by village officials and the community in Sukapura Village. In this case, product specifications are made based on agreed solutions. The digitization system used is OpenSID which has been in development since May 2016. OpenSID is a Village Information System (SID) which is deliberately designed to be open and can be jointly developed by the SID caring community. OpenSID was originally developed using SID from the Combine Resource Institution (CRI). The last CRI SID that has been merged with OpenSID is SID 3.10 which was obtained on February 15, 2017. This research will develop mobile applications that can be integrated with OpenSID services, there are several parts, namely Front-end, Back-end, Database and Public Services. The following is a mockup and architectural design of the application that will be made.
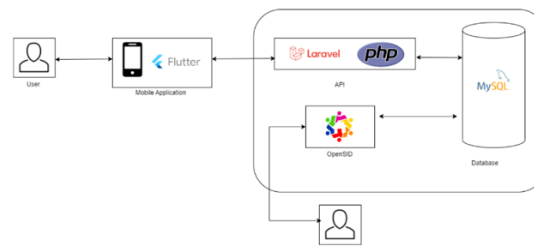
Figure 2. Application Mockup Image

Figure 3. Application Architecture Drawing

A village digitization system will be implemented which will be a mobile-based application system. With the mobile application, the community and village officials will access one integrated application, so that services can be focused on only one application.
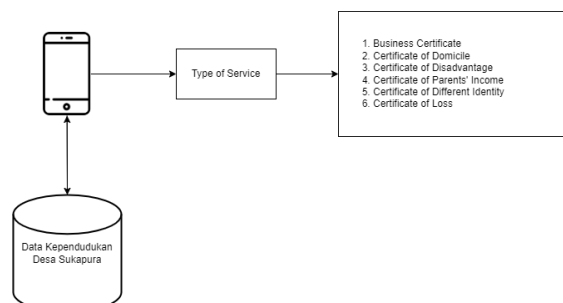

Figure 4. Application Feature Images

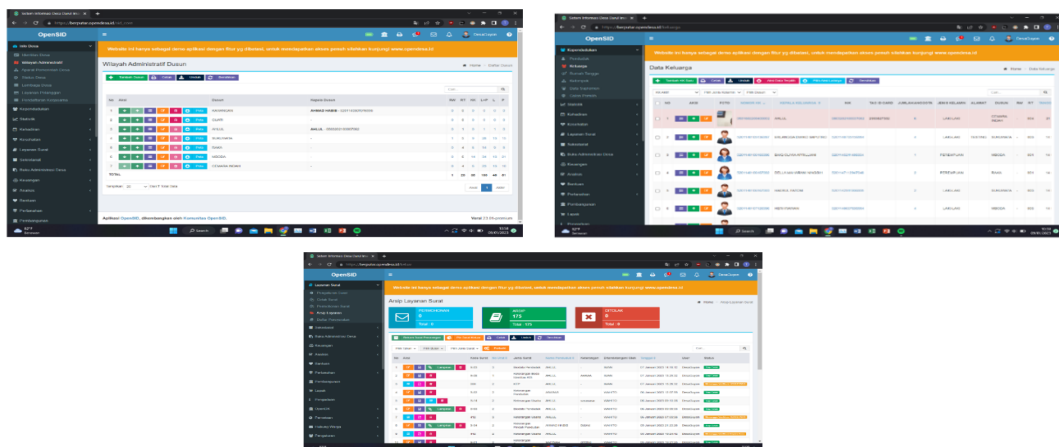The results of the resulting OpenSID website can be observed in the image:

Figure 5. Image of population data page, family, mail service archive, household grouping, etc.

In developing an application such as a mobile application, a User Interface is needed. The User Interface (UI) is part of a program that functions to make it easier for users to interact with the program in graphical form that users can see, touch and understand [10]. The User Interface (UI) is useful for making users comfortable and happy in interacting with an application system because the designs used are visually attractive and interactive, such as choosing layouts, choosing colors, choosing font types and sizes, and so on. In addition to the user interface, the user experience must also be considered. User experience (UX) is the response or perception and reaction or reciprocal feelings of a user when interacting with a product, service or system [11]. This user experience (UX) is useful for making users feel comfortable and easy in achieving the goals they want to do with the application system. To be able to create a good user experience, there are several characteristics that can make a design said to have a good UX.

To develop the UI/UX design of this application, we need tools that can support it, such as Figma, Adone XD, and many more. However, in developing this application system using Figma. Figma is an application for designing the UI/UX of a mobile application and website from the initial stage to prototyping. In the UI/UX development process, a standard that has been used by many people is needed, namely Design Thinking. Design Thinking is a process of creative thinking to be able to understand users, identify problems, to find effective solutions by involving various stakeholders. Design Thinking is a framework for creating simple and affordable solutions to user problems.
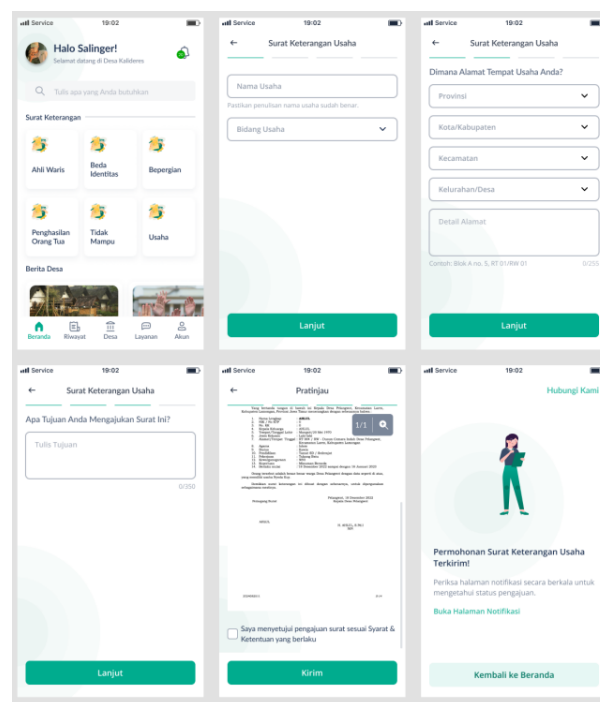

Figure 6. Application Mockup Image

As for the Alpha Testing test stage, it is known that the results obtained from testing all the flow of letter submissions obtained can be concluded that there are no problems with the components contained on each page of the existing letter submission, so that users can submit letters properly. Whereas in the Beta Testing test it is known that the results of the respondents will then be examined for the reliability of the questions. In this examination, the Cronbach alpha method will be used with the results of these calculations showing the value of the reliability coefficient (r 11) equal to 0.75 and this has exceeded the minimum limit for a question to be considered reliable.

In this test, there are 2 different testing methods and have different results, namely alpha testing and beta testing. In the testing method using alpha testing which focuses on widget testing using automation tests with the aim of testing the testing of mailing public services. Meanwhile, the beta testing method focuses on testing the user acceptance test using the Google form to find out the assessment of the user directly. Analysis of the results of the alpha testing test is to carry out overall testing of the flow of letter submissions in the Sukapura Village Mobile Application such as different identity letters, domicile letters, loss letters,

parental income letters, letters of incapacity and business letters. Before testing, determine goals so that testing is declared successful.

Testing is carried out as an example of whether one of the components in the Sukapura Village Mobile Application can function properly. Testing is declared successful when the output issued "test passed". In the beta testing section, this test focuses on the user acceptance test. In this test there are 7 questions posed in the user acceptance test questionnaire relating to the mailing public service system using the Sukapura Village Mobile Application. From the results of the tests that have been carried out, the results are quite satisfactory. In addition, the questions that have been asked are considered reliable because the reliability coefficient value is 0.75 which has exceeded the minimum limit for the reliability coefficient value in the Cronbach alpha method. In this method the minimum value of the reliability coefficient is 0.7. Based on the results of the test analysis of the alpha testing and beta testing methods that have been carried out to test whether the application functions properly in terms of the user interface and user experience, the results are quite good. This can be concluded from the two test methods that have been carried out so as to obtain sufficient data.

4. CONCLUSION

Village digitalization is one of the government's programs, namely e-Government which has been regulated in the Regulation of the Minister of Villages, Development of Disadvantaged Regions, and Transmigration concerning E-Government at the Ministry of Villages, Development of Disadvantaged Regions, and Transmigration No. 1 of 2016. This research is here to help realize e-Government. Offering smartphone application development that can be used by people in villages to get public services that can be accessed anywhere. In planning this proposed research, several aspects have been analyzed, including aspects of use, namely that it can make it easier for people to submit letters, while the government can provide more effective and efficient community services.

REFERENCES

[1] Pemerintah Pusat, "Undang-undang (UU) tentang Pelayanan Publik," 18 Juli 2009. [Online]. Available: https://peraturan.bpk.go.id/Home/Details/38748/uu-no-25-tahun-2009. [Acesso em 14 November 2022].

[2] I. Lindgren, C. Ø. Madsen, S. Hofmann e U. Melin, "Close encounters of the digital kind: A research agenda for the digitalization of public services," *Science Direct,* vol. 36, nº 3, pp. 427-436, 2019.

[3] Pemerintah Pusat, "Peraturan Presiden (PERPRES) tentang Sistem Pemerintahan Berbasis Elektronik," 2 Oktober 2018. [Online]. Available: https://peraturan.bpk.go.id/Home/Details/96913/perpres-no-95-tahun-2018. [Acesso em 14 November 2022].

[4] Pemerintah Pusat, "Peraturan Presiden (Perpres) tentang Satu Data Indonesia," 12 Juni 2019. [Online]. Available: https://peraturan.bpk.go.id/Home/Details/108813/perpres-no-39-tahun-2019. [Acesso em 20 November 2022].

[5] C. K. N. C. K. Mohd e F. Shahbodin, "Personalized Learning Environment: Alpha Testing, Beta Testing & User Acceptance Test," *Science Direct,* vol. 195, pp. 837-843, 2015.

[6] Y. L. Arnatovich, M. N. Ngo, T. H. B. Kuan e C. Soh, "Achieving High Code Coverage in Android UI Testing via Automated Widget Exercising," *2016 23rd Asia-Pacific Software Engineering Conference (APSEC),* pp. 193-200, 2016.

[7] R. Suman e S. Sahibuddin, "User Acceptance Testing in Mobile Health Applications: An overview and the Challenges," pp. 145-149, 2019.

[8] M. R. Fine, Beta Testing for Better Software, Indianapolis: Robert Ipsen, 2002.

[9] M. Amirrudin, K. Nasution e S. , "Effect of Variabilityon Cronbach Alpha Reliability in Research Practice," *Jurnal Matematika, Statistika dan Komputas,* vol. 17, nº 2, pp. 223-230, 2020.

[10] J. Ruiza e E. Serral, "Unifying Functional User Interface Design Principles," *International Journal of Human–Computer Interaction,* vol. 37, nº 1, pp. 47-67, 2021.

[11] L. Bollini, "Beautiful interfaces. From user experience to user interface design," *The Design Journal,* vol. 20, nº 1, pp. S89-S101, 2017.