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Design And Building Of A Web Based E-Voting System For The Election Of Osis Chairman At SMPN 10 Bengkulu Selatan Using Rapid Application Development (RAD) Method

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Abstract: The election of the chairman and deputy chairman of the OSIS is held every year by all schools including SMPN 10 Bengkulu Selatan. The election was carried out conventionally where this activity required quite a lot of money and energy as well as quite long teaching and learning hours which were cut to carry out the election of the OSIS chairman. Apart from that, there is the potential for fraud, human error, operational inefficiencies from the start to the end of the election, and non-real-time monitoring which are shortcomings of conventional voting systems. To answer this problem, research is proposed which aims to build a web-based e-voting system for the election of OSIS chairman at SMPN 10 Bengkulu Selatan. The software development method used is Rapid Application Development (RAD). The method emphasizes rapid and incremental prototyping.

Keywords: e-voting, information system, rapid application development, OSIS.

Introduction

The election of the student council chairman is an annual activity carried out by the student council management, especially at SMP Negeri 10 Bengkulu Selatan. The election of the student council chairman at SMP Negeri 10 Bengkulu Selatan is carried out with a manual system where the student council chairman election committee will be preoccupied with the preparation of places and events so that it takes up a lot of teaching and learning hours and a logistics budget that is not small every year. This causes operational inefficiencies in terms of time, energy, and finances in addition to the potential for fraud and low participation.

Manual election of student council leaders has many disadvantages, especially in operational inefficiency, student participation, and security. Operational inefficiencies caused by the manual election system are repeated election preparations every year, a slower counting process, annual logistics costs that are not small, and a large potential for miscalculations due to *human error*. Equally important inefficiencies are the reduction in teaching and learning hours so that knowledge transfer activities do not run properly. Security factors related to the difficulty of tracking audit trails because they are not well-documented and transparency is difficult due to the absence of *live reports*.

Based on the above problems, the researcher offers a study that focuses on how to design an e-voting system for SMP Negeri 10 Bengkulu Selatan that can minimize the above problems. The e-voting system to be designed requires perspectives and inputs from the election committee, students, and teachers as users of the e-voting system. In addition, the e-voting system needs to accommodate the three phases of the election, namely pre-election, election, and post-election. Based on the results of the 2019 Walinagari Batu Taba election case study in Agam Regency, where the application of e-voting has a significant effect of 71% on the level of community political participation. (Novaldi and Adnan, 2021)..

The purpose of this research is to design an e-voting system that can minimize problems and obstacles, as well as increase honest, fair, transparent, and optimal values in the student council chairman election system at SMP Negeri 10 Bengkulu Selatan. In addition, the e-voting system is expected to increase democratic values to students at SMP Negeri 10 Bengkulu Selatan. The design of the e-voting system uses the Rapid Application Development (RAD) method so that the design process is more flexible that follows the needs of users both on the side of the election management team, teachers, and students..

Methodology

Use of Rapid Application Development Method

In designing the application in this study, researchers used the rapid application development (RAD) method which goes through various stages as follows.

- Requirements Planning

At this stage, it will go through various sub-stages including data collection, problem analysis, and needs analysis. Researchers collect data related to research through interviews, surveys, and literature studies. The interview and field survey process was carried out at SMP Negeri 10 Bengkulu Selatan to obtain primary data related to the student council chairman and vice chairman election system. The problem analysis carried out is that researchers identify problems that occur around voting in the election of the chairman and vice chairman of the Student Council at the Junior High School. The results of problem identification at this stage are a description of the root causes of the current student council chairman and vice chairman election system. The researcher also formed a description for the proposed solution offered in this research. Problem analysis will be explained further in Subsection 3.2 Problem Analysis. At this stage, the software, hardware, and functionality requirements needed to develop an e-voting system at SMP

Negeri 10 Bengkulu Selatan are analyzed. The needs analysis involves the school as the user of the e-voting system. The needs analysis will be explained further in Subchapter 3.3 Needs Analysis.

- User Design

At this stage, researchers create various diagrams and mock ups to design a system that will later be converted into source code. The user design made is use case diagram, sequence diagram, data flow diagram, entitiy relationship diagram, and mock up. Researchers will create a simple prototype of the features that have been designed. At the system design stage, there will be a prototype cycle that will continue to repeat until the system design design is agreed upon. User design will be explained further in Section 3.4 System Design.

- Construction

At this stage, researchers will write the final code. The source code written by some will be displayed in Subsection 4.1 Implementation. Application development is carried out in short cycles based on features that have been approved and designed. Furthermore, application testing continues to be carried out continuously according to the short cycle development. Overall testing will be explained further in Subsection 4.2 Testing.

- Cut Over

At this stage, we will deploy the application by hosting the evoting application so that it can be accessed online. Before that, we will migrate the data, source code, and additional applications needed from localhost to the computer server. On this occasion, the researcher used the website address for the evoting application, https://evoting.sospro.my.id. The screenshot of the hosted evoting application will be shown in Section 4.1 Implementation.

Problem Analysis

Researchers conducted in-depth interviews with open-ended questions with teachers and student council administrators at SMP Negeri 10 Bengkulu Selatan. The researcher found several points related to the organization of the election of the Chairperson and Vice Chairperson of the Student Council as follows.

- The election of the Chairperson and Vice Chairperson of the Student Council of SMP Negeri 10 Bengkulu Selatan when it was done manually caused many teaching and learning hours to be sacrificed so that the learning process was temporarily stopped.
- The preparation process was long and took a lot of time and energy from before, during and after the election.
- The same preparation process every year which is repeated in the same pattern.

System Design

At this stage, researchers designed the system using various diagrams including *use case diagrams*, *activity diagrams*, *data flow diagrams*, *entity relationship diagrams*, and *mock ups*.

The design aims to explain the stakeholders involved, describe business processes, data flow in the system, data structure, and application display design.

- *Use Case Diagram*

In the development of the e-voting system, there are 3 actors involved, namely the super admin, admin, and voters. All use cases require actors to login to the system for authentication. This e-voting use case diagram is shown in Figure 3.1.

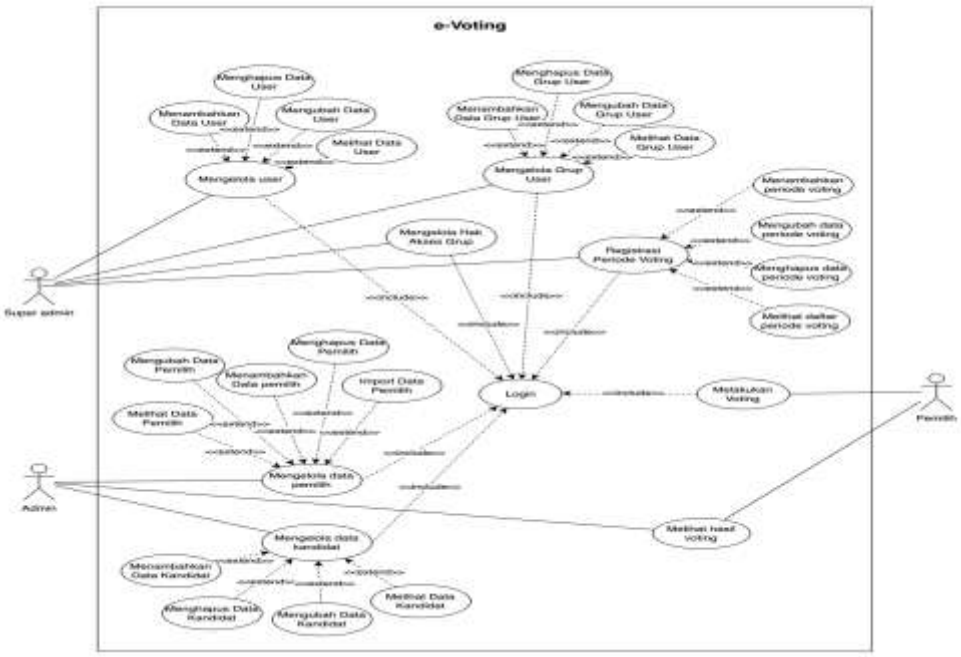

Image 1. Use Case Diagram

Result and Discussion

Implementation

The implementation section contains screenshots of the SMP Negeri 10 Bengkulu Selatan e-voting system that has been designed. There are several *prototype* changes that occur during the process. Considering that the development of the e-voting system is oriented by user needs. The changes that occurred are shown in Table 4.1.

Table 1. Prototype Changes

No.	First Cycle	Second Cycle
1	No usage guide page	Guide Page
2	User cannot select the desired selection period	Users can select the election period when they want to view the election history by period.
3	No voter import page	There is a page for importing voters using .xlsx format files, making it easier for admins to *enter* large amounts of voter *data*.

The results of the implementation in this study will be organized based on actors, namely Admin, Super Admin, and Voters, as well as pages that include all actors.

- Pages that include all actors
- Home Page

The home page contains a navigation bar at the top. The navigation bar contains the home menu, candidates, votes, results, and login for the admin. The home page is shown in Figure 4.1.

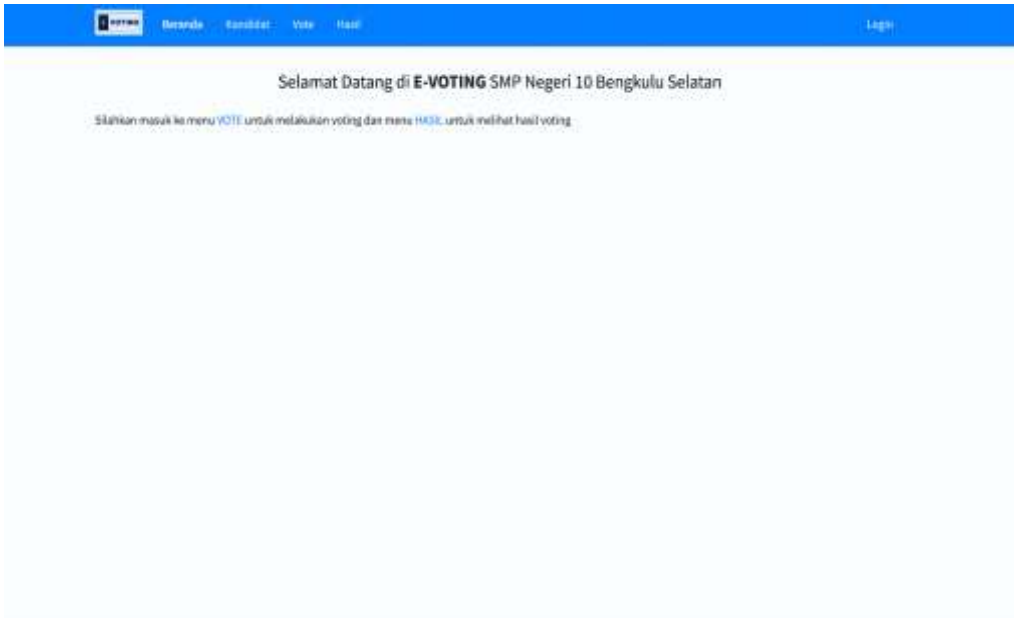

Image 2. Home Page

- Login Page

The login page contains a login form that contains an email field and a password field. The login page aims as an interface before entering the system. The login page is shown in Figure 4.2.

Image 3 Login Page

- Candidate Information Page

The candidate information page contains all candidate pairs based on the selected period. There is a list of candidate data containing photos, names of candidates for chairman and vice chairman, vision, and mission. The Candidate Information page is shown in Figure 4.3.

Image 4.. Candidate Information Page

- Voting Result Information Page

The voting result information page contains information on the voting results for the selected period. There is a list of voting information data for the period including the number of voters, the number of voters who have not voted, the number of voters who have not voted, the number of votes for each candidate, and a diagram of candidate votes. The voting result information page is shown in Figure 4.4.

Image 5 Voting Result Page

- Period Select Page

The Select Voting Period page contains a form to select the election period for candidates for student council chairman and vice chairman. The page is to select the election period to be managed. The Select Voting Period page is shown in Figure 4.5.

Image 6 Select Voting Period Page

- Admin
- Voting Information Page

The voting information page contains various voting information, number of voters, percentage of overall votes, and votes per candidate. The voting information page is shown in Figure 4.6.

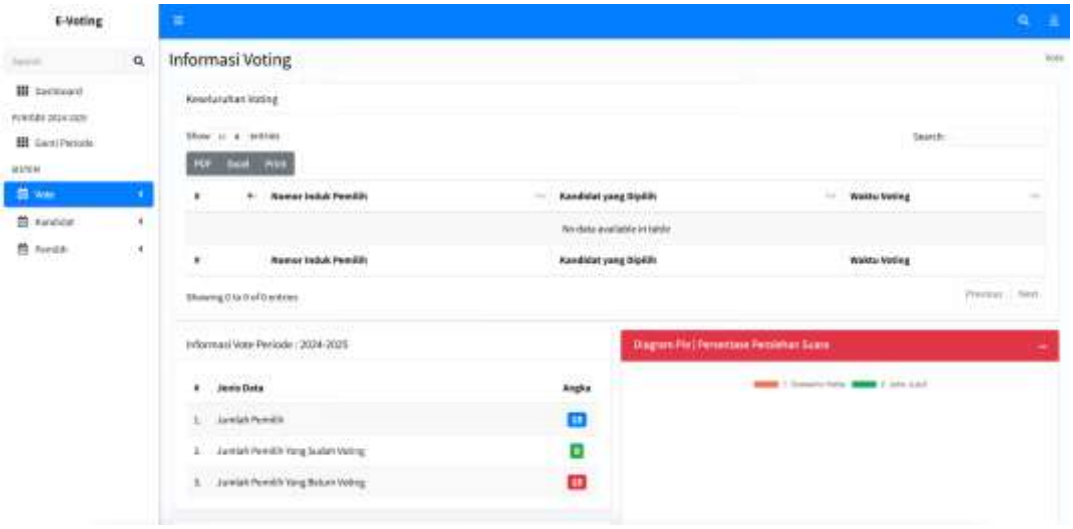

Image 7 Voting Information Page

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Conclusion

The conclusions of the research on the Design of an E-Voting System for the Election of the Head of Osis at SMP Negeri 10 Bengkulu Selatan Web-Based with the *Rapid Application Development* (RAD) Method are as follows:

- The development of the e-voting system using the RAD method occurs prototyping and dynamic and rapid changes in functionality and is carried out with a short cycle. The short cycle requires researchers to communicate intensely with *end users* such as admins, teachers, and students.
- The e-voting system makes it easier for election organizers and voters to vote for the student council chairman election because access can be done using a *smartphone* that requires an internet connection.
- The designed e-voting system can minimize the time inefficiency of organizing the student council chairman election because it does not stop the teaching and learning process to conduct the student council chairman election.
- Teaching and learning activities are not hampered and teaching and learning time is not wasted on election day.
- With an e-voting system, election preparation does not require a long time and a lot of resources.
- Counting is done in *real time* so as to be able to present actual election information

Overall, the e-voting system is an effort to provide lessons in democracy since school days without having to sacrifice teaching and learning hours with time efficiency that cuts the workflow for the preparation and implementation of manual student council elections.

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