

Design and Develop Automated Voting System

Joel M. Gumiran, Cherry R. Gumiran



Abstract: Voting system is a tool for managing the complete process of the election with the use of technology. It will record the information of the candidates, voters and administrator. Commission on Election is an organization where in-charge in conducting the election process. Also, they are accountable for evaluating the qualifications of the candidates and assigned officers who serve as the electoral board who will proclaim the winner/s. The researcher applied the System Development Life Cycle in designing and developing the automated voting system using the development platform such as MySQL which serves as the database wherein it stores the data of election; Visual Basic 6.0 serves as the programming editor and Local Area Network (LAN), a network connection. The system was tested and implemented during the Student Supreme Council and Student Body Organization election in the year 2012 and 2013 applying the two level of security which is in the form of access code generated by the system and exported data from the registrar office as the basis and filters the qualified voters. During the testing and implementation, most voters from the agriculture found out that the system is less convenient compared to BSIT students who believed that the system is the most suitable method of voting. Regarding security, BS Agriculture students also think that the system is less secured, whereas the BS Fisheries voters emphasized that the system provides the high level of protection. In this manner, voting system addresses the problems encountered every election and designed a friendly-user interface for all kinds of users.

Keywords : Election, Electoral Board, Iterative and Incremental Mode, Tabulator, Voters

I. INTRODUCTION

Election procedure handles and manages by the election committee or the electoral board led by the chairman. National Election conducted by the Commission on Election or COMELEC which are accountable for providing the qualified candidates and completes the process of an election with honesty and integrity based on their objectives. Tabulation is the most critical part of the election procedure which stores the information of the users, tallying the data and providing an efficient and accurate result. In doing so, COMELEC adopts technology utilizing using the PCOS machine to automate the counting of votes and offers quick declaration of the winner.

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Isabela State University conducts an election for student and faculty. There are two different kinds of Student election held by the school. One is for the campus which is SSC, and the other is the SBO for the college. Before the year 2010, Isabela State University Roxas Campus used the manual election which asked them to exert extra time, effort and cost. In this manner, there are issues, and problems arise and considered the most unmanageable activity particularly in the voting process, tallying of data and declaration of winners.

Nowadays, there are different methods came out to process the election in a most efficient and convenient way of using a system. The International Institute for Democracy and Electoral Assistance (IDEA) published a book entitled "Introducing Electronic Voting" which stated the different strengths associated with e-voting. Advantages include, faster vote count and tabulation, more accurate results as human error is executed, efficient handling of complicated electoral systems formulae that require laborious counting procedures, increased convenience for voters, potentially increased participation and turnout, particularly with the use of internet voting, reduction of spoiled ballot papers as voting systems can warn voters about any invalid votes and potential long term savings through savings in poll worker time, and reduced cost for the production of ballot papers. The book encourages the readers to change the traditional process of election into an electronic voting. Furthermore, Analysis of Electronic Voting System was studied by Tadayoshi Kohno, Adam Stubblefield, Dan S. Wallach and Aviel D. Rubin at the University of California and stated that e-voting is not suitable for use in a general election. Any paperless electronic voting system might suffer similar flaws, despite any "certification" it could have otherwise received. It is suggested that the best solutions are voting systems having a "voter-verifiable audit trail", where a computerized voting system might print a paper ballot that can be read and verified by the voter.

Hence, the Development of Automated Voting System was designed and developed to address the needs of the school about the process of election. The system handles the official tabulator which able to produce printable output validated by the voters, tabulators who serves as the head of the electoral board and the chairman.

II. LITERATURE REVIEW

Security analysis of the Estonian internet Voting System (2014) studied by Tadayoshi Kohno, Adam Stubblefield, Dan S. Wallach and Aviel D. Rubin at University of California and stated that e-voting is not suitable for use in a general election. Any paperless electronic voting system might suffer similar laws, despite any "certification" it could have otherwise received.

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Method for the secure electronic voting system: face recognition based (2017) studied by M. Affan Alim; Misbah M. Baig; Shahzain Mehboob; Imran Naseem. The researchers emphasized that their framework is for low cost secure electronic voting system based on face recognition. Furthermore, they applied a technology “Local Technology Pattern” to capture the feature of the face characterization in texture format and the chi-square distribution for image classification. In this manner, researchers developed two parallel systems which are for smartphone and web application for face learning and verification modules. Also, it is applied two tire level of security which is by using person ID and face verification. During their testing, it was evaluated and found out that the system is secure, hassle-free voting and less intrusive compared to biometrics.

Secure Electronic Voting (2012) studied by Dimitris A. Gritzalis. It was stated that there was five various technology used in voting like, hand counted paper ballots, lever voting machine, punched card ballots, optical marksense ballots, and direct recording electronic voting machine. According to them, each technology mentioned has its own high points and significant weaknesses. However, some of their strengths are the level of security like the direct-recording electronic voting system wherein the machine was excluded in experiencing the problems of the election like the ballot box theft and tampering. Thus, the central-count systems based on the punched card or optical mark-sense ballot counting cannot offer the voter the opportunity to correct errors such as over votes.

Ballot-polling Risk-limiting Audits in Two Pages (2012) studied by Philip B. Stark. Their purpose of conducting the study is to minimize the number of ballots inspected if the machine count-outcome is right. Their research has several advantages like virtually no set-up cost, requires nothing of the voting system, preserves voter anonymity, counting burden low unless the margin is minimal, like an opinion poll.

III. PROJECT DESCRIPTION

The Automated Voting System has the following features:

1. Register, Update and delete information of candidate, party-list and voters.
2. Filters voters based on the registered voter.
3. Record the votes of each voter.
4. Search, print and validate the individual voters' record.
5. Automatic ranking of evaluated and certified votes according to the number of voters, party list and position.
6. Search and print the summary of result validated by the official tabulator.

IV. OBJECTIVES

This study aimed to design, develop and implement the Automated Voting System to automate the process of election. It also aims to:

- search and filters student per program
- store and manages the information of the candidate and voters;
- develop strong security in voting;
- provides efficiently the accurate result validated by the official tabulator;
- provides help to the voters in identifying the name of the candidate through the attached picture of the candidate;
- automate the tally of votes;
- automate the ranking of evaluated and validated votes according to position and party list;
- automate the declaration of the new set of officers; and
- determine the effectiveness of the system to the school and to the participants

V. RESEARCH METHODOLOGY

The researcher applied the software development life cycle using the software development platform, ballot sheet and survey instrument.

Scientific Basis/Conceptual Framework

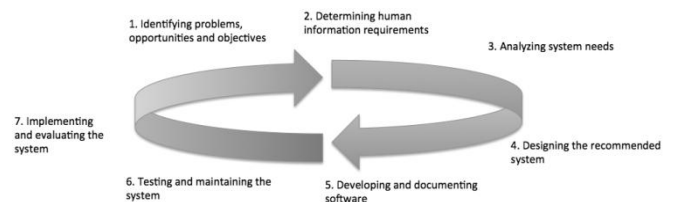


Fig 1: Software development life cycle

1. Identifying Problems, opportunity and objectives. The instrument development started with determining the problems of the agency using the manual process. In determining the problems encountered, pre-survey questionnaire will be applied.
2. Determining human information requirements. This phase is necessary and should be taken all the needed information which is applied in designing the registration form to record the information in the system. Ballot sheet was used for the registration of the information of the candidates, voters and electoral board.
3. Analyzing the System needs. Technical requirements are significant to be able to run properly the developed software; otherwise, errors might be encountered and even delays of transporting data which causes ineffective and inconvenience.
4. Designing the Recommended System. Developer must design the platform intended for the user to address the problems encountered applying the manual system. This is to encapsulate the process of the manual election to come up a better and simplified process for the convenience of the voters and electoral board.
5. Developing and documenting software. Developer writes code to be able to translate the process into a simpler and easiest way.

It is applied the software development platform in designing and developing the system such as the MySQL (Standard Query Language), Visual Basic 6.0 as the programming editor and Local Area Network serves as the network connection.

6. Testing and maintaining the system. Developed software will be installing to the agency for testing. Suggestions and recommendations are be made by the users.
7. Implementing and Evaluating the system. Recommendations and suggestion were addressed and ready for implementation. This phase used the Post Survey Questionnaire to measure the usability and functionality to the user. Same instrument is applied to determine the effectiveness of the software.

A. Locale of the Study

The researchers conducted the study during the election of Supreme Student Council Activities and Student Body Organization in the year 2012 to 2013 at Isabela State University Roxas Campus, Rang-ayan, Roxas, Isabela.

B. Respondents

The respondents in this study the voters from the departments (Institute of Information and Communication Technology, Institute of Teachers Education, Institute of Agriculture, College of Fisheries and School of Criminology), Official tabulator with the person of Joel M. Gumiran and to the Chairman and Electoral Board with the person of Dr. Charibel Sarte.

C. Instrument

Post-Test – Post survey questionnaire was given to the user to evaluate the performance of the developed system in terms of security and convenience.

D. Statistical Tool

Analysis of Data. A five point Likert scale will be used to interpret the data that will be gathered in the respondent:

Scale	Range	Descriptive Rating
1	0.00 -0.99	Strongly Disagree
2	1.00-1.99	Disagree
3	2.00-2.99	Undecided
4	3.00-3.99	Agree
5	4.00-5.00	Strongly Agree

Weighted Mean. this method was used during the testing and after the implementation of the proposed system by means of using the post-test method tool.

$$\text{Formula: } WM = \frac{5(R)+4(R)+3(R)+ 2(R) +1(R)}{N}$$

Where:

- WM-Weighted Mean
- N-Sum of all respondents
- R-Number of Respondents per Rating

VI. RESULTS AND DISCUSSION

As a result of testing and implementation, voters have assessments. Some find relevant and some see less significant due to several reasons like adopting technology in the

process. Voters came from the different programs where technology is not an option to do the

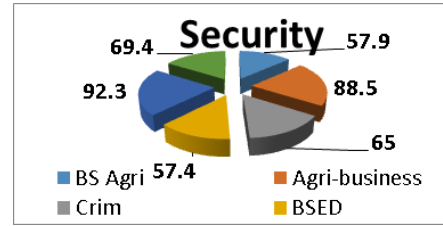


Fig 2: Shows the view of the voters regarding security utilizing the automated voting system

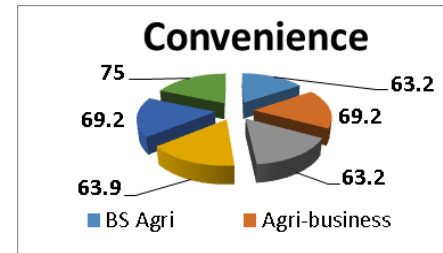


Fig 3: Shows the view of the voters regarding convenience utilizing the automated voting system.

Bachelor of Science in Agriculture

Based on the graph 1 and 2, 57.9 of BS Agriculture voters disagreed that voters may access the system quickly without username and password same as well in allowing them to vote many times. Whereas 63.2 of the voters responded strongly agree stated that automated voting system will enable them to vote in the most convenient way.

Bachelor of Science in Agri-Business

Whereas 88.5 of BS Agri-business voters responded strongly disagree in allowing the users to edit the vote of others. Also, 69.2 of the voters responded strongly agrees that the automated voting system will enable them to vote in the most convenient way.

Bachelor of Science in Criminology

Moreover 65 of BS Criminology voters responded strongly disagree in allowing the users to edit the vote of others. And 63.2 of Criminology voters met agree that the automated voting system will enable them to vote in the fastest way.

Bachelor of Science in Secondary Education

Furthermore, 57.4 of BS Secondary Education voters responded strongly disagree in allowing the users to edit the vote of others. Whereas 63.9 of them reacted strongly agrees that the automated voting system is allowing them to vote in the most convenient way.

Bachelor of Science in Fisheries

In addition 92.3 of BS Fisheries voters responded disagree that the automated voting system allows the voters to vote many times, same as well with encourages flying voters, dishonesty and vote shaving through the use of the computerized system. Concerning the convenience, 69.2 of fisheries voters responded strongly agree that the automated voting system allows them to vote in the fastest way.

Bachelor of Science in Information Technology

Additionally, 69.4 of IT voters responded strongly disagrees that the automated voting system allows the voters to edit the vote of others.



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Concerning the convenience, 75 of the voters responded strongly agrees that the automated voting system will enable them to vote in a fastest and the most convenient way.

VII. CONCLUSION

Overall, BS Fisheries voters responded strongly agree that the automated voting system provided strong level security especially regarding accessing and editing or changing the data entered by the voters. Also, they decided that the system discourages dishonesty, flying voters and vote shaving. However, BS Agriculture voters find the system less secure.

Furthermore, concerning convenience, BS Information Technology voters strongly agreed that the system provides a user-friendly interface which makes them convenient to use mainly in choosing their candidates by looking at the attached photo of the candidates.

REFERENCES

1. Alim, M. A., Baig, M. M., Mehboob, S., & Naseem, I. (2017, June). Method for secure electronic voting system: face recognition based approach. In Second International Workshop on Pattern Recognition (Vol. 10443, p. 104430H). International Society for Optics and Photonics.
2. Bell, S., Benaloh, J., Byrne, M. D., DeBeauvoir, D., Eakin, B., Fisher, G., ... & Pereira, O. (2013). STAR-Vote: A secure, transparent, auditable, and reliable voting system. *USENIX Journal of Election Technology and Systems (JETS)*, 1(1), 8.
3. Draper, S. W., & Brown, M. I. (2004). Increasing interactivity in lectures using an electronic voting system. *Journal of computer assisted learning*, 20(2), 81-94.
4. Gritzalis, D. A. (2012). *Secure electronic voting* (Vol. 7). Springer Science & Business Media.
5. Hotto, R., & Perez, D. (2012). U.S. Patent No. 8,201,738. Washington, DC: U.S. Patent and Trademark Office.
6. Kumar, S., & Walia, E. (2011). Analysis of electronic voting system in various countries. *International Journal on Computer Science and Engineering*, 3(5), 1825-1830.
7. Katiyar, S., Meka, K. R., Barbhuiya, F. A., & Nandi, S. (2011, February). Online voting system powered by biometric security using steganography. In *Emerging Applications of Information Technology (EAIT), 2011 Second International Conference on* (pp. 288-291). IEEE.
8. Kumar, D. A., & Begum, T. U. S. (2011). A novel design of electronic voting system using fingerprint. *International Journal of Innovative Technology & Creative Engineering*, 1(1), 12-19.
9. Leech, D. (2002). Designing the voting system for the Council of the European Union. *Public Choice*, 113(3-4), 437-464.
10. Lindeman, M., Stark, P. B., & Yates, V. S. (2012, August). BRAVO: Ballot-polling Risk-limiting Audits to Verify Outcomes. In *EVT/WOTE*.
11. Springall, D., Finkenauer, T., Durumeric, Z., Kitcat, J., Hursti, H., MacAlpine, M., & Halderman, J. A. (2014, November). Security analysis of the Estonian internet voting system. In *Proceedings of the 2014 ACM SIGSAC Conference on Computer and Communications Security* (pp. 703-715). ACM.
12. Tagawa, K. (2010). U.S. Patent Application No. 13/378,870.
13. Turner, B. (2010). International Institute for Democracy and Electoral Assistance (IDEA). *The Statesman's Yearbook: The Politics, Cultures and Economies of the World 2011*, 46-47.

AUTHORS PROFILE



Joel M. Gumiran, A Master in Information Technology graduate in the year 2008. Presented and Published 2 papers in the year 2018 entitled "Using Hypertext Pre-processor Code in Converting .csv File into Civil Service Commission Daily Time Record Format Applying Agile Model" and "Applying Design Science Research in the Development of Human Resource Record Management System with Predictive Analysis through Pointing System" at ICSCA '19 Proceedings of the 2019 8th International Conference on Software and Computer Applications in Penang Malaysia. Also, developed

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