ANDROID-BASED E-VOTING APPLICATION USING UNIVERSALLY UNIQUE IDENTIFIER (UUID) GOVERNOR ELECTION BEM FACULTY OF ENGINEERING (CASE STUDY: BHAYANGKARA UNIVERSITY SURABAYA)

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ABSTRACT

Election of the Governor and Deputy Governor of the Student Executive Board of the Faculty of Engineering (BEM FT) Bhayangkara University Surabaya is an activity where each student uses his voting rights. The selection is done by voting with the candidate who has the most votes coming out as winners. The selection of the Governor of UB's FT BEM is still not maximally indicated by the voter data, which is still small compared to the number of active students. Procedures that are still conventional with students having to go to campus to vote can be the cause. Therefore, the use of information and communication technology gave rise to the idea of making an electronic voting system or commonly called Android-based E-Voting using the Universally Unique Identifier (UUID). E-Voting is a method of voting and vote counting in an election using a mobile phone electronic device. In other words, this technology makes it easy for voters in a general election to exercise their voting rights by using electronic and internet media. With the E-Voting, it is expected that the interest of students to participate in giving more votes and the sound processing process will be faster.

Keywords: mobile phone, voice, e-voting, Universally Unique Identifier.

1. INTRODUCTION

Mobile media (mobile devices) such as cellular phones or more popularly known as mobile phones or mobile phones have become increasingly dynamic trends and lifestyles with high levels of mobility, demanding the existence of a tool and technology that can provide information and applications in more ways easy and flexible. The development of these technologies also encouraged an increase in the transition of human activities from real space to electronic space. Almost all human activities are assisted or supported by electronic devices or systems, such as banking to e-banking, sales to e-commerce, learning to e-learning, the application of electronic resident cards called e-ktp and so on. This is felt to facilitate human activities and save time, costs and resources. This also reflects the opportunity for the development of voting applications using electronic media or what is called e-voting.

The Great General Election Mechanism (PEMIRA) of the current Ubhara Faculty of Engineering Student Executive Body still does not go as expected. The limited information media in disseminating PEMIRA along with the profile of the BEM FT Governor candidates, made some students less enthusiastic in choosing candidates. In addition, the voting process carried out is still manual, namely by using a paper ballot and must come to the polling station (TPS). The use of the Universally Unique Identifier (UUID) is the right step to build this Android-based application.

The Universally Unique Identifier (UUID) is a unique code given by the system to a device to identify the device. UUID can also be used to identify DVD drives, Removable media (USB drives) and all partitions on the hard drive.

Based on the problems that the author has mentioned above, the author sets the title "E-VOTING APPLICATION BASED ON ANDROID USING THE UNIVERSALLY OF UNIQUE IDENTIFIER (UUID) GOVERNOR ELECTION BEM FACULTY OF ENGINEERING (CASE STUDY OF BHAYANGKARA UNIVERSITY SURABAYA)". The results of this study are expected to provide convenience in understanding the electoral system development model electronically.

2. BASIC THEORY

2.1 E-Voting

According to the Technology Research and Application Agency (BPPT), e-voting is a system for making ballots, giving, counting, broadcasting votes, and generating and maintaining audit tracks electronically and digitally.

2.2 Universally Unique Identifier (UUID)

The Universally Unique Identifier (UUID) is a standard identifier used by Open Software Foundation (OSF) software as part of a distributed computer environment (DCE). There is also an UUID in the directory / etc / fstab in that directory. You might also see entries such as UUID = 62fa5eac-3df4-448d-576-916dd5b432f2. This entry is not a pointer to the device name like, / dev / hda1, but this entry is called a unique identifier (UUID) or more clearly is the unique identification code provided by the system. UUID can also be used to identify DVD drives, Removable media (USB drives) and all partitions on your hard drive.

In Android smartphone devices, UUID is usually known as Android Device ID. Android Device ID is a unique code that has a 16 digit code found on an Android smartphone that is not just a number, but is a combination of numbers and letters. Its main function is to give an identity to the smartphone. In addition, it also serves as a code for Google to know that the smartphone has an Android operating system so that it becomes the key to enter to download Android applications on the Google Play Store.

2.3 Android

According to Nazaruddin Safaat H (2011: 1) Android is an operating system for mobile devices based on Linux that includes operating systems, middleware and applications. Android provides an open platform for developers to create their own applications for use by various mobile devices. Android is commonly used on smartphones and tablet PCs. It functions the same as the Symbian operating system on Nokia, iOS on Apple, and BlackBerry. Android OS is not bound to just one mobile phone brand, some well-known vendors that already use Android include: Samsung, Sony Ericsson, HTC, Nexus, Motorolla, and others.

The main advantage of Android is that it is free and open source, which makes Android smartphones sold cheaper than Blackberry or iPhone even though the features offered by Android are better. Some of the main features of Android, among others: WiFi Hotspot, Multi-touch, Multitasking, GPS, accelerometers, Java support, supports many networks (GSM / EDGE, IDEN, CDMA, EV-DO, UMTS, Bluetooth, Wi-Fi, LTE & WiMAX) as well as basic mobile capabilities in general.

3. SYSTEM AND DESIGN ANALYSIS SYSTEM

3.1 System Analysis

The stages of system analysis have the task of improving the quality of several parts which are the implementation of important functions that can be accessed by students. Broadly speaking, the system is expected to be able to verify student data and record student status, the system is able to record selected results from students and the system can add the results of the voting and display it.

3.2 Problem Analysis

In an organization, especially BEM FT (Faculty of Engineering Student Executive Board) that is an organization that is a container center and channeling aspirations or desires of students, FT BEM should have an adequate management information system. Every year the members of the BEM FT Bhayangkara University Surabaya will hold an election for the Governor of FT BEM which has become a routine agenda per year. However, the selection process is still done in a conventional way or still in a simple way (manual). So that in general, the Faculty of Engineering, Bhayangkara University Surabaya in selecting the Governor of the FT BEM must spend considerable costs and the process of time efficiency cannot be carried out optimally.

By analyzing the problem, an e-voting system was created in the selection of the BEM Governor of the Faculty of Engineering, Bhayangkara University, Surabaya by utilizing the Universally Unique Identifier (UUID). This program is built so that students are easy to give their voting rights to prospective candidates, and at the same time facilitate the committee in collecting total votes to get the final results.

3.3 Data Analysis

The data used in this final assignment is data of active students of the Faculty of Engineering who are at Bhayangkara University Surabaya with several system criteria needed. Data sources come from NIM and Student Name.

3.4 System Flow Chart

The overall flow chart of the system is a description of the processes related to the running of the system. At this stage, it is illustrated as follows:
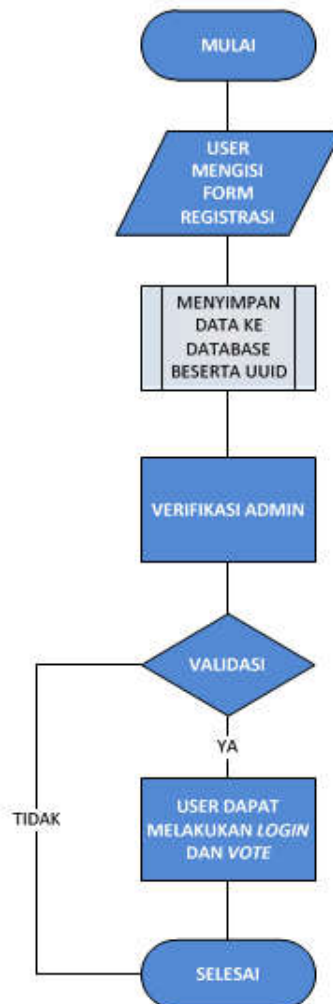

Figure 3.1 Flowchart System

3.5 Data Flow Diagram (DFD)

Data Flow Diagram (DFD) or data flow diagram is a development method of a structured system, DFD can describe the flow of processes and data on the system to be built, which can represent all the processes contained in a system. Data flow diagram consists of several sub diagrams that can look like the picture below:

a) Context Diagran

This diagram describes the flow of data and entities or system users on a tiered top level diagram. The following is the design of the context diagram system:
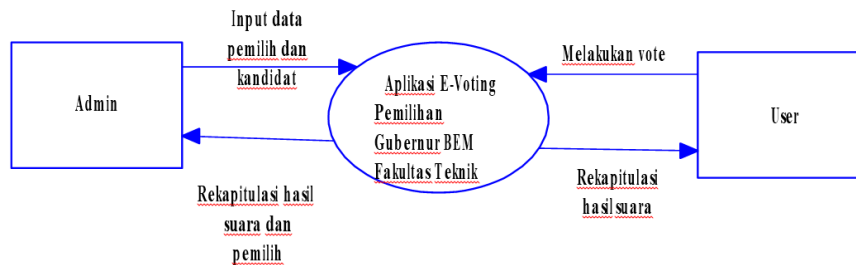
Figure 3.2 Context Diagram

The diagram above consists of two entities or system users. The admin entity has full access rights to the system. Admin has the task of inputting user data, inputting candidate data, inputting job data, and inputting data votes. Admin entities receive recapitulation of votes and voters.

While the user entity has limited access rights. Users will only vote, then the system provides information on the results of voting.

b) DFD Level 1

DFD Level 1 is the initial process of the flow of a system. Level 1 DFD of the system used in this Final Project is described as follows:
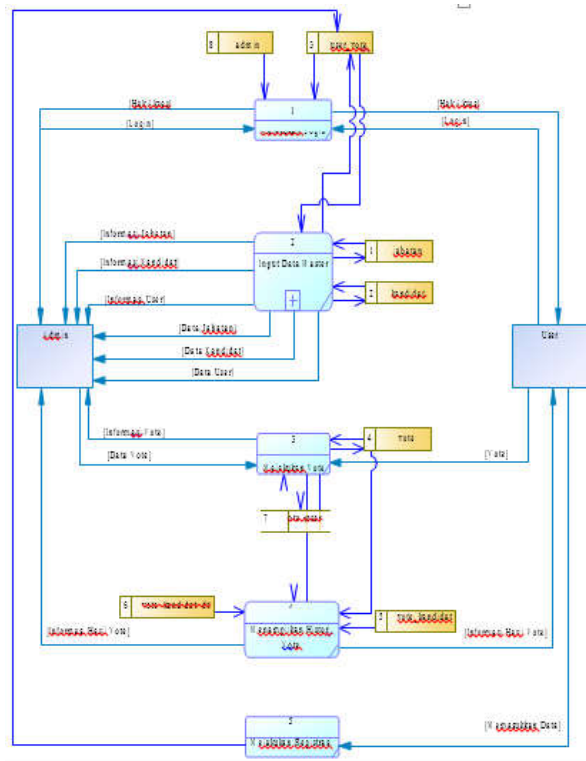
Figure 3.3 DFD Level 1

Viewed from Figure 3.3, the admin has several very important processes. The following is an explanation of each of these processes:

1) Login Proccess
   The process for entering the e-voting system.
2) Process Position Data Input
   The process of inputting positions in accordance with the positions required, such as the Governor or Deputy Governor.
3) Candidate Data Input Process
   The process of inputting candidate profiles in the form of candidate names, visions, missions, telephone numbers, home addresses and candidate candidates.
4) User Information Input Process
   The process of inputting information for users who will vote in the form of NIK, Name and Date of Registration.
5) Vote Data Process
   This process contains information such as the type of data vote and the starting period and the period of termination of the election.
6) Vote Information Process
   This process contains information on the number of candidate votes and the user's vote date.

Viewed from Figure 3.3, the user has several very important processes. The following is an explanation of each of these processes:

1) Registration Process
   The process for registering as a voting participant in order to be able to vote.
2) Login Process
   The process for entering the e-voting system.
3) Vote Process
   The process by which students choose candidates that are displayed in the system.
4) Vote Information Process
   The process of obtaining votes from all prospective candidates after students take election action.

c) DFD Level 2
   DFD Level 2 is a decomposition process from DFD Level 1. This diagram describes several processes that have not been decomposed in DFD Level 1. DFD Level 2 of the system used in this Final Project is described as follows:
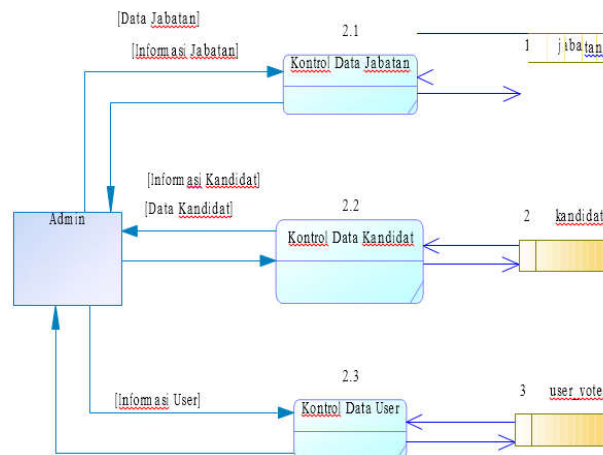

Figure 3.4 DFD Level 2

Viewed from Figure 3.4, in the master data menu there are several decompositions that can only be done by the admin. Admin is given full access rights in this system, namely inputting job data, candidate data and verification and validation of user data.

3.6 Entity Relationship Diagram (ERD)

Entity Relationship Diagram (ERD) is the main data modeling that organizes data in a project into entities and determines relationships between entities. ERD design in this case explains the relation between attributes, along with the relation:
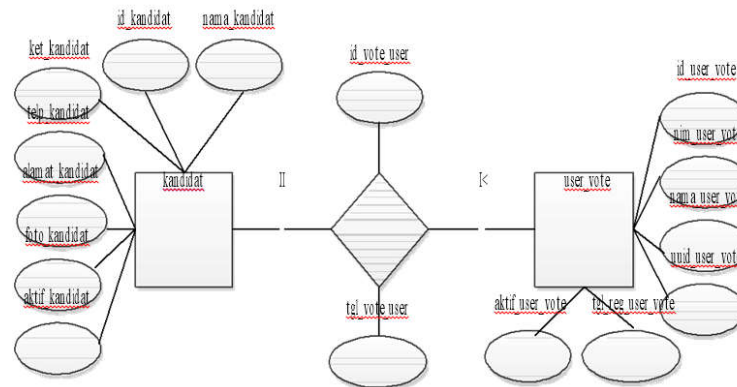
Figure 3.5 Entity Relationship Diagram (ERD)

4. SYSTEM IMPLEMENTATION

4.1 Interface Implementation

Implementation of the interface is a display of the system as a whole, in the implementation section of this interface will discuss the results of the program that has been done. In the application system in this Final Project has two display interfaces, namely the appearance of the website interface and the appearance of the mobile phone interface.

4.2 Website Interface

In this system, the website will only be used by the admin as a means of entering all the data needed by the e-voting application. These data include candidate data, voter data (user), determination of the starting period and the end of voting, as well as the results of voting. The website is not intended for voting.

a) Interface Dashboard page

The dashboard page is the start page that will appear when the admin has successfully entered the login process. This page displays data and graphs of voters or voters. The data to be displayed are the number of users who have voted, the number of users who have not voted yet, the number of users who have not voted and the total number of voters. Next is the display of the dashboard page shown in Figure 4.1 below:
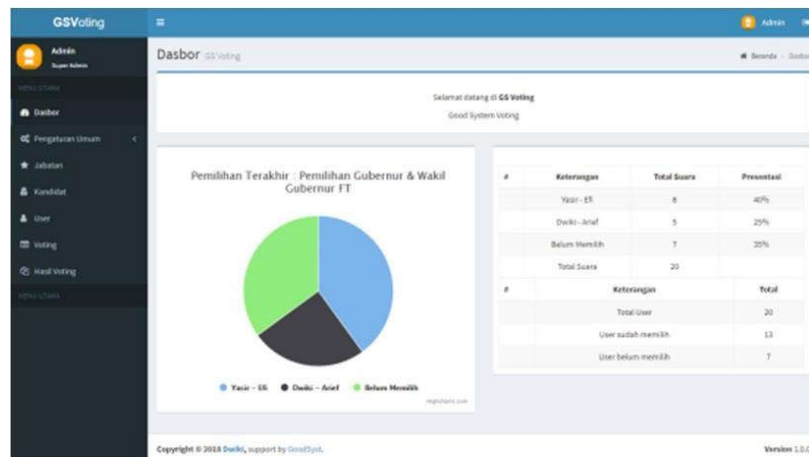

Figure 4.1 Interface Dashboard page

b) Candidate Menu Interface

Candidate menu has a function to accommodate all data for candidates for Governor and Deputy Governor of FT BEM which will be chosen by the user. Admin will input the form provided by the system, such as candidate name, telephone number, and candidate photo. In addition, the admin can also update and delete candidate data. Next is the display of the candidate menu shown in Figure 4.2 below:
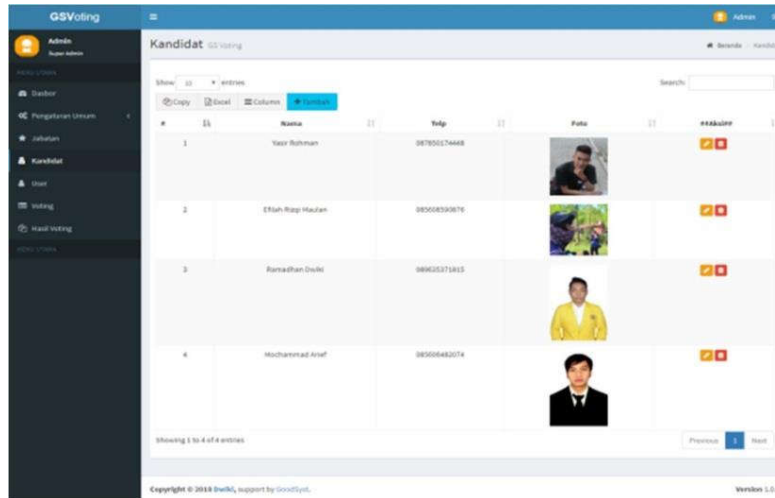

Figure 4.2 Interface Candidate Menu

On this page, the admin can enter more than two pairs of candidates who nominate themselves as candidates for Governor and Deputy Governor of FT BEM.

c) Interface Menu User

The user menu functions as data management for all voters who have access rights to vote. In this menu, admin can add, change and delete voter data. Next is the display of the user menu shown in Figure 4.3 below:
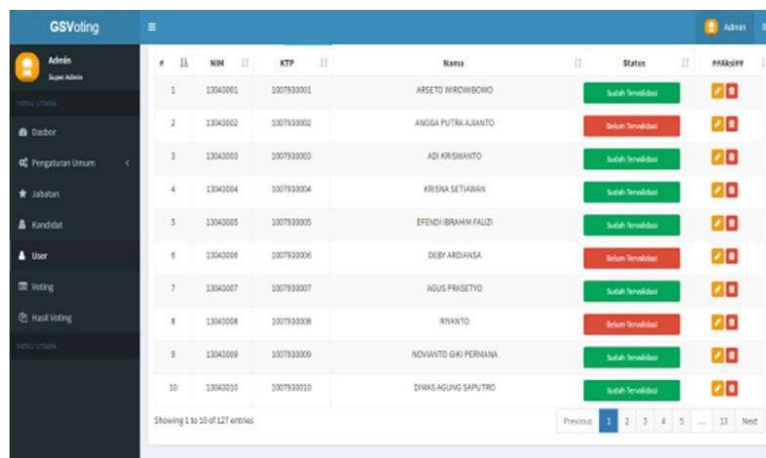

Figure 4.3 User Interface Menu

On this page, the admin can enter all data of active students who are entitled to vote.

d) Interface Menu Voting

The voting menu on this website has a function as a regulator of the schedule for the implementation of the FT BEM Governor. Admin regulates the starting period and the end of voting. Following is the display of the voting menu shown in Figure 4.4 below:
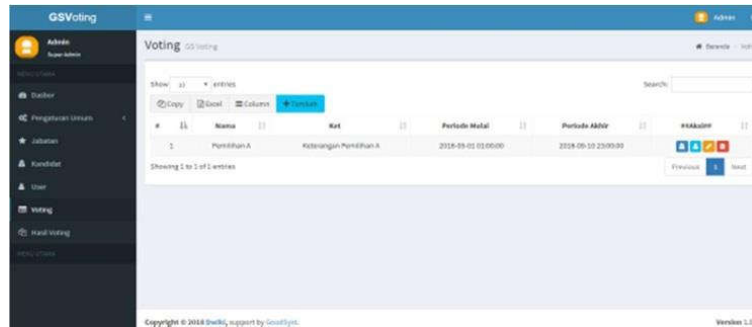

Figure 4.4 Voting Menu Interface

On this page, the admin can enter the starting period and end with the specified date and time.

e) Voting Results Menu Interface

The voting result menu will display information on vote acquisition in the ongoing election period. Comparison of votes for all candidates will be displayed in graphical form. Next is the display of the voting results menu shown in Figure 4.5 below:
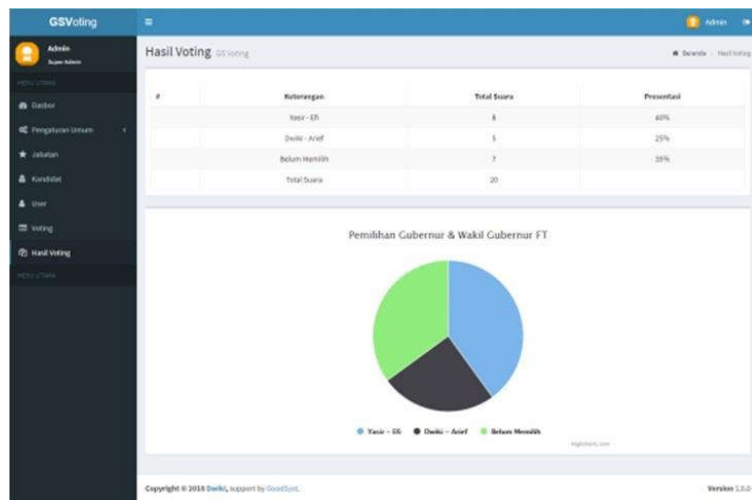

Figure 4.5 Voting Results Menu Interface

Information on the acquisition of votes from all candidates will also be seen in android applications that are used by students as voters.

4.3 Interface Mobile Phone

In this system, mobile phones (Android) will be used by students as users to select the e-voting application. By utilizing the Universally Unique Identifier (UUID) on this application, users will only be able to log in on one mobile phone device only. Users will only be able to vote and see the results of votes from all candidates.

a) Interface Menu Home

The home page is the start page that will appear when the user has successfully entered the login process. This page displays the opening message that the user has successfully logged in. Next is the display of the home menu shown in Figure 5.6 below:
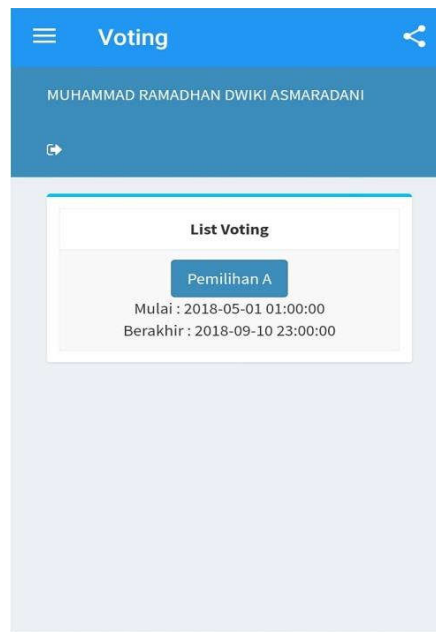

Figure 4.6 Hom Menu Interface

b) Interface Menu Voting

The voting menu has a function as a page for users to be able to do the voting process. Students as users, can choose which candidate to choose. In this voting menu, users will be shown candidates who will serve as Candidates for the Governor and Deputy Governor of the BEM FT, Bhayangkara University, Surabaya. Users only have to click on the vote icon that appears below the image of the candidate pair.

Next is the display of the voting menu shown in Figure 5.7 below:

Figure 4.7 Voting Menu Interface

c) Voting Results Menu Interface
This page is the last page in the e-voting application. The voting result menu is a place where students as users get information on the results of votes after they make the voting process. Next is the display of the voting result menu shown in Figure 5.8 below:
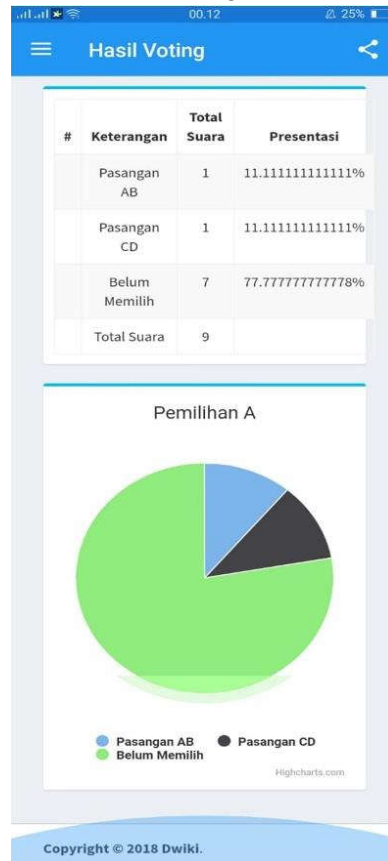

Figure 4.8 Interface of Voting Results Menu

5. TESTING AND DISCUSSION OF RESULTS

5.1 Testing

Testing is the most important thing that aims to find errors or deficiencies in the software to be tested. The test intends to find out that the software created has fulfilled the criteria that are in accordance with the purpose of designing the software. The method used is the black box method.

The black box method itself is a software testing method that tests application functionality. This functional testing technique will be used in testing this application. In addition, testing in terms of effectiveness, efficiency and safety of application usage is also carried out.
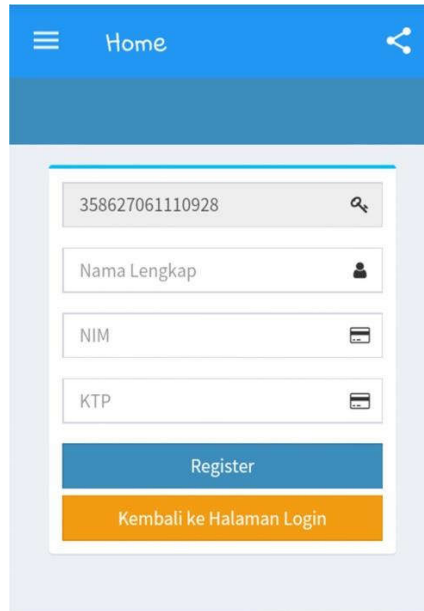
5.2 Testing by Functional Testing

Functional testing is part of system testing which is intended to test the extent to which the system can perform calculations in accordance with the flow used. This test is carried out by the user to use the e-voting application system by utilizing the Universally Unique Identifier (UUID) by clicking on the vote icon in one of the candidate columns to be chosen by the student as the user.

If the input provided by the process can produce output that matches its functional requirements, the program created is correct. However, if the output produced is not in accordance with its functional requirements, then there is still an error in the program and further tracing is done to correct the errors that occur.

5.3 Functional Testing Results

The following tests are the testing flow of the e-voting application. The flow or course of the program described by the user can be seen in Figure 4.1 and Figure 4.2. Based on the voting procedure, the running of the system is as follows:

Figure 5.1 Register page

The first step that must be done by the user after installing the application in order to carry out a vote process is to register on the registration page provided in the application. In the registration form, the user must fill in the Full Name, Student Identification Number (NIM) along with the Population Identity Number (NIK). When the user has finished registering by clicking the register icon, all user data and the UUID will be entered and recorded on the system database. When the user registers with the same NIM / NIK / UUID device, the user will not be able to register again. Its function is so that there is no such thing as double data in one user account. The following is the display of the menu register with the occurrence of double data.
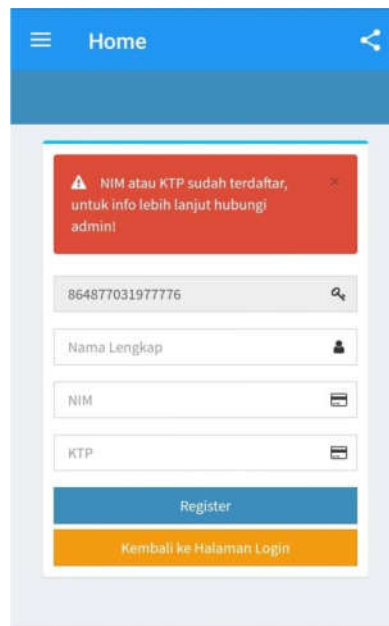
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Figure 5.2 Registration Process when there is Double Data

After completing the registration process and succeeding, the user will wait for the verification process and validation from the admin. The login process will not be possible if the data / user account has not been validated by the admin. The validation process by the admin uses the agreed time or the user can immediately confirm the success of the registration process so that the admin can be validated immediately so that the user can carry out the vote without having to wait for the specified time period for the admin to do the validation process. Admin validation process as shown in the following picture.
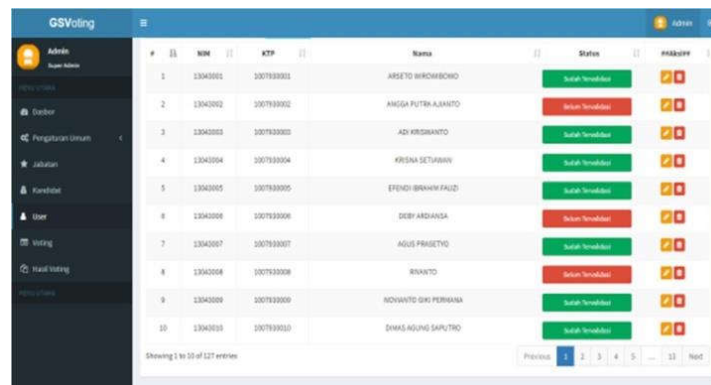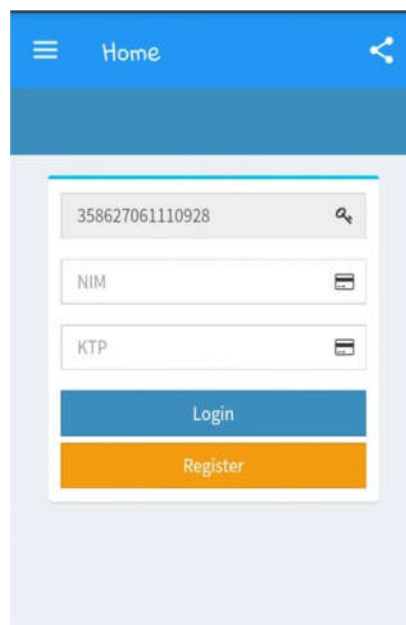

Figure 5.3 Validating a User Account

Admin will validate all active student accounts that have the right to vote. Validation functions so that students can log in and choose candidates who are candidates for Governor & Deputy Governor of BEM, Faculty of Engineering, Bhayangkara University, Surabaya. If the student account has not been divorced, the user will not be able to vote on the voting page on the E-Voting application menu. The function of other validations is to minimize fraud that occurs, for example students are no longer active as Engineering students or even Universities, students have transferred to other faculties, or deliberately entered NIM / NIK friends or other people. These are all factors that can be minimized by

this admin validation process. The validation process can be done by pressing the "Not Validated" button. The following notifications will appear

Figure 5.4 Account Validation Notification

Figure 5.5 Login process

Figure 5.6 Login process rejected

After the student account is validated by the admin, then the user can log in via the e-voting application that has been installed on their respective mobile phones. The login page is shown in Figure 5.5 above. The use of the Universally Unique Identifier (UUID) in this application is able to deny access to incoming users on one mobile phone device to another device as shown in Figure 5.6 above.

Figure 5.7 Start Page

When the login process is successful, the start page will appear on the application shown in Figure 5.7. There are 3 choices in this e-voting application, namely Home Menu, Voting Menu and Voting Results Menu. The following is a display of the application menu options as shown in Figure 5.8 below.
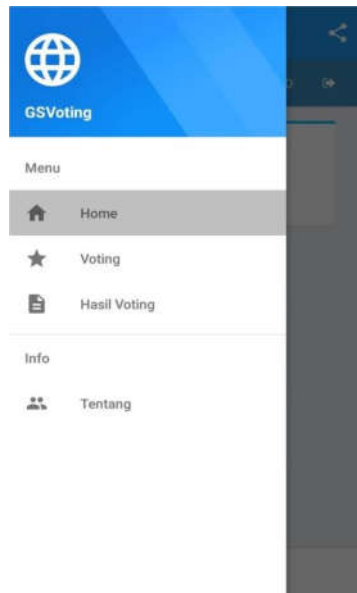
Figure 5.8 Menu Options

Select the voting menu so the user can vote. There will be candidates who have been approved by the election committee along with the starting and ending periods of voting as shown in Figure 5.9 and Figure 5.10 below.

Figure 5.9 Options menu
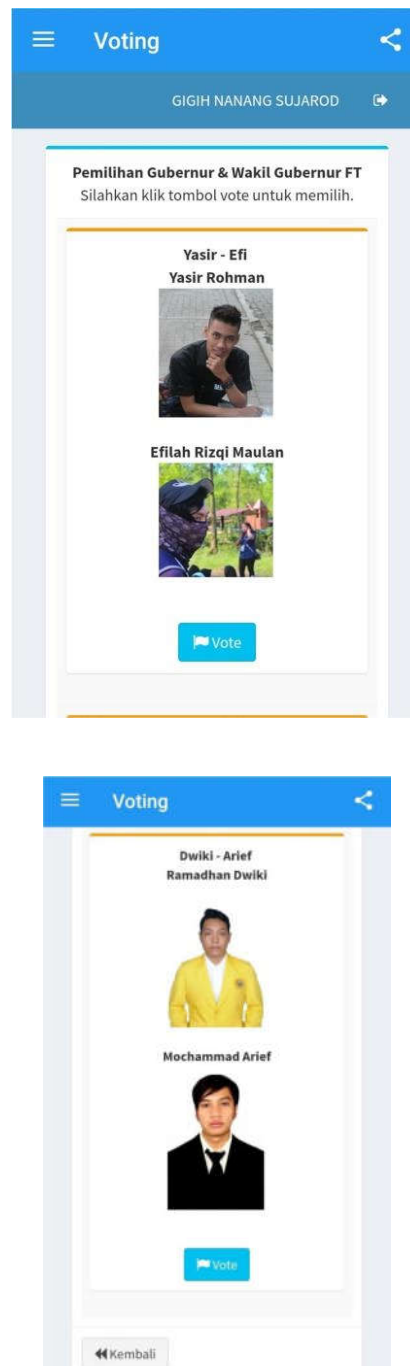
Figure 5.10 Candidates for Governor & Deputy Governor of BEM FT UBHARA

The vote process is only done once. A notification will appear that the vote has been successfully carried out as shown in Figure 5.11 below.
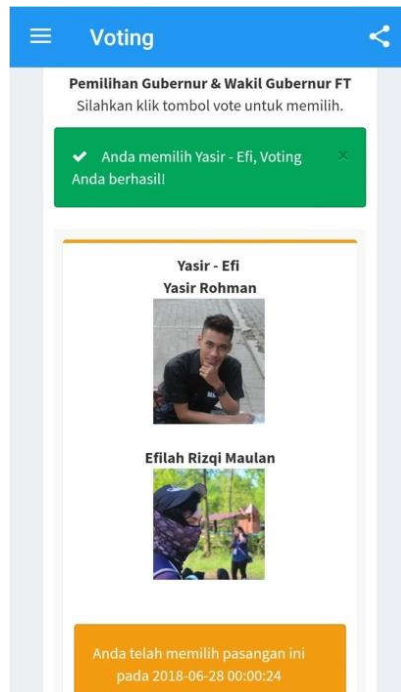
Figure 5.11 Notification successfully vote

After making a vote, the user can see the temporary and final vote in the application. Vote can only be done once by each user. The results of the vote can be seen on the mobile phone and website in the voting menu as shown in Figure 5.12 and Figure 5.13 below.

Figure 5.12 Results of Voice Gain (Mobile Phone)

Figure 5.13 Results of vote acquisition (website)

The following functional testing techniques for application systems are summarized in the form of tables on both websites and mobile phones such as table 5.1 and table 5.2 below.

Table 5.1 Test Case on the Website

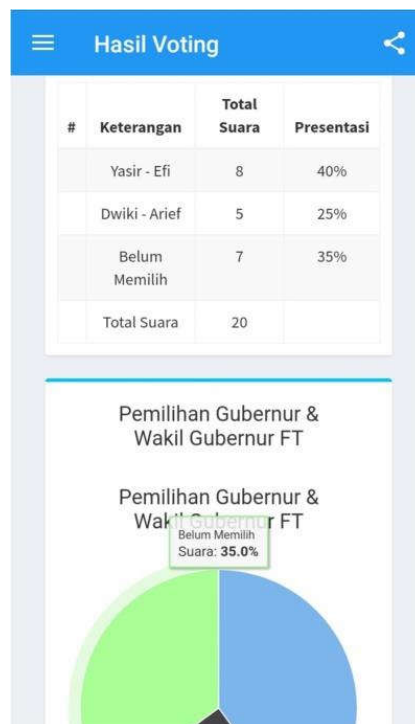| N	Testing Location	Testing Scenario	Expected Results	Conclusion
1.	Login	Produce incorrect data for username & password	The system will deny login access and display the message "Username e or wrong password"	Corresponding
2	Position Menu	Don't fill in the position name field, then click Save	The system will refuse to move to the next page and it will display the message "Please fill out this field"	Corresponding
3	Candidate Menu	Not fill in the fields provided in the Add Data form	The system will refuse to move to the next page a and it will display the message "Please fill out this field"	Corresponding
4	User Menu	Does not fill in one of the fields provided by the system on the Add User form	The system will refuse to move to the next page and it will display the message "Please fill out this field"	Corresponding
5	Voting Menu	Does not fill in one of the fields that the system has provided on the Add form	The system will refuse to move to the next page and the message will appear	Corresponding

Table 5.2 Test Case on a Mobile Phone

N	Testing Location	Testing Scenario	Expected Results	Conclusion
1	Registration	Enter the same NIM & NIK after the previous registration process	The system will deny registration access and display the message "" NIM or NIK is registered, for more info contact the admin! ".	Corresponding
		Try logging in with registered data	The system will deny login access and display the message "NIM or NIK is not registered / not active".	Corresponding
2	Login	Produce incorrectly data for NIM & NIK	The system will deny login access and display the message "NIM or NIK is wrong"	Corresponding
		Trying to log in to another mobile phone device, when the account on the previous device is still logged in	System will refuse login access and display the message "This user has logged in on another device"	Corresponding
3	Voting Menu	Try choose more than one candidate	The system will reject by removing the vote button on the candidate column	Corresponding

5.4 Testing Of The Effectiveness Of The Application

The e-voting application is made as a medium that meets the criteria and desires of users such as easily accessible at any time without having to go back and forth to the polling station and need more energy and fuel for the vehicle during the application process. Sound calculations are faster and more accurate. In addition, the time needed is also faster than having to queue with other voters who have the same rights to carry out the election process. Display interfaces are also made as needed so that users are faster and easier to understand the concepts and functions of the application.

5.5 Testing of Application Efficiency

In making this e-voting application, researchers want to reduce the use of paper quite a lot in the manual voting process, such as the example of ballot paper production and voter data. By reducing paper use, researchers also have a role to support the Government's program of saving paper with the paperless concept. Paperless is reducing paper use, not eliminating the use of paper at all. So, it is hoped that the paperless concept will not be translated as "Paper Free". Because it is almost impossible for an agency or institution not to use paper in carrying out its administrative process. This concept is the result of thoughts that emerged besides as a result of the development of information technology

and computers is also a solution to reduce the use of cabinet filling as a place to store archives and is a job that takes too long.

Table 5.3 Table Testing the Effectiveness and Efficiency of Applications

MANUAL	E-VOTING
VOTING - Must come to the polling station (TPS)	- No need to come to the polling station (TPS)
- Requires more paper production	- Requires less paper production
- Requires a lot of energy	- Does not require a lot of energy
- The flow of the voting process takes a long time	- The flow of the voting process takes less time
- Voice counts are often different and long	- Voice calculation is more accurate and fast

5.6 Testing Of Application Security

The e-voting scheme is to maintain the security or confidentiality of voters in carrying out elections and interactions with the election and counting committee. In addition there are a number of things that are done when testing security in this application:

1. Prevent double data

   The existence of user registration, verification of data and validation from the admin, minimizes the existence of double data or data that is stacked together. Data taken by the system is NIM, NIK data that is inputted by the user and UUID which is automatically read by the system. The benefit of UUID is that when a user has finished registering by clicking the register icon, all user data and UUID will be entered and recorded on the system database. When the user registers with the same NIM / NIK / UUID device, the user will not be able to register again.

2. Prevent double login

   The admin validation process functions so that students can log in and choose candidates who are candidates for Governor & Deputy Governor of BEM, Faculty of Engineering, Bhayangkara University, Surabaya. If the student account has not been divorced, the user will not be able to vote on the voting page on the E-Voting application menu. The function of other validations is to minimize fraud that occurs, for example students are no longer active as Engineering students or

even Universities, students have transferred to other faculties, or deliberately entered NIM / NIK friends or other people.

The purpose of the security of this e-voting system is to guarantee privacy or voter confidentiality and choice accuracy. Security in this application system has several criteria:

1) Eligibility means that only registered voters can carry out the election process.
2) Unreusability means that each voter can only give one choice.
3) Anonymity means the choice of voters is kept secret.
4) Accuracy means that choices cannot be changed or deleted during or after an election and also cannot be added after the election is closed.
5) Fairness means that the vote count can be witnessed by all voters.

All of the above criteria are the basis of the security programs developed. All criteria are interconnected in the concept of information security.

6. CONCLUSION

From the results of the discussion of previous chapters on the Android-based E-Voting Application System Using the Universally Unique Identifier (UUID) the Selection of the Governor of BEM, the Faculty of Engineering, Bhayangkara University, Surabaya, some conclusions were obtained as follows:

1) Based on the testing in terms of the effectiveness of the application in the previous chapter, the e-voting application can help users and the BEM Governor election committee of the Faculty of Engineering, Bhayangkara University, Surabaya, so they do not have to come to the polling place to register and vote. In addition, it takes a faster time than manual vote. The results of calculating the sound also become faster and more accurate.
2) Based on testing in terms of the efficiency of the application in the previous chapter, the e-voting application succeeded in supporting the government's program of reducing paper use and utilizing information technology and computers to reduce the use of cabinet filling as archival storage and a long-time job.
3) Based on testing in terms of application security in the previous chapter, e-voting applications can prevent the occurrence of the same data that is stacked (double data) and with the validation by the admin, the system can minimize fraud, such as students who are no longer active as Faculty Engineering students or even Universities, students have transferred to other faculties, or deliberately entered NIM / NIK friends or other people. In addition, the system carries out the purpose of e-voting system security, namely to guarantee privacy or voter confidentiality and choice accuracy. Some application security criteria, such as Reliability, Unreusability, Anonymity, Accuracy and Fairness are interrelated in the formation of this application.

And based on the validity test of the questionnaire that the author addressed to 20 students as users, the E-Voting application system was deemed necessary to be used during the Election of the Governor and Deputy Governor of the Student Executive Board of the Faculty of Engineering (BEM FT) Surabaya Bhayangkara.

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