

The Implementation of an Electronic Voting System for Supreme Student Council in the State College

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Abstract— The study was conducted to design and implement the electronic voting system for supreme student council in the state college of Zamboanga del Sur, Philippines. It was explicitly undertaken to realize the following objectives of the study; (1) to automate the election result. (2) to develop a module that the voter can cast their votes easily. (3) to develop a module that the election officer can manage the candidates and (4) to provide necessary printed reports needed by the election officer. The methodology used was rapid application development to fasten the application development. It was implemented in web-based application using Hypertext pre-processor (PHP) programming language and MYSQL database. Furthermore, the system was tested by the stakeholders and garnered above average in terms of system usability. The newly developed voting system helps the office of student affairs and the supreme student council during the election process and canvassing.

Keywords— Electronic Voting: Election System: Voting System Implementation: Web-based System.

I. INTRODUCTION

Technology is becoming an integral part of our daily life, and both researchers and practicing educators are constantly exploring new ways in which technology can help facilitate learning, as well as contribute to a higher quality of education and higher levels of student satisfaction (Kozlova, D. & Pikhart M. (2021). The technology gives establishments an aggressive edge by offering improved services to students and staff, driving more prominent efficiencies and making enhanced learning encounters and experiences (Brahm, 2018). The study looks at the common election process on how these procedures can be enhanced with the use of technology. The use of computer or computerized voting equipment to cast ballot in an election, this term sometimes is used more specifically to refer to voting that takes place over the Internet (Storer & Duncan, 2004).

The J.H. Cerilles State College is the only state college in the province of Zamboanga del Sur, Philippines. It has three (3) organic campuses namely Dumingag Campus, Canuto MS Enerio Campus, and Main Campus with approximately ten (10) Thousand student population. For the past years, the office of the student affairs in the state college spearheaded the conduct of election for the student supreme council. As part of the democracy, student has the right to run for certain position in the student body and has the right to vote for the elected officials. The conduct of election usually takes a couple of days and it was implemented using traditional voting system. Some of the problems encountered in the previous elections, that many of the voters did not sign in the paper

ballot that leads to disqualification of their vote and vote is wasted. There must be a system to hold an election that lessen the percentage of rejected ballots and increases voter/student participation by holding an election electronically.

A. Objectives of the Study

The main objective of the study is to design and implement the electronic voting system for Supreme Student Council in one of the State College in Zamboanga Del Sur, Philippines. The specific objectives are the following:

1. To automate the election result.
2. To develop a module that the voter can cast their votes easily.
3. To develop a module that election officer can manage the candidates.
4. To provide necessary printed reports needed by the election officer.

B. Significance of the Study

The implementation of the electronic voting system has been beneficial to institution especially in the office of student affairs and student services in facilitating the election process of the supreme student council because the election can now be done within a day. The students can immediately cast their vote at their convenient place and time as long as they are in the school campus connected to the same network. The candidate of a particular position can immediately know the result after the election process and this system can be used as a reference of the future research enthusiast in their system development.

II. METHODOLOGY

The researcher used the rapid application development in the application development. Coleman & Verbruggen, (1998) RAD was taken to relate the projects based around tight timescales which use prototyping and combine high-level of development tools and techniques. Figure 1 shows the four (4) phases of the Rapid Application Development methodology namely Requirement and Planning, System Design, Development, and Cutover.

A. Requirements and Planning

The researcher gathers and identify all the functionality of the system to clarify the projected scope of the system and have a better picture of what is needed in the system development process. The voting system is divided into two logical subsystems which are the election administration and

the voting. The election administration handles all the interactions with election officer who setup the election. The voting handles all the interaction with the voters including voter verification, ballot creation, and vote recording.

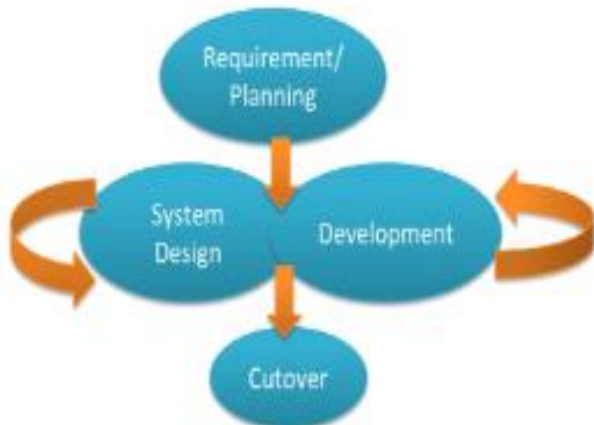


Fig. 1: Rapid Application Development

A.1 Functional Requirements

1. The system must have administrative log-in to register the voters and candidates.
2. The candidates and the voters must be registered the system.
3. The system should record all the casted votes correctly.
4. The system should count the votes correctly and display the result in the public.
5. The system should allow the voter to cast votes quickly, distinguish their candidates through image and even in minimal computer skills.
6. The system must allow for recounts and should work robustly without thrashing of any votes, even if there are failures like machine crumple and power interruption.
7. Voter can only vote once and can vote straight by selecting the party list.
8. Voter is not required to vote all the candidate’s position.
9. Votes should not be able to be modified, forged, or deleted with detection.

A.2 Non-Functional Requirements

1. The candidates must be officially enrolled in the current semester.
2. The Office of the Student Affairs and Student Services (OSAS) must assign Election Officer (EO) to assist the needs of the voters.
3. All students are required to cast their votes.

B. System Design

After identifying all the requirement and necessary functionality of the system the researcher used of use case diagram identify the actor of the system that manage the use cases. The actor refers to the Election Officer, candidate, and the voter. The election officer has to manage the candidate, voter, votes, position, election result, and election itself. While the candidate can file their candidacy and the voter can vote through the electronic voting system as shown in Fig 2.

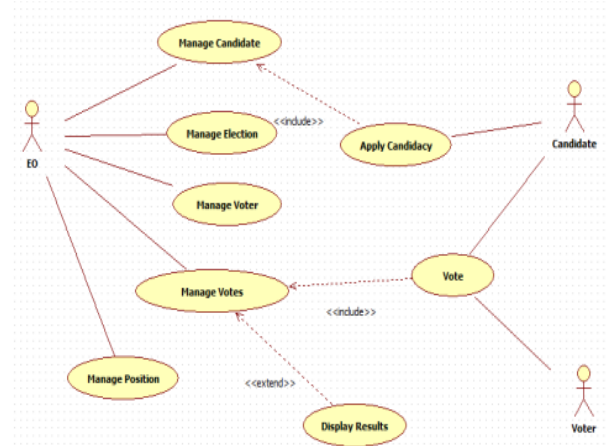


Fig. 2: Use Case Diagram

Fig 3 shows the class diagram of the electronic voting system that describes the structure by showing the system classes, attributes, operations and the relationships among objects. There are six (6) classes identified in the diagram namely voter, candidate, election, votes, election officer, and position.

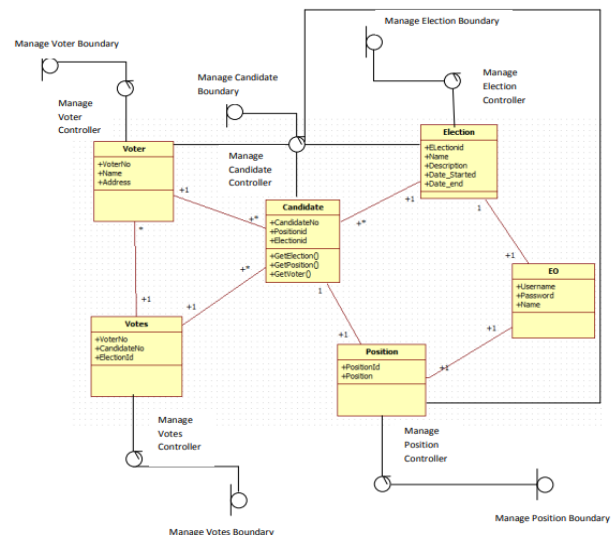


Fig. 3: Class Diagram

Fig 4 shows the activity diagram of the voting process. The diagram explicitly emphasizing how the activities are coordinated to provide a service to achieve the operations.

C. Development

At this stage, the researcher was able to identify all the necessary use cases that can be managed by specific actor, the research started to developed the electronics voting system and implemented in a web-based application. The Hypertext Pre-processor (PHP) program language has been used to implement the required functionality of the system. The Cascading Style Sheets (CSS) used to improve the design/ user interface of the system and JavaScript to improve interactivity of the system. During development process, the research presented the system for initial testing by the

stakeholders to gather comments and recommendations to further enhanced the system.

Voting Process

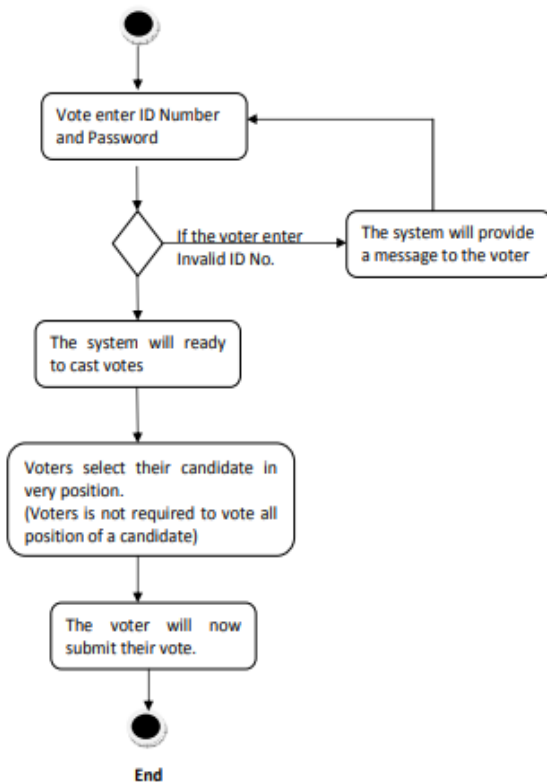


Fig 4: Activity Diagram on Voting Process

D. Cutover

The developed system has undergone series of testing. The System Usability Scale questionnaires has been used to test the usability and functionality of the system. There are thirty (30) respondents who evaluated and tested the system with different stakeholders identified in the use case diagram.

Fig 5 shows the user responses in each question based on the system usability questionnaires. The y-axis represents the scale of the questionnaires ranging from 0 to 4 (with four being the most positive response).

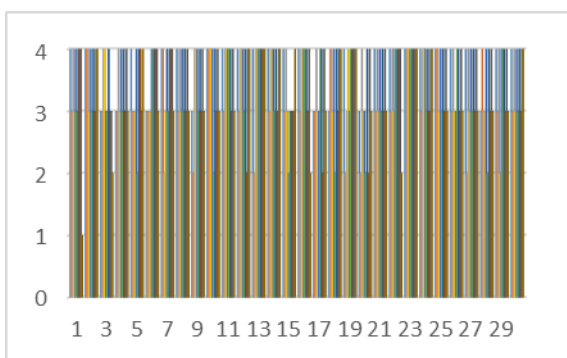


Fig. 5: User Responses

Fig 6 shows the total score of each respondent ranging from 0 to 40. The user responses will be added in each item to arrive the total score. The y-axis represents the total score and x-axis represents the respondents and x-axis represents the total score.

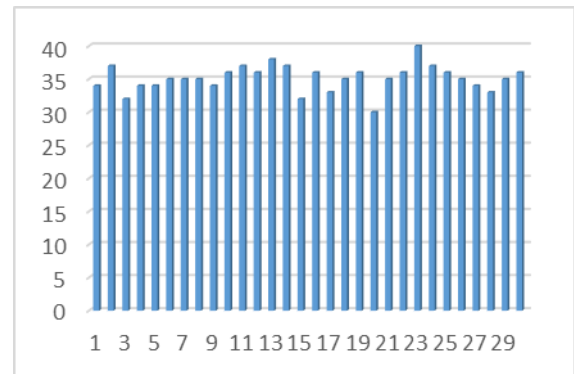


Fig. 6: Sum of User Responses

Fig 7 shows the overall summary result during the system usability testing. The y-axis represents the total score ranging from 0 to 100, to get that range add up each respondent response and multiplied by 2.5.

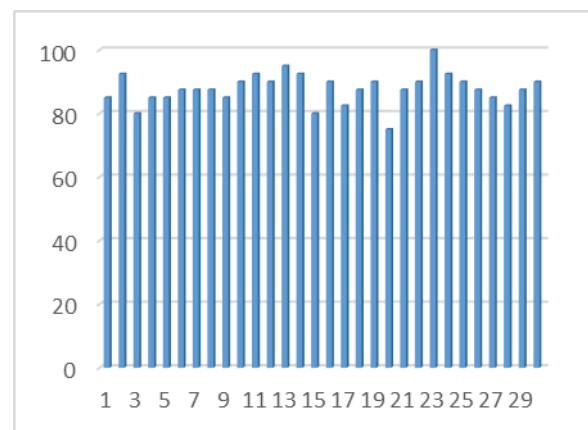


Fig. 7: User Responses in Percentile

The result of the testing garnered the score of 85 over 30 stakeholders that evaluated the system. The average scoring of System Usability Scale is Sixty-Five (65) (Sauro, J., 2011).

III. RESULTS AND DISCUSSIONS

This chapter presents the results and discussions of the design and the implementation of the electronic voting system following the specific objectives of the study.

A. To automate the election result

The election officer as well as the office of the student affairs can immediately view and print the official election result as shown in Figure 8. It displayed the official number of votes that the candidate has.

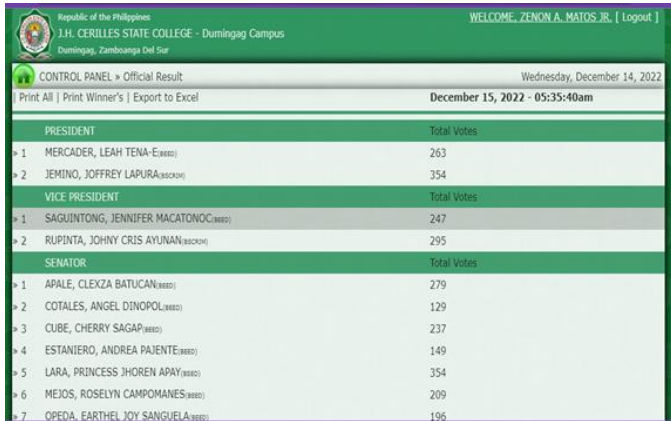


Fig. 8: Election result

B. To develop a module that the voter can cast their votes easily.

The developed module was provided for the voter to cast their votes easily. Figure 9 shows the screenshot of the voter need to input their pin code given by the election officer for them to cast their votes. If they pass the authentication process, they can now proceed to the voting module where they choose their candidate in a certain position.

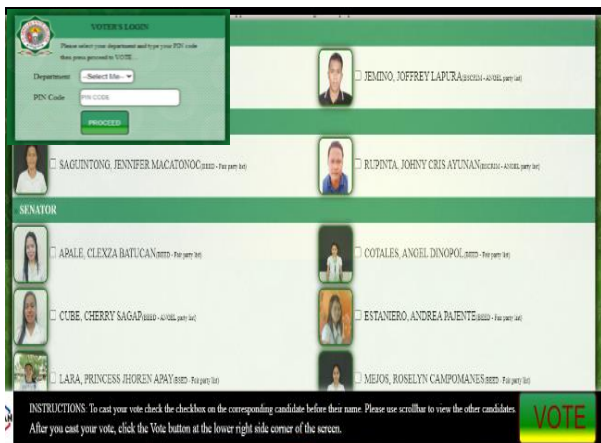


Fig. 9: Voter Casting Votes

In cases where the voter attempted to cast their votes again, they system will notify the voter that they are not allowed to vote. After the voter choose they candidate, the voter must click the Vote button to submit official votes. Additionally, the voter has the option review their casted vote before submitting it.

C. To develop a module that election officer can manage the candidates.

The Fig 10 shows the screenshots of the module where the election officer managed the running candidates. The election officer has the right to add new candidate, update information of the running candidates, and even disqualify the candidate. The module can also provide needed report by the election officer such as the list of all running candidates and the list of running candidate by party.

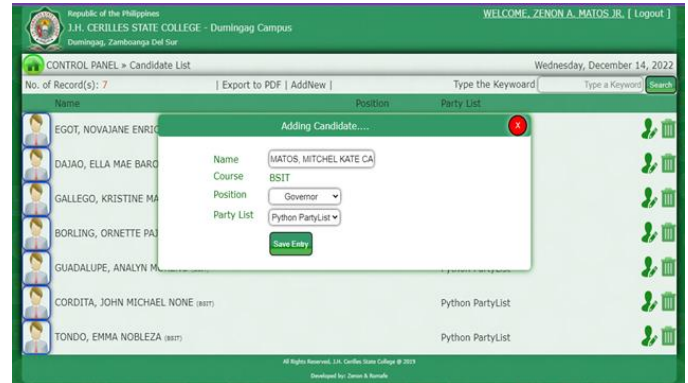


Fig. 10: Candidate Module

D. To provide necessary printed reports needed by the election officer.

The system has provided reports to the election officers as well as to the office of the student affairs in a pdf format or in excel format. It can provide printed report for the list of candidates who run for a certain position, list of registered voters that are eligible to vote, list of party list for the candidate. Additionally, it also provided a printed report for the official result of the election.

IV. CONCLUSION AND RECOMMENDATION

The electronic voting system of the student supreme student council was implemented at J.H. Cerilles State College – Dumingag Campus in the province of Zamboanga del Sur. It was implemented in a web-based application based on the functional requirements defined during data gathering. The system allows the voter to cast their votes easily and prevented them from disqualification. The election officer can automatically view the election result and print the necessary printed report needed since the election only takes one (1) day.

The researcher recommended that the electronic voting system will be utilized in all of the election process in the college aside from supreme student council, might as well they consider the election of classroom officers and Parents and Teacher Association (PTA) officers. To further enhanced the system, the researcher recommends to explore and examine the integration of the QR code which allows the voter to votes by scanning the allocated QR Code.

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