SMS BASED ELECTION SOFTWARE

Rusty Abanto[1,a], Cesar Bermundo[1, b]

[1]Camarines Norte State College, Daet, Camarines Norte, Philippines

[a]rustyabanto@gmail.com

[b]czar_bermundo@yahoo.com

ABSTRACT

This study aims to find a solution to the perennial problem of inefficient and costly conduct of elections in the Philippines. It proposes the use of the SMS-Based Election software run by a computer program linked to a designated server, computers, and cell phones. It is assumed that the use of this program will significantly reduce the time to conduct and determine the results of elections. In addition, it will reduce the cost of the conduct of elections and this will mean savings for the government.

The program was pilot tested in a school election. Using triangulation, the results were generated less than an hour after the voting and were found to be 100% accurate. A focused group discussion with the student voters later confirmed that the results matched the names of the candidates for whom they actually voted. The research concluded therefore that the program is not only efficient, but also 100% accurate.

Keywords: *SMS, software, server, parsing, validity*

INTRODUCTION

Elections in the Philippines have always been plagued by questions and problems on accuracy of results. Whether these elections are school-based, barangay-based, etc., doubts persist, which question the validity and veracity of the results. At the national level, accusations of doctored results through the "dagdag-bawas" scheme perpetrated by unscrupulous people at the behest of powerful candidates who want to tamper with the people's will in order to win a coveted post are the order of every election day.

In an effort to solve this problem on inaccurate results, the government, through the COMELEC, the body tasked with the conduct of elections, has introduced the use of the Precinct Count Optical Scanner (PCOS) machines in the last two elections. The use of these PCOS machines, however, has not solved the problem. Accusations of rigged results continue to persist as some of the machines experienced some glitches. Furthermore, the astronomical cost of such PCOS machines amounting to several billions of pesos means that the government will continue to burn a great deal of money every election, not to mention their

maintenance and storage cost – money which can instead be used for social services for the ordinary Filipino.

This software is an attempt to finally solve the chronic problem of inaccurate election results. It is a software that is low-cost, user-friendly, and accurate. More importantly, it utilizes the technology known and available throughout the Philippines, the cellphone.

Using technology that is widely used by the ordinary Filipino, this software aims to deliver accurate election results and address the perennial problem of slow and sometimes inaccurate election results. Specifically, it aims to:

Develop a SMS-based program for elections; determine the efficiency and accuracy of the program; and implement the use of the program in school, or even barangay and national elections.

This is not the first project on SMS-based voting. In India, Rahman and Khan (2006) proposed SMS security as part of an electronic voting system. Basically, this system is proposed to work via Short Message System (SMS). Using secure messaging system,

they developed the e-voting system which would send SMS from a registered cell phone to a server located in the base polling station and cast a vote for a voter. The system must be secured so that while voting, no outside interference can be made to change the vote. So, there will be no tension of casting false vote. By the help of this system voters would be able to cast their votes in a secure way and the results would be available immediately when the vote casting finishes.

Kamaraju, Rao and Lakshmi (2013) likewise presented the electronic voting scheme using GSM mobile technology. By integrating an electronic voting scheme with the GSM infrastructure, they were able to exploit existing GSM authentication mechanisms and provide enhanced voter authentication and mobility while maintaining voter privacy. The objective of their project is to avoid the queue in voting time and to improve traditional voting procedures.

Sidqi (2014) also proposed an electronic voting system using Global System for Mobile (GSM) technology in Iraq. By integrating an electronic voting scheme with the GSM infrastructure, his study was able to exploit existing GSM authentication mechanisms and provide enhanced voter authentication and mobility while maintaining voter privacy. In his study SMS has been used to send messages which contain only code or identification of a candidate. A mobile phone is used to receive messages, which is also connected to a server to collect messages.

Gawade, Shirolkar and Patil (2015) proposed a similar SMS based voting in India, in which they claim that their program will make it possible to determine the final results within an hour after the voting ends. Their program also makes use of a key based signature scheme for voter authentication by using the existing (GSM) authentication infrastructure and allowing voters to vote anywhere they are without going to a polling booth.

Deotale and Rojatkar (2015) likewise proposed an electronic voting system through the use of mobile phones in India. By integrating an electronic voting scheme with the GSM infrastructure, they modified existing GSM authentication mechanisms and provide enhanced voter authentication and mobility in order to maintain voter privacy. Just like the previous study, their objective is to avoid the long lines and long waiting time.

In another study, Meshram, Komal, Pooja, Shrikant, & Ruchira (2015) likewise proposed a voting system to remove the efforts needed in the traditional voting process. They developed an application on android phone via which the user can cast his vote from anywhere on the face of the globe. The user registers by giving his personal details and the image of his face which gets stored in the database at the server side. After the voting date is fixed the user gets notification on the android phone via GCM (Google Cloud Messaging). After that the user opens the application. The face authentication is done and then the OTP (One Time Password) is sent to the user's mail address if the user is a valid user. Using OTP, the user opens the voting form, casts his vote, and then click on submit button and then logout. The results are checked on the server side. The GCM sends notification to the user's android phone. If the user's Internet connection is off, then the notification and other details get stored on his/her local server. When s/he starts the Internet connection, this message is retrieved from the GCM that is the local database of the android phone.

All the previous studies mentioned do not require the voters to go to a voting precinct to cast their votes. All they do is to enable the voters to cast their vote anywhere they please and, in doing so, avoid the long lines and long waiting time. This current study, however, still requires the voters to go to polling precincts to vote.

Several studies have also been conducted to explore the characteristics and benefits of SMS voting.

Ng, Sulaiman and Zolait (2008) studied the characteristics of SMS voting adopters in terms of demographic factors as well as explored the mobile users' perception towards SMS voting. They conducted a survey using questionnaires to gain information and opinions from a convenience sample of 300 Malaysian mobile users regarding their perceptions on using SMS to vote. The findings revealed that approximately two-thirds of the Malay respondents use SMS voting, most mobile users in the sample are single and female, and that mobile users like to send their votes using SMS. There is a significant difference between the usage of SMS voting among female respondents. Of the respondents 80 per cent perceive that the ease of use factor has greatly influenced mobile users in using SMS for voting purposes.

Wang (2014) explored social voting behaviors on mobile platforms. In the hope to unveil how to improve social voting user experience, his study focused on how a change in voting interface affects people's voting behavior. His study provided two interfaces: one is a ranking from negative to positive measures, and the other is a ranking of all positive measures. The recruited groups of people in the study used these two interfaces to make decisions on group outing to a movie or restaurant. From this one-month study, Wang figured that people prefer the negative to positive measures better than the all-positive measure.

Vedala, Gargho, Lackchaloemporn, & Hadi (2013) showed that Mobile computing has sprung up considerably, with an increase number of mobile apps being evolved to work on next generation networks. In current scenario SW is designed to necessitate and drive mobile components interacting Packet switch network

leading to further simplification tasks to a greater extent. The design level was mostly into development of database, web server, domain hosting along with crypting, all interacting to a physical device running on Android OS in direction of Mobile voting system along with further unique identity using NFC tag.

METHODS

This study made use of the quasi-experimental design. This type of research is an empirical study used to estimate the causal impact of an intervention on its target population without random assignment. The intervention used in this study is the use of the SMS-Based Election software.

The data were gathered from the pilot testing of the program on January 16, 2016, in the class of 31 fourth year Mechanical Engineering students taking Methods of Research. They were divided into two precincts of 17 students and 14 students as precinct A and precinct B, respectively

Research Instruments

The study used a software named SMS-based Election prepared by the researchers. This software was used to conduct the election and determine the results. Three methods were used to determine the results – i.e. the traditional vote tallying on the board, the use of Excel, and processing the results from the computer software. Triangulation and focused group discussion were used later to compare the results using the 3 methods.

Data Gathering Procedures

Testing the program

The program was first tested on January 16, 2016, in the class of 31 4th year mechanical Engineering students taking Methods of Research. They were divided into two precincts of 17 students and 14 students as precinct A and precinct B, respectively

A student was asked to write the different elective positions and the candidates for the position. The other students were asked to get ¼ sheet of paper and to cast their votes using the prescribed format.

Two students acting as the COMELEC members for Precinct A and Precinct B were provided a cell phone with unlimited load to supervise the casting of votes and check if the format is correct. Using the format suggested, the student voters cast their votes for the candidates of their choice, whose names were provided in the computer. They then sent their votes to the official cellphone. When all the texts were received,

they were parsed to one file as required and the data were transferred to the laptop for counting and posting.

Two students were asked to tally the votes on the board, while another two students were asked to tally in computer Excel. Still another was asked to process computer software to triangulate the result. Although there were minor discrepancies in the three processes due to human error, after checking the errors, the results were found to be 100 % accurate in the end.

Each of the voters was asked if the received parsed data are the same as what they wrote on the paper, and 100% of them confirmed them as accurate. The activity ended after an hour.

Using the program in a nation-wide election

To use the software in a large-scale election such as the barangay elections, local and national elections, the following procedure should be followed;

Preparations

Before voting

1. Five cellphones with number 01, 02, …, 05 will be assigned to each voting precinct.

During voting

2. Each voter will be asked to use a cellphone provided by the COMELEC.
3. The voter will write or tick the box corresponding to the candidate of his choice.
4. The voter will text the vote in the cellphone with sequence number. Voters are assigned a sequence number as they vote to help determine the number of voters who actually voted during the election.
5. The voter will cast his/her vote by typing the candidate codes per position, depending on his/her choice. Format CODE 001 \A B C D E F G . . .Z, shall be taken from the cellphone template.
6. A member of the Precinct Board of Canvassers will GROUP send the text message to the following:
    a. Other sim numbers in the same precinct
    b. Regional Tabulator with sim card per province
    c. National Tabulator
    d. Majority Party
    e. Minority Parties
    f. NAMFREL
    g. PPCRV
    h. Others, for reliability (numbers to be supplied by the COMELEC)
7. The next voter will use the next series number to facilitate the counting of voters per cellphone.   CODE 002 \A B C D E F G… Z

8. A member of the Precinct Board of Canvassers will write the series number opposite the name of the voter in the form.

After voting

9. An android program will parse all the votes in the precinct per cellphone.
10. The members of the Precinct Board will process and print the report and sign the report.
11. The COMELEC will check the veracity of each precinct while they are sequestered in the national office.
12. The sim card of non-COMELEC members will be kept at the COMELEC office until the time set by the Precinct Board of Canvassers.
13. The sim cards will be given to desired parties after the voting has closed.
14. The sim cards will be kept by the COMELEC after the election to serve as evidence in case of election protest.

After the election

15. The cellphone will be donated to the public school for testing and future use.

Materials

The number of cellphones for actual use in voting is 10; one cellphone is reserved. One laptop is where all the data sent through the cellphones will be transferred to canvass the votes. The projector will show the results of the election on a screen. This will be used to print the election results.
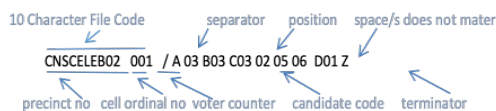
All the above equipment shall be provided by the COMELEC and shall be registered with the COMELEC. The laptops are formatted to contain only this program. The cellphones are likewise formatted to allow SMS texts exclusive for the election.

The software program is generic, and the data are flexible. It can be used in classroom elections, school general elections, mock elections, local elections, and even national elections.

Storage Size

The size of a sim card is 0.1cm x 1.5 cm x 1cm, volume is 0.15cc. If the size of a shoe box is 18cm x 10cm x 5 cm, volume is 900cc. By dividing the volumes, a shoe box can contain 6000 pieces of sim cards. This means that the COMELEC will spend less for storage unlike the expenses incurred with the use of PCOS machines.

STRUCTURE OF TEXT MESSAGE:

10 Character File Code   separator   position   space/s does not mater

CNSCELEB02 001 / A 03 B03 C03 02 05 06 D01 Z

precinct no   cell ordinal no   voter counter   candidate code   terminator

Send to: 09464012392

Sample Text Messages and Software Validation

Say we are to elect only four senators:

Mon Sep 18 13:45:30 PHT 2017	Means	Remarks
09205771593001/A01 B02 C03 01 03 06 D02	Double Entries 03	only one taken
09205771593002/A02 B02 C03 01 02 04 D03	Normal entry	read in any order
09205771593003/A03 03 B02 C03 03 02 03 06 D01	More than 4 entries	all are void
09205771593004/A03 B04 C06 D01	Less than 4 entries	no problem
09205771593005/A01 B04 C D01	No candidate C01	no problem
09205771593006/ 03 B04 D01	No Position C03	no problem
	No line	no problem

RESULTS AND DISCUSSIONS

This section discusses whether the assumptions of the study were proven true after the pilot testing of the program.

The SMS-Based Program for Elections is an efficient and accurate means to conduct elections. The pilot testing of the program showed that the program is an efficient and accurate means to conduct the elections. The student voters found that voting through the use of the SMS-Based Program, which allows them to use a cellphone to vote, is easier than the usual "voting by ballot" procedure. Since text messaging is a skill common to all of them, they found the program user-friendly. They also confirmed in the focused group discussion conducted later that the candidates whom they voted for matched exactly the ones received and recorded by the server. The triangulation used to determine the accuracy of the results also showed that the program ensures election results with 100 % accuracy.

The SMS-Based Program for Elections will significantly reduce the time to conduct and determine election results. The pilot testing of the program showed that the SMS-based program for elections indeed significantly reduced the time to conduct and determine election results. Voting time was faster than the usual "voting by ballot" procedure since the voters had to text only a few codes and send their texts to the server. Results were immediate once the texts were received by the server. After triangulation and focused group discussion, which took less than an hour, the results of the election were confirmed to be 100% accurate.

The SMS-Based Program for Elections will be cheaper than the current means of voting which uses PCOS machines. Based on current cost of the devices and equipment to be used in using the said program, the government can cut down on election expenses. The astronomical cost of PCOS machines

and the additional of their maintenance and storage could drain the government coffers of funds that could instead be used for other government projects.

CONCLUSIONS AND RECOMMENDATIONS

This study has presented a program on SMS-based election which uses a few devices to conduct elections and provide accurate results. As tested in a school-based election, the program is an efficient and accurate means to conduct elections. The triangulation used to determine the efficiency of the program and the accuracy of the election results, plus the focused group discussion conducted afterwards proved that the results were 100 % accurate. In addition, the time elapsed in the conduct of the elections up to the final results showed that using the SMS-Based Election software can reduce both the voting time and the waiting time for the election results. Texting is a skill common to most Filipinos; they find it easy to text the votes, thus reducing voting time. Waiting time for results is reduced since the results are immediate once the texts are received by the server. Finally, the cost of the devices used in a SMS-based election is much, much lower than the prohibitive cost of purchase and maintenance of PCOS machines.

In view of the foregoing findings, the researchers recommend the use of the SMS-Based Election program to conduct elections in schools, barangay or even national elections. Furthermore, it is recommended that funding should be provided by appropriate government agencies to enable the researchers to upgrade the program, in collaboration with experts in the field, to ensure for a more viable program that could address the need of a nation-wide election.

REFERENCES

Deotale, S. P. & Rojatkar, D. V. (2015). Advance SMS-based voting system. International journal of electrical and electronics research. Vol. 3, Issue 4, September-October, pp: 205-208. Retrieved from http://www.researchpublish.com.

Gawade, D. R., Shirolkar, A. A., Patil, S. R. (2015). E-Voting system using mobile SMS. International journal of research in engineering and technology. Vol. 04. 09 | eISSN: 2319-1163 | pISSN: 2321-7308. Retrieved from http://esatjournals.net/ijret/2015v04/i09/IJRET20150409033.pdf

Kamaraju, M., Rao, P.V. & Lakhsmi, J. T. (2013). Novel voting system using SMS. Retrieved from http://airccj.org/CSCP/vol3/csit3634.pdf

Meshram, D.A., Komal, M., Pooja, P., Shrikant, G. & Ruchira, W. (2015). Online voting system using android application. Retrieved from http://www.ijarcsms.com/docs/paper/volume3/issue2/V3I2-0075.pdf

Ng, K. S., Sulaiman A. & Zolait, A. H. S. (2008). Analysis of mobile users' perception towards SMS voting. Retrieved from http://ibimapublishing.com/articles/CIBIMA/2008/222712/222712.pdf

Rahman, C.M. & Khan, A. (2006). Study of SMS security as part of an electronic voting system. Retrieved from dspace.bracu.ac.bd/xmlui/handle/10361/476.

Sidqi, H. M. (2014). E-Voting system using GSM mobile SMS. International journal of emerging trends & technology in computer science. Vol. 3, Issue 4, July-August 2014. Retrieved from http://www.ijettcs.org/Volume3Issue4/IJETTCS-2014-08-06-86.pdf

Vedala, R., Gargho, R., Lackchaloemporn, W. & Hadi, L. S. (2013). Mobile voting using Android. Retrieved from http://www.asethome.org/project/Mobile_Voting_Final_Main.pdf

Wang, J. (2014). Voting on a mobile platform. Retrieved from https://www.ideals.illinois.edu/bitstream/handle/2142/49589/Jicong_Wang.pdf?sequence=1