**Chapter I Introduction**

1. **Project Context**

Trinity University of Asia’s vision is “to transform a community of learners as leaders towards humane society.” Its goal is to make every student a responsible leader who shall eventually assume the continuous leadership in their chosen fields of venture. One way to achieve this goal is by encouraging the students to join the student government to enhance their leadership skills. Another important program is to encourage the students to participate in the election of those who would lead them themselves. This practice reflects the students’ future place as citizens in a democracy.

The Central Student Council (CSC) is the highest student governing body of this university. It is the main branch for all student organizations. The Student Commission on Elections (SCOMEL) is responsible for handling the University’s election; communicating with all Local Student Councils; organizing University-wide and College-wide organization’s activities; and informing all students about the Central Student Council Constitution and rules. This council is composed of seven officers, which are the President, Vice President, Secretary, Treasurer, Auditor, Business Manager and Public Relations Officer (PRO) who shall be elected by the students of the university. (“TUA Student Handbook.” Trinity University of Asia. 2010)

The students who shall constitute the CSC are chosen through an election, where students make a decision or choice between two political parties by voting. Voting is a way to exercise student’s right of choice among candidates to lead them inside the university. A campaign period is prescribed so that candidates will be able to showcase their platforms, and that student voters will be able to know the candidates better. Exercising their right to vote is important as the protection of students’ welfare and interest shall depend on it.

Any voting process, however, even at a university level, is not at all simple. Several difficulties have been encountered by the SCOMEL in the past. For the past years, the election of CSC representatives in Trinity University of Asia is paper-based and done manually. Students need to go to the voting stations or precincts, fill-up the ballots, and then deposit them in ballot boxes. Once the student voting period is due, the SCOMEL starts the tallying of votes to get the election results. It is “a one day manual counting of votes.” Last July 17, 2012 when the Central Student Council held its special elections to choose the new set of officers for the school year 2012-2013; the SCOMEL members and volunteered students struggled a lot as they counted the votes. Tallying started at six o’clock in the evening. At twelve o’clock midnight, they were not still finished because there were still a lot of ballots to count. The seemingly difficult tallying has caused students to doubt previous student political parties that governed them in the past school years.

The Student Commission on Elections (SCOMEL) is also the one responsible for handling the expenses to buy and fabricate the materials needed for the elections. These include making copies of ballots, crafting of ballot boxes, producing stamp pads and indelible ink etc. According to Ms. Froilie Somera, CSC Head - “It is really time consuming, tiring and expensive.” Even with these tedious preparations, some students still opt not to vote. For them they find it uninteresting and a waste of precious time.

The researchers recognize that the annual voting exercise is critical to the student culture of the University. As the student elections shall be the first grounds in exercising the students’ part as future citizen participants in a country where voting and democracy are basic rights that must be claimed. The Central Student Council is the voice of Trinitians and the one that helps them improve their welfare. It is then important that all, if not a significant majority, must be persuaded to participate in the voting process to ensure that the said student welfare is protected from the very beginning. To address the above mentioned issues of accuracy, time, budgetary constraints and student participation; the researchers have decided to turn to the appeal of technology. The researchers developed an online and mobile voting system that will be hopefully be a milestone in implementing a fair, swift and accurate election of the Central Student Council. By implementing this system, the election of Central Student Council will be more accurate, secure and interesting for the students.

1. **Purpose and Description**

The researchers’ aimed to help Central Student Council of Trinity University of Asia managed the elections. The system TUA-CSC Online and Mobile voting system helped provide the students a more convenient way on voting their choice of candidate through sms/text messaging or online; which had the benefits such as:

* **Minimum skilled requirement:** No need of personal appearance on the voter’s side. Students used their mobile phones wherever they are or if they have internet in their place. They chose any of the two options. On the other hand, the SCOMEL (Student Commission on Elections) did not undergo to manual counting instead the votes are tallied by the number of text messages occurred in the system. They are not also needed to stay in the polling place to assist or guide the students to secure if the voting process is correct.
* **Less time consumed**:Both parties (SCOMEL and students) had enough time focusing on their course and other extracurricular activities which promoted quality on education. Also they did something more important than spending time at the polling place.
* **Less Expense:** the committee no longer spent money for ballot, ballot boxes, stamps, stamp pads and even food as snacks for the committee. Just a mobile device and a computer or laptop that they originally have and our system is in-charge on the voting process.
* **User Friendly:** the system is also reached by the absent and disabled students. Even if the students with no class schedule on the given date of the Central Student Council (CSC) election can vote.
* **Prevented multiple voting:** the system detected if someone voted more than once by tallying the number of the population from the occurred sms message.
* Less influences and coercion: students did not influence because online and mobile voting is more private and confidential.

**Online features:** In online voting the admin put pictures of the candidates and there is also short information about the candidates like name, year level and course that helped the students to know more about their chosen candidates. Also, the students’ information can be shown in the online ballot like name and student number.

1. **Objectives**
   * 1. **General Objectives**

* The study aims to develop an online and mobile voting system that solved problems that the Central Student Council and students have encountered during the previous elections.
  + 1. **Specific Objectives**
* To allow online voting through the use of mobile phones, computers or laptops by accessing the internet; or through SMS (text message) voting
* To facilitate faster tallying and announcement of election results
* To ease the time allotted for the work of the SCOMEL during the voting day
* To encourage greater participation from the students by accessing the appeal of technology
* To lessen manpower, materials, and expenses needed for the elections
* To automatically count, tally, canvass and transmit votes
* To generate of the election results

1. **Scope and Limitation**

This study focused on developing a system that holds the election for the Central Student Council of students and other student organizations. Only the students enrolled within the school year have the chance to vote. The system use two devices computers and mobile. The voter only has to choose one device that he or she will use to cast a vote. Example: if the voter choose to vote through mobile he or she can no longer vote through online. Same if voting through online. One vote policy only, no voting twice.

The system is done through the use of laptops or computers that have internet connection, or by the use of mobile phones that has enough load. This is to eliminate the use of ballots and ballot boxes. The system tallies, counts, and generate reports. It also shows the results of the election fairly making it secured and accurate.

In online voting system the student must first log-in. they used their student number as the username and their surname as the password, if log-in process was successful, the student was directed to the voting menu, here an online ballot appeared were filling-up process was done. They only have to select the names of the candidates they wanted to vote. When filling-up process was accomplished, the student was sent back to the log-in menu. In the mobile voting system the student vote via text, they used the party’s code or the individual codes for each position, when a student voter texted a vote, the vote was received by the broadband connected to the computer. The system will now fetch the message and identified it its a valid or invalid vote. The voter will receive a confirmation if his/her vote is counted.

**Chapter II Technical Background**

The Trinity University of Asia-Central Student Council (TUA-CSC) used paper-based system for their elections. Voting was done by following a series of steps or procedures; student voters cast their votes with a ballot in which they selected their choice of candidates. Voters checked or wrote the names of candidates on the ballot. Votes were protected by placing it inside the ballot box that served as a container for the ballots. The other processed such as the counting, tallying, and canvassing of votes were done by hand. Also vote results were recorded manually same for the announcement of winners just like the National Elections of the Philippines before.

Used of this old kind of routine, a lot of problems arise; students thought it would be a waste of time for them so they opt not to vote. It was a big problem that caused lack of votes resulting to failure of elections that the student council faced. As Trinitians, researchers from the College of Computing and Information Sciences devoted time and conducted a study on how these problems can solved. Researchers came up with the idea to build a new voting system the “TUA-CSC online and mobile voting system.” In building the system researchers used the languages PHP, VB.net, Visual Studio, MySQL and Adobe Photoshop CS5 that created the online and mobile voting system.

For the online voting system the researchers used PHP was a famous server side HTML-embedded scripting language, originally designed for creating dynamic web pages. Now it was also used for database accessed because it can read and wrote information in the database. Also it can edit files remotely; do basic files and maintenance, managed access logging and handles graphic content. PHP have many advantages such as free because it was open-sourced, stabled, accessible, secured, easy to implement, learn and used.

In mobile voting, researchers chose to usedVB.NET and Visual Studio 2010. The Visual Basic.NET (VB.NET) which is an object-oriented computer programming language, developed by Microsoft. It was viewed by the use of Visual Basic and implemented on the.NET Framework it also have software tools that build accurate programming needed by Windows. It also provides different and detailed software architecture. The Visual Studio 2010 is an integrated development environment or IDE. It can be used for writing console applications  Windows applications, Windows services, Windows Mobile applications, ASP.NET applications, and ASP.NET web services, in your choice of C++, C#, VB.NET, J#, and more. It has time-saving and convenient features such as IntelliSense that helps its user while programming by showing to the user the available classes and the methods and properties available on those classes.  It includes visual WSYIWYG designers for Windows applications, ASP.NET applications, and Windows Mobile applications. (Avery, James. “What is Visual Studi”. O’Reilly windows devcenter.com. 2005)

Adobe Photoshop CS4 is a famous graphics editing program. It was created and published by Adobe Systems. It has a default file extensions as .PSD meaning Photoshop Document. It also have many tools like cropping, slicing, painting, etc. CS4 features a new 3D engine allowing the conversion of gradient maps to 3D objects, adding depth to layers and text, and getting print-quality output with the new ray-tracing rendering engine.(Wikipedia. “Adobe Photoshop”. )

For storing or keeping records such as the voting results for both online and mobile, the researchers used MySQL. It was a client/server system and an open-sourced DBMS, a free database software which the person can view the source code publicly. Since it was a database management system that allowed the user to access, process, update, add, delete, and edit data stored in the system. It was also a RDBMS or relational database management system that operates data as a collection of tables. MySQL offered many benefits such as handling large databases faster, secured because data can be protected through setting a password, reliable, and easy to use.

The researchers believed that this development software contributed a lot in to develop the system and brought improvement for the Central Student Council elections.

**Chapter III Review of Related Literature**

This chapter focuses on the review of related literature on both local and foreign studies that discusses on how technology can be a big help in preventing problems during the elections by the use of machines, the benefits it has for the people, and others. This will also serves as a guide to the readers about what the topic is all about.

The continuous advancement in technology gives way to introduced the E-voting or electronic voting. It makes use of different machines where the casting, counting and other electoral processes were done electronically. In the old manual voting system that have lots of problems like casting and counting of votes are done by hand or the worst it can result to an electoral fraud that can be in the form of buying votes or changing the results of elections. Electronic voting includes punched cards which contain digital information, optical scan voting systems and specialized voting kiosks (self-contained direct recording electronic voting or DRE). Transmission of ballots and votes can be also done electronically via telephones, computers, laptops or the internet.

Unlike the traditional manual voting system, E-voting offers a lot of advantages such as:

* Speed and accuracy in the counting of votes and announcement of results
* Accessibility for everyone including the people with disabilities
* Flexibility in the design and modification of the ballots
* Prevention of involuntary errors (like over-voting and under-voting)
* Easy to use for voters
* Support multiple languages
* In internet voting or online voting provides mobility and convenience

Disadvantages can’t be avoidable sometimes. Electronic machines are no different than web sites or software; they can be penetrated and altered by a hacker. But people need to take into consideration these errors and faults that may prove to be trouble in the end. However people must realize that not one system will be error-free, but finding the best alternative to make sure as many votes as possible will be counted.

**3.1 Foreign and Local Literature (Unpublished Materials)**

**eVACS of Australia**

The eVACS or Electronic Voting and Counting system created by Software Improvements was used by the Australian parliament for its election. It has a voting terminal composed of a PC and ballots in twelve languages, consisting Serbian and Farsi. It also includes English audio for disabled and illiterate voters. The terminals are link to a server in each polling station by a secure LAN to avoid transmission of votes via Internet or phone lines. The voting process starts when the voter swipes a bar code through a reader; it restarts the machine for a new vote and calls up a ballot. The voter selects his/her choice of candidates and reviewed his/her votes. When the voter is finished, he/she swipes the bar code again to cast the vote. The bar code doesn’t identify the voter; it only allows the voter to cast one vote. Matt Quinn, the lead engineer of this system said the server writes two copies of the votes onto separate discs that are digitally signed and delivered independently to a central counting place. The digital signature is a 128-bit unique identifier generated from the voting data. If the data were changed in transit, the identifier would change too, raising red flags that something went wrong. Quinn also believes that voting systems must use open-source software for the reason that the people are the customers and they dictated the requirements needed like security and functionality plus they play an important role in the development process, from the requirements to testing. Quin said “They proofed every document we produced." Although some are criticism they were still open for it because they were able to solved the problems.

The eVACS was once again used for the Australian Federal election in November 2007. The election was for the blind and visually impaired voters. The eVACS they used was a standard telephone-style keypad and allowing the voters to choose four different screen colors and font sizes guided by an audio. In addition, one of the keys on the keypad provided context-specific information via audio to assist voters throughout the voting process. The said event was successful because no technical issues were reported.

**India’s EVMs or Electronic Voting Machines**

The Electronic Voting Machines (EVMs) also internationally known as Direct Recording Electronic voting machines were the devices used during India’s elections in 2004. Votes were recorded directly in the machine’s electronic memory. It was connected using a 5 m cable that was permanently fixed to the ballot unit. Powered by a battery pack located in the control unit. The ballot was consists of sixteen candidate buttons. If some buttons were not used it was covered by a plastic masking tab inside the unit and if there are more than 16 candidates an additional ballot unit was connected through a port on the underside of the first ballot unit. A total of four ballot units can be connected together having a total of sixty four candidates. EVMs made the Indian election simple, ease in tabulation of ballots, easy vote counts, faster and accurate vote results Dr. Lisam, Khomdon Singh.

**Indians Vote via Web with Scytl Technology**

Internet Voting is a system that State of Gujarat is currently using in India. With the help of Scytl, an international technology company, it makes the election more secure by its remote technology. Through this technology, people will be more interested to vote because it is simple to vote on internet rather than going to polling place and have a long wait. As the first implementation of voting via web, a large percentage of voters vote for their choice. The technology company (Scytl) wants to show that this new system is more secured in terms of confidentiality and transparency.

**Venezuelans test out new voting system ahead of elections**

Venezuela’s new voting system this year was the Integrated Authenthication System (SAI). In order to cast a vote, the voter must first scan his/her finger print to activate the machine. This serves as an identification process to prevent double voting and identity theft. If the process was successful, the voter can now vote directly his/her preferred candidates using a computer screen. After voting, the machine prints off the voting card, placed in a secret ballot by the voter. A test was conducted this August 2012, allowing voters to try and familiarize the new voting system. Many voters who joined the event were impressed of the new voting system. “Everything was really quick, and it was well attended. I am sure that on Election Day I’ll be able to do it even more quickly because I was able to do the test-run today,” said Ambar de Montero from Caracas.

“It is the most comprehensive that, electronically speaking, I've seen in the world, because all steps are automated. In the US, where I vote, it (the voting system) is only automated from the moment I touch the screen”, According to Jennifer McCoy, director of the Carter Center’s Americas Program.

# Estonia first to allow online voting nationwide

# Estonia was given the nicknamed “e-Stonia” for its tech-savvy population. It was the first country to conduct an election using the internet. “Everything has gone smoothly” said by Tarvi Martens, a spokesman for the National Electoral Committee.

# In order to cast an online ballot, voters must use their ID Cards issued by the government that serves as voter identification, a card reader device and a computer or laptop with internet access. It was done through following a series of steps:

1. The voter inserts the ID Card into a card reader and opens the webpage for voting
2. The voter verifies him/herself using the PIN1 of the ID Card.
3. The server checks if the voter is eligible (using the data from the population register)
4. The voter is shown the candidate list of the appropriate electoral district.
5. The voter makes his/her voting decision, which is encrypted.
6. The voter confirms his/her choice with a digital signature (by inputting the PIN2-code)
7. The voter receives a notice on the computer screen that the vote has been accepted.

At the vote count the voter’s digital signature is removed and at the final stage the members of the National Electoral Committee can collegially open the anonymous e-votes and count them.

**The world’s first mobile voting service**

Mobile Voting in Estonia was created by Telia Sonera, the operator EMT. It is the world’s first mobile service to give the people the right to vote their preferred candidates through their mobile phones. There is an ID card which serves as an identity verification and digital signing of the voters. It is been implemented for over six years in Estonia since the local elections in 2005.

**How Brazil has put an ‘e’ in vote**

## The use of electronic voting machines in Brazil was first introduced in 1996. By 2000, the elections were done electronically. It made the voting easy for the Brazilians as well as for the illiterate voters and it lessened the number of problems compared when using ballot papers. A numeric keyboard serves as the main interface of the system. There’s no need for the voter to write the names of candidates he/she wanted to vote. The machine shows a list with numbers that match the candidate’s names together with their picture, after the selection the voter typed the number of the candidates they chose and pressed the green button as a sign of confirmation. A stub was given to the voter as a proof that he/she voted.

## Votes are recorded into two flash cards, just like the ones used in digital cameras. To make the system protected, each card was coded making it work only for one specific ballot box. If the voting process was done the card was removed and the data was sent to the Regional Electoral Office, then the counting of votes starts and finished in just six hours. “In addition to the data from the voter – date of birth, voting area, etc, we will also have the fingerprint identification.” Mr. Esio of Regional Electoral Office in Sao Paulo said.

**Belgium looks into the future and retakes electronic voting**

Belgium had started using electronic voting machines since 1990s. Before they make used of magnetic stripe cards but due to some problems like recounted of votes the used of it was temporarily suspended. After that incident, the country welcomes again the use of electronic voting machines. Now, the Belgium government’s voting equipments was provided by Smartmatic. The voting machine was touch screen for easy selection and provides printing of voter receipt for eventual audits of the results. Although the country encountered some problems in the past using electronic voting machines, they are still willing to use it rather than the manual voting.

**Honduras experiences first approach to electronic voting**

The election system in Honduras is possible to be modernizing after experiencing political crisis about three years ago. Electronic voting is presented as a proposal to the political parties that will be into an election next November by the electoral institution together with Smartmatic. Electronic voting will be use in the province of Francisco Morazen if it gets accepted. TSE Magistrate Enrique Ortiz Sequeira said that if this proposed system will solve the political problems then, it can be an option against the other. It is favored by the representative of National Party Mario Aguilar for the November primary elections. The said system is assured that it has a sample experience in different countries. It is high in terms of initial investment but electronic voting is cheaper than manual voting in terms of time. It is also reliable and secured as presented by the spokespeople. The decisions for implementation of electronic voting system are still ongoing from the political parties.

**Ecuadorians approved electronic vote**

Electronic voting system is used by the National Electoral Council in Ecuador for the first time. Ecuadorians proved that this system is 100% of accuracy and it is simple and easy system based from trials. The process of the said system is just a seconds. You will just touch the screen to vote for your preferred candidates and then the machine will print the vote slip and place into the ballot box. This new system is provided by the Smartmatic who has an expertise in terms of automated elections.

**University of the Philippines – Halalan System**

When Philippines was busy for their preparations on 2010 National Elections, the University of the Philippines – Diliman have already implemented its very own automated voting system for their local student council elections of 2009. Entitled as “Halalan” which is an open source software developed by the members of the organization “UP Linux Users Group (UNPLUG).” Its system uses a series of desktops or laptops (as may be available to UP students) located in the voting precincts, each equipment are registered to the university’s IP address named as DILNET server.

The Halalan system of UP – Diliman also won in the Best plans for Free and Open Source Software (FOSS) in the Software Freedom Day 2006 competition. It only shows that the Filipino Youth can compete with others.

**Elections automated University – wide**

In the previous elections of the University of Santo Tomas (UST), the student leaders chose to stay in school overnight to make sure that the counting of ballots was done properly and wait until the announcement of the results. Today they are using computerized University-wide student council elections. The Educational Technology Center provided technical support by hosting the software used during the elections in its servers. Through THOMASIANS “E-Leap” online accounts, students were able to cast their votes immediately and efficiently.

**E-votenista 2012 – Ateneo de Davao University**

Ateneo de Davao University held their first automated student council election last January 19 to 21, 2012. In order to cast a vote, student’s school ID was scanned first to identify if he/she was a qualified voter. If the student’s name appeared in the list of student records of the school’s database they can now access or log-in by typing their student number. A test was also conducted before the said election to see if there are still problems that need to improve.

e-Votenista 2012 used desktop computers, its system was written in Visual Basic.NET (.Net 3.5) and they also used MS SQL Server Express for DBMS. For some components (add-ons) the team also used DevExpress.DotNetBar and Crystal Reports. The idea of having an automated election for the school was originally made by Paolo Villanueva (BSCS student and creative team head of SAMAHAN) and Nitish Khemani (BSIT student and director of motion graphics design). “What our project does is get rid of these papers, all these Manila papers, all these that cause the environment problems then make it easiear na talagang paperless na siya and its green, its environment friendly. There will be no hassles, no problems and quick.” Paolo Villanueva said.

**Online/Automated Elections in Philippines**

For many years, Philippines have been using manual election system through the use of ballots and ballot boxes. In this old system, voting manually was time consuming for voters to write the name of their choice candidates in their desired position. Plus the boring counting process takes about weeks or even months before the declaration of the winners. There are also issues regarding the election such as vote buying and the most controversial “Hello Garci Scandal” – an alleged wiretapped conversation between former President Gloria Macapagal Arroyo and former Virgilio Garcilliano about the 2004 elections. In order to prevent these problems the government fined ways and came up with the idea of introducing a new election system. In the new system the voting process will be done by computers or machines such as the counting, tally, transmission and consolidation of votes.

The machines used in the election were Smartmatic’s Precinct Council Optical Scan (PCOS) a type of Optical Mark Reader Technology (OMR). It uses paper ballots where voters only have to shade the oval or bubble shape which corresponds to their candidate of choice. Also it records and counts votes, handles the tabulation, consolidation and canvassing of votes then electronically sends the results. Actually it is not new to Filipinos because it is commonly used in National College Entrance Examination (NCEE) and the lotto system of Philippine Charity Sweepstakes Office (PCSO).

Filipinos will not encounter anymore the old process of counting votes because the PCOS machines will be the one in charge of this process. Once the poll is close all the votes done at every precinct will be automatically counted by the PCOS machines and the results will be sending electronically to the canvassing centers.

**The Philippines hails election automation a success**

Despite of some problems on the PCOS machines, the country still made the election successful. “I’m smiling again. Automation has been a success.” COMELEC Chairman Jose Melo said. Filipinos were able to see the fast counting of their votes and unlike in the old system the declaration of the winners does not take so long. According to COMELEC about fifty three million Filipinos participated in the election and most of them were satisfied in the new voting process. Even voters outside the country like the OFW’s at Singapore were able to cast their votes through the absentee voting. “The Philippines is the first country in Southeast Asia to implement overseas absentee voting, and first to implement automated polls. We’re a pioneer in expanding democracy.” said by Neal Imperial, Minister and Consul General of the Embassy of the Philippines in Singapore, and Chairman of the Special Board of Canvassers for the Philippine elections in Singapore.

**3.2 Foreign and Local Literature (Published Materials)**

**Manual vs. Automated: The new face of voting**

There’s a lot of difference between the manual and automated voting system. In the old ballot, the voter writes the names of candidates he/she selected in the blanks. If the voter made a mistake such as misspelled name of a candidate, the voter can write a new name over the scratched but this kind of scenario was not allowed in the new system. The new ballot was colored and can contain up to 300 names on the front and another 300 names on the back. Instead of writing the names of candidates, the voter will shade only the oval directly beside the selected candidate’s name. There’s also an indication of how many candidates per position the voter need to vote for. Example: “vote for not more than 12 Senators.”

In the new system, ballots cannot be used interchangeably over the country because the names of candidates are printed on the ballot unlike in the old ballot it was allowed because it has blank spaces. In addition, the new ballots are bar coded that served as an identity where precinct it belongs. If the ballot inserted to the PCOS machine belongs to other precinct, the machine will automatically spit out or reject it. The ballot also includes of an invisible security mark to prevent duplication. Only one ballot was given to a voter to cast only one vote. In this new system the government was not providing only convenience to Filipino voters but also security to their votes.

**Namfrel pushes for mobile voting**

The National Citizens Movement for Free Elections (NAMFREL) proposed a new voting system that will allow people with disabilities and senior citizens to vote without going to the polling station. They recommended the “Mobile Polling Station” and “Postal Voting’ which were already done in other countries. “A mobile polling station proved to be very beneficial to the disabled and sick, and others who are physically unfit to go to the polling places.” Mr. Damaso Magbual – Namfrel National Council member said.

Earlier, two bills were submitted at the House of Representatives that recommended for having a “Special Polling Places” for disabled persons, pregnant mothers and senior citizens that of HB 2296 of Rep. Godofredo V. Arquiza and HB 4048 of Rep. Teddy A. Casiño et al.

**Comelec okays source code**

COMELEC approved recommendation of Executive Director Jose M. Tolentino to release source code of Automated Election System (AES) to be used on May 10, 2010 elections. Source code is a set of instructions embedded in every PCOS machine as presented by Comelec IT consultant Renato Garcia of Ateneo de Manila University. In addition the source code was also reviewed by the international software testing company SysTest Labs of Colorado, USA. The COMELEC chose SysTest to review and certify the source code that will be use in the first automated election in the country also in accordance with Republic Act 9369 or the Poll Automation Law.

**Comelec eyes own election technology**

COMELEC is looking at having its own automated election system (AES) to be used in 2013. Comelec Commissioner Augusto Lagman said “We like a Filipino-developed technology to be used since we want COMELEC to be more involved in the implementation elections”. To do this, he said that they include in their five year strategic plan the need to further enhance the IT capability for the conduct of modernize, efficient, transparent and credible elections. The first step was to upgrade IT competence of in-house personnel. Lagman cleared that the initial plan was to develop their own “back-end system” but not the “front-end” yet. The “back-end” was the consolidation and canvassing while the “front-end” involves voting, counting and transmission.

**Comelec vows fraud-free automated elections**

The Commission on Elections (COMELEC) assured that the first automated election in the country would be fraud free through the help of the Precinct Count Optical Scan (PCOS) machines, the 2010 elections will be secure, fast, transparent and clean. In the automated counting, the counting of votes will be just in one minute. After the voter finish filling up the ballot, he/she puts it into the PCOS machine and automatically it will be counted. Only the Board of Elections Inspectors (BEI) was allowed to handle the transmission of ballots. In the new system COMELEC also ensure that the proclamation of winners would be fast.

But critics doubt that the first automated election would fail due to malfunctioning of PCOS machines, security failure because the system was hacked and the vote results are sabotaged. But the Commission on Elections (COMELEC) assured that there’s nothing to worry. There’s no more space for another Hello Garci Scandal and they prepared in case there are some machine problems. “Once the machine malfunctions, we have contingency plan for that. We can replace the ballot if the machine cannot scan the ballot. Take the memory card and deliver it to another machine that can transmit the ballot results” Jimenez said.

In addition, Smartmatic said that they would have about fifty thousand technical support representatives if machine problems occur. They will be sent in polling precincts all over the Philippines during election. They also assured that the system used super-safe algorithms code that can store and send votes from the PCOS machine to the canvassing centers and restrain tampering of votes.

**Comelec urges Congress to pass Internet voting bill**

COMELEC Chairman Sixto Brillantes urged the Congress to pass a law that will allow more overseas Filipino workers to vote in national elections through the use of internet voting. “Half a million of OFWs registered in the 2010 polls, but 172,000 actually voted.” Said by Brillantes.

“Congress should come out with legislation allowing online voting.” He adds. COMELEC’s target is to have about one million registered absentee voters for the 2013 elections. Brillantes also asked the Congress to have a law that would provide absentee voting for members of media who are away from their places of registration or official assignment on the day of elections.

Internet voting would be a big help to Filipino OFW’s because they can cast their votes anywhere and anytime without going to the polling precincts, they only need a computer and internet, no hassle and cheap.

**Electronic Voting**

“Computer scientists have a key role to play in ensuring that election systems meet often conflicting requirements.” According to J. Epstein a voting system must have the following requirements:

* Secrecy and anonymity: the number of votes, whom the voter vote for, etc. must be kept confidential especially for an election official. It should be impossible for voters to prove to any third party how they voted.
* Security: it should be close to impossible for anyone including both insiders and outsiders to tamper the votes and vote results.
* Verifiability: must be possible to confirm that all votes are counted as the voter recorded.
* Simplicity: easy to managed by both experts and non-experts or people who have minimum training. Usable without assistance or help by the general public including people with disabilities and non-English speakers.
* Error-limiting: the system should limit the voters to do something they did not intend to do, such as voting for two candidates for the same race.
* Cost-effectiveness: acquiring, maintaining, and operating election equipment at a low cost is a priority.

**Mobile Services – Fiasco or Roaring Success & Who Needs Mobile Services, the mobile internet – two approaches, two outcomes**

Nowadays, mobile phones are being widely used all over the world. Billions of people use it for communication, messaging, personal organization and entertainment. In 2005 there are around two billion people using mobile phones around the world and over six hundred eighty million phones have been sold in one year. Clearly, humans have a very strong need for mobility and communication and the mobile is becoming one of the few things people cannot live without.

In the late 1990s the number of internet and mobile users increased. Many have thought that the combination of internet and mobile phones would make a perfect match. It was already possible to connect a laptop PC to the internet using a mobile phone as a modem. Let us look at two examples of mobile internet services with similar aims but very different outcomes. First the NTT Docomo’s i-mode, this kind of service allowed its customers to send and receive email and to browse a range of information, fun, entertainment and m-commerce services through the use of their mobile phones. Second was the WAP a language that permits mobile phones to connect directly to the internet over the mobile network and it was standardized for use on any mobile network.

**Online Voting**

The use of internet becomes a part of everyday life. People can do shopping and banking through online. A survey was conducted in United States; the results showed that internet was frequently used by age eighteen to twenty nine years old having the percentage of ninety five percent. In terms of education, college students got ninety six percent while eighty one percent in urban community used internet. As a result of expanded internet usage, it is natural that online voting should be a way for your organization to connect with membership. Online voting can be used to elect board members and officers. It is now in demand because it provides a lot of benefits such as:

* Empowerment: Voting is the most powerful way for members to have a voice in the leadership and direction of their organization.
* Accessibility: Online voting allows people to accept ballots anywhere and anytime.
* Cost effectiveness: Online voting considers staff time and production costs.
* Security and confidentiality: A well designed online voting system assures security of ballots and protects voter’s identities.
* Transparency: A fully transparent election allows voters to witness the entire election process.
* Accuracy and expedience: Results are automatically calculated and eliminates the use for manual tabulation or dreaded recounts.

**Will Voting Online Change Anything?**

In March, citizens of Arizona will cast their votes online for their Presidential elections. Florida and Washington are also considering of having an online voting in their place. A test was also conducted; overseas soldiers were given the chance to try the online voting in November. The use of online voting is growing rapidly. Some people see it as a way to increase voter turnout. But people must also be aware that this system might also encounter problems like machine malfunction, hackers that can access the ballots and others, in this case people responsible for the system must be prepared.

Online voting can provide a positive change to everyone such as to energize nonvoters to vote, making voting easier, and introducing absentee voting for people outside the country. According to political scientists the real problem is not the inconvenience of voting but the apathy and disgust of people with politics. The idea of online voting might be good but it can also be bad to others, for them their rituals of democracy will be affected.

**PHP – Introduction**

PHP is a “widely used general-purpose scripting language that is especially suited for Web Development and can be embedded into HTML.” Also PHP is a scripting language; it was designed to write Web scripts, not stand-alone applications. It is the fifth most popular programming language when it comes to creating dynamic web sites. Famous web sites such as Yahoo!, Wikipedia, and Facebook all use PHP. What benefits people can get from using it is excellent performance, a tight integration with nearly every database available, stability, portability, and a nearly limitless feature set due to its extendibility. How does it work? When a guest visits to a web site within in PHP, the server reads the PHP code and then processes it according to its scripted directions.

**MySQL – Introduction**

MySQL is the world’s most popular open-source database and it was used by NASA and the United States Census Bureau. It can handle databases as large as sixty thousand tables with more than five billion rows. The MySQL software is also consists of several pieces, including the MySQL serve which runs and manages the databases, the MySQL client which gives the user an interface to the server, and numerous utilities for maintenance and other purposes. Like PHP, it offers a lot of benefits like excellent performance, portability, and reliability, with a moderate learning curve and little to no cost.

**MySQL Basics & Accessing MySQL via the command line**

A database is a structured collection of records or data stored in a computer system. All records are organized so that it can be searched fast and information can be retrieved quickly. MySQL is based on English and also used on other databases such as Oracle and Microsoft SQL Server. It is designed to allow simple requests from a database via commands.

A MySQL database contains one or more tables which is a subcontainer within a database that stores the actual data, it also contains records or rows that consist of several fields. Within these rows are various columns or fields that contain the data itself. If people want to interact with MySQL there are three main steps they can use:

* Using a command line
* Via web interface such as phpMyAdmin
* A programming language like PHP

**Seven ways mobile phones have changed lives in Africa**

About 100 million mobile phone lines were established in Nigeria of West Africa. It was Africa’s largest telecoms market, according to statistics by the Nigerian Communications Commission. Across the rest of the continent the trends are similar: between 2000 and 2010, Kenyan mobile phone firm Safaricom saw its subscribers base increase in excess of 500-fold. In 2010 alone the number of mobile phone users in Rwanda grew by fifty percent figures from the country's regulatory agency show. In 2007, Rwanda President said “In ten short years, what was once an object of luxury and privilege, the mobile phone, has become necessity in Africa.” The following are the seven ways how mobile phones changed the lives of Africans:

* Banking: Many Africans used their mobile phones to pay their bills and airtime, buy goods and make payments to individuals, and remittances from relatives living abroad.
* Activism: It transforms ordinary citizens disenchanted by their governments, into resistance fighters. During the bloody elections in Kenya citizens were able to report violent occurrences in their place via text messages to a server that allows everyone to view what happened that time. It also brings transparency in their elections.
* Education: Used to for teaching because it was cheaper and easier to run than PCs --- gain ground as tools for delivering teaching content. Students who are absent can still be updated to their lessons in school by just communicating with their mobile phones.
* Entertainment: In 2009, according to a survey the most popular activity for which mobile phones was used for “entertainment” like dialing into favorite radio shows, voting in reality shows, downloading, and sharing songs, photos, videos as well as tweeting.
* Disaster Management: Mobiles have been finding innovative uses in refugee camps, allowing displaced persons to reconnect with family and loved ones. An NGO, [Refugees United](http://www.refunite.org/), has teamed up with mobile phone companies to create a database for refugees to register their personal details. The information available on the database allows them to search for people they've lost contact with.
* Agriculture: It serves as platforms for sharing weather information, market prices, and micro-insurance schemes, mobile phones are allowing African farmers to make better decisions, translating into higher-earning potentials. Farmers are able to send a text message to find out crop prices in places thousands of kilometers away.
* Health: People can find healthcare providers anywhere in the country 24 hours a day, using their mobile phones. Mobile phones play an important role in mediating the provision of better healthcare to the citizens of African countries.

**Mobile phone text voting pioneered**

E-voting is coming to Norwich and Ipswich, where more than 6,000 people have already registered to use it. In the past people had to vote using ballot boxes. But now Norwich City Council and Ipswich Borough Council are pioneering voting through the use of text messaging using mobile phones. It is part of the government’s goal to increase the voter’s turnout. "The idea is to get young people to vote because young people nationally aren't voting. We want to try to encourage more people to vote.” James Hehir, chief executive of Ipswich Borough Council, said.

**Mobile phones stir Indian voters**

About fifty percent of Indians voters are less than twenty five years old, making the country one of the youngest in the world. But the prime ministerial candidates of two leading parties are over twenty years old. To bridge the gap, political parties decided to change their traditional door to door campaigns into a modern way. Their election campaign was done through digital media using text messages, social networking sites, online campaign tunes and videos.

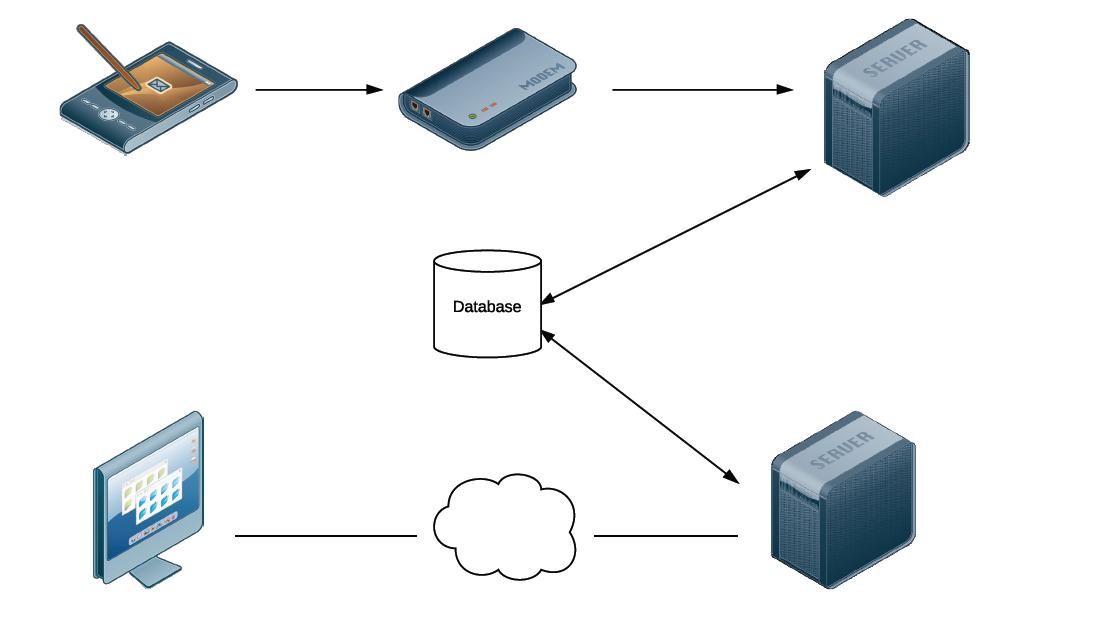
In India there are about around forty five million internet users as compared to over three hundred seventy mobile subscribers. It was the reason why political parties spent a lot in thinking what was the right mobile strategy like targeting the voters with ring tones, text messages, and even wallpapers of their campaigns. Political parties also created some political games instead of the usual combat or racing, here you can see Indian politicians pumping iron, running a marathon, and punching in a boxing arena. The idea is to encourage young people to vote.

In this kind of campaign it gained a lot of comments some are positive, some are negative. "This is the first I'm going to vote…this is just a game - I don't think this will help me in deciding who to vote for." Said by eighteen year old Neeraj Kumar. But 22 year-old Rajender is addicted to the games. "This is a fun way of learning about the elections. It's my first time as a voter and I learnt about all the leaders and parties through these games."

In previous elections, political parties didn't feel the need to campaign for young people's votes, as they are not traditionally seen as politically active. But this time, young Indians have been active on websites, blogs and social networking sites expressing their political opinions. Now it remains to be seen if this interest will translate into votes. An estimated 100 million young voters will qualify to participate in this election. And in order to convince this generation, politicians too are being forced to get tech-savvy.

**Chapter IV Design and Methodology**

**4.1 System Architecture**

****

Online Student

Web Server Application

Internet

Local Server Application

GSM Modem

Student

TUA CSC Mobile and Online Voting System will build by using PHP and Visual Basic programming language. The developers will also use MySQL to make tables and in storing the vote results in the web based system. It gives much efficient way in updating and navigating databases. On the other hand, VB.net gives easier way in building codes block by block.

The system has two type of use. Mobile and Online. The users has an option if they want to use their cellphone by texting the correct student number and keywords or by using their computer and visiting the given site.

The system needs a GSM modem, It is a wireless modem that works with a GSM wirelss network. It needs a Sim card that is compatible with the network of the said GSM modem. When running the system, the application of the GSM modem should always be activated so it can receive messages sent by the users.

The process of this system on mobile voting starts from the votes of the students from their cellphone thru text. The votes will directly go to the GSM modem. It will be filtered by the local application server before updating the database. The votes will be stored in the online and mobile database. On online voting, the students will vote thru their computer having an internet connection. The votes will enter the web server application when filtering is done. The votes will also stored in the database just like on the mobile system.

The system administrator has an access in managing school year. This will be helpful to make the system applicable in every school year. The administrator has an access also in managing candidates. It’s only viewable in the web-based and the administrator can also update the pictures and informations of the canditates as well as the parties. And lastly, the administrator can see the real-time statistics of the election. This will be a great step in having a fast and reliable election.To ensure the user if their vote is counted, the local server application will filter the vote and send a confirmation or an error message back to the user.

**4.2 Flow of the System**

**Figure 4.2.1 Context Diagram and Data Flow Diagram of Current CSC Election**



Ballot

Ballot Box

Staff/SCOMEL

Staff/SCOMEL

Students List

Precinct

Students

The diagram portrayed the current CSC election. Students go to the precinct or polling station, a staff or a SCOMEL member check if he/she is in the list of enrolled students during that school year, if his/her name is found in the list the staff gives a ballot to the voter but if his/her name is not in the list he/she is not qualified to vote. Only students enrolled in that semester or school year have the chance to vote. In the ballot names of the candidates were written, the voter only has to check the names of candidates he/she wants to vote. If filling-up is finish, the voter puts his/her ballot inside the ballot box then the voter goes to a staff or a SCOMEL member to have an indelible ink in his/her index finger as proof that he/she already cast a vote. Only one vote is given to every student, voting twice is not allowed.

**Figure 4.2.2 Context Diagram of TUA-CSC Online and Mobile Voting System**



In this diagram staff will set candidates for the election. Then the upcoming students will vote through the system, the students will be notified if his/her vote is counted. The systems will send reports to the council about the totality of votes.

**Figure 4.2.3 Data Flow Diagram Candidates Record in TUA-CSC Online and Mobile voting system**



This diagram shows that the staff will set the gathered information from the candidates through the system’s database.

**Figure 4.2.4 Data Flow Diagram of Voting Process & Generating Reports**



This figure shows that the students will cast their votes to the system and if the vote is valid, checked from the student’s database, the vote will be automatically stored in vote table database and reports will be produced for the coordinator.

**Figure 4.2.5 Database Schema of TUA-CSC Online and Mobile Voting System**



**4.3 Project Management**

**4.3.1 ONLINE & MOBILE: One time cost**

**Hardware:** Desktop Computer

|  |  |  |
| --- | --- | --- |
|  | | **Price (In Peso)** |
| **Casing** | Power Logic V12 ATX 600W PSU | 1000.00 |
| **Hard Disk Drive** | Seagate 500GB 7200rpm SATA | 2800.00 |
| **Keyboard** | A4tech KRS-83 USB Keyboard | 265.00 |
| **Memory** | Kingston 2GB PC6400 DDR2 800 | 900.00 |
| **Monitor** | 18.5" Acer S191HQL/V193 LED Widescreen | 4100.00 |
| **Motherboard** | Biostar G41D3C Intel G41/DDR3/V/L | 1900.00 |
| **Mouse** | A4tech N350 Wired V-Track | 250.00 |
| **Printer** | Epson Stylus ME32 (T141 BLK/C/M/Y- 390) | 2450.00 |
| **Processor** | Intel Core i3 540 3.06Ghz 4MB LGA 1156 | 4650.00 |
| **Video Card** | Asus ENGTS450 1GB DDR3 128bit | 4350.00 |
| **Web Server** |  | 5,000.00 |
| **Mobile Phone** |  | 6,000.00 |
| **Broadband** |  | 999.00 |
| **Total** |  | ***34, 664.00*** |

**Software:** (Programs/ Languages to be use)

|  |  |
| --- | --- |
|  | **Price (In Peso)** |
| **PHP (open-source)** | ------------------ |
| **MySQL (open-source)** | ------------------ |
| **Adobe Photoshop CS5 license** | 21,500.00 |
| **VB.NET (open-source)** | ------------------ |
| **Visual Studio 2010 (open-source)** | ------------------ |
| **Total** | ***21,500.00*** |
| **One Time Cost Total** | ***56, 164.00*** |

**4.3.2 Recurring Cost**

|  |  |
| --- | --- |
|  | **Price (In Peso)** |
| **Electricity Bill** | 500 |
| **Maintenance Personnel (1) per month** | 6000 |
| **Load for Mobile Voting per month** | 600 |
| **Recurring Cost Total** | ***7100*** |
| **Overall Cost** | **62,265** |

These were the lists of equipments needed for the system. Estimated prices were also included. It served as a guide and gave awareness for the user/s about what was the cost of the project and the expenses. In Online voting it needed an internet in order to cast a vote. Since Trinity University of Asia has its own wireless internet connection, the CSC can use it and no need to pay because it is free. If problems occurred in both Online and Mobile voting system the CSC can ask for the assistance of maintenance personnel from the ICT Department of the school.

**4.3.3 Details of Activities**

|  |  |
| --- | --- |
| Date | Worked Done |
| June 14 – 15, 2012 | Discussed the thesis topic. |
| June 18 – 19, 2012 | Searched for possible thesis topic. |
| June 20, 2012 | Submitted tentative project title |
| June 21, 2012 | Requested Ma’am Bathan to be the group’s adviser. |
| June 25, 2012 | Discussed the final project title. |
| June 27, 2012 | Submitted the final project title. |
| June 30, 2012 | Brainstormed about Chapter 1 DRAFT. |
| July 02, 2012 | Interviewed CSC Head about the current system & Started Chapter 1 DRAFT. |
| July 03, 2012 | Consulted Ma’am Bathan about Chapter 1 DRAFT. |
| July 04, 2012 | Submitted Chapter 1 DRAFT. |
| July 06, 2012 | Discussed about the group’s proposed system and its process to Ma’am Bathan. |
| July 13, 2012 | Interviewed CSC Head about the CSC Election. |
| July 14 - 16, 2012 | Worked on Chapter 1 REVISED. |
| July 17, 2012 | Chapter 1 REVISED, checked by Ma’am Bathan also do some changes on that day. |
| July 18, 2012 | Submitted Chapter 1 REVISED. |
| July 19, 2012 | Brainstormed about Chapter 2 DRAFT. |
| July 21 – 22, 2012 | Worked on Chapter 2 DRAFT. |
| July 24, 2012 | Consulted Ma’am Bathan about Chapter 2 DRAFT. |
| July 25, 2012 | Submitted Chapter 2 DRAFT. |
| July 26-27, 2012 | Started Chapter 2 REVISED. |
| July 28 & 31, 2012 | Consulted Ma’am Bathan about Chapter 2 REVISED. |
| August 01, 2012 | REVISED again all Chapters 1 & 2. |
| August 04, 2012 | Consulted Ma’am Bathan about Chapters 1 Introduction & 2 Technical Background. |
| August 12-13, 2012 | Worked on Chapters 1 & 2 FINAL REVISED. |
| August 14, 2012 | Chapters 1 & 2 FINAL REVISED checked by Ma’am Bathan. |
| August 15, 2012 | Submitted Chapters 1 & 2 FINAL REVISED. |
| August 16 – 28, 2012 | Went to Libraries for research and Started Chapter 3 Review of Related Literature. |
| August 29, 2012 | Submitted Chapter 3. |
| September 01, 2012 | Brainstormed about Chapter 4 Cost, Benefits and Analysis. |
| September 08-10, 2012 | Worked on Chapter 4. |
| September 11, 2012 | Consulted Ma’am Bathan about Chapter 4. |
| September 12, 2012 | Submitted Chapter 4. |
| November 09, 2012 | Discussion about thesis and inspection. |
| November 16-17 2012 | Start coding for online voting system. |
| November 20, 2012 | Meeting with Ma’am Bathan discussion about online and mobile voting system. |
| November 22-23, 2012 | Research about mobile voting system. |
| November 27, 2012 | Discussion with group mates about the problems and task that already accomplished. |
| November 28-30, 2012 | Worked on online voting system. |
| December 04, 2012 | Alpha Inspection of all groups. |
| December 07, 2012 | Discussion about Beta Inspection. |
| December 12-13, 2012 | Worked on online voting system for beta . |
| December 14-15, 2012 | Tried to worked on mobile voting system. |
| December 19, 2012 | Beta Inspection (MOVED). |
| January 03-04, 2013 | Meeting with group mates, worked on thesis. |
| January 07, 2013 | Discussion about Beta Inspection with group mates (what have accomplished and not yet finish). |
| January 08, 2013 | Discussed the problems to Ma’am Bathan. |
| January 14, 2013 | Worked on thesis . |
| January 15, 2013 | Beta Inspection of all groups. |
| January 21-22, 2013 | Worked on thesis (online and mobile voting system). |
| January 23, 2013 | Consultation to Ma’am Bathan. |
| January 24, 2013 | Worked on thesis and interviewed OSA. |
| January 27, 2013 | Worked on both online and mobile voting system |
| January 28, 2013 | Submission of Degree Paper |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **4.3.4 Gantt Chart of Daily Activities** | | | | | | | | | | | | |
| **(Online and Mobile Voting System)** | | | | | | | | | | | | |
|  | **November 2012** | | | | **December 2012** | | | | **January 2013** | | | |
| **TASK** |
| Log-In Module |  |  |  |  |  |  |  |  |  |  |  |  |
| User's Module |  |  |  |  |  |  |  |  |  |  |  |  |
| Candidate's Module |  |  |  |  |  |  |  |  |  |  |  |  |
| Database Module |  |  |  |  |  |  |  |  |  |  |  |  |
| Managing School Year |  |  |  |  |  |  |  |  |  |  |  |  |
| Reset |  |  |  |  |  |  |  |  |  |  |  |  |
| Logout |  |  |  |  |  |  |  |  |  |  |  |  |
| Designing Voter's Page |  |  |  |  |  |  |  |  |  |  |  |  |
| Voting Module |  |  |  |  |  |  |  |  |  |  |  |  |
| Sending Module |  |  |  |  |  |  |  |  |  |  |  |  |
| Receiving Module |  |  |  |  |  |  |  |  |  |  |  |  |
| Connecting The Mobile System To The Database |  |  |  |  |  |  |  |  |  |  |  |  |
| Designing The Webpages |  |  |  |  |  |  |  |  |  |  |  |  |

**4.4 Benefits**

**4.4.1 Measurable Benefits**

* **Easy to use:** Just simply clicked the mouse or pressed the keypad buttons, voters can cast their votes easily.
* **Increased voters turnout**: Many students gain interest on the new kind of election process because it only takes seconds in voting for their chosen candidates. Students now were modern. They do not like a manual process so the researchers think that they preferred this kind of processed. The number one problem also in the last CSC election was a lack of votes. More votes results to a fair and successful election.
* **Reduced expenses:** No need to spend money for ballot papers, ballot boxes, stamps, stamp pads and etc. The system was the one in-charge of the voting process. It needed a computer only or mobile device were every student have in the said university.
* **Lessen manpower**: In the manual system everything was manual from the voting process, the counting of votes up to the announcement of results. In order to accomplish all these, it required a big number of people that managed the election. But in an online and mobile voting system most of the works was handled by the system. It saved a lot of effort for the SCOMEL and CSC committee.

**4.4.2 Intangible Benefits**

* **Transparent election**: Students can view how the election processed was performed. Their votes were directed to the system and it was tallied automatically.
* **Organized records:** All important records and files related to the elections were arranged properly. Unlike the old system, votes were kept in ballot boxes and vote results were recorded manually but in the system, the computers were the ones in-charge of it, records were stored in its own database.
* **Modern system:** From the traditional system that made used of ballots it changed from a modernized way with the helped of technology. Voters can vote through their computers or mobile phones.
* **Improved CSC election**: This system changed the manual processing on the student election to more efficient and accurate election. The CSC can no longer have a problem regarding of lack of votes which they experienced on the last election.
* **Secured vote results**: The result of votes was more private and confidential avoiding coercion and fraud. The system’s database in which the vote records were placed was protected by a password. Only the CSC committee has the authority to see records and change the password.
* **Accessible system:** This system was easily accessed by the students especially those people with disabilities and people who were absent on the day of election because they can vote online or mobile.

**Chapter V Results and Discussions**

This part is the result of the study. Students can now vote online with the automated system to lessen the time consumed from the past manual system. Students who are the voters are now interested because the election process in the university is now modern and have easy instructions. SCOMEL will no longer waste their time and effort to handle the election especially on tallying the votes.

On online voting, they can log-in as user or admin. The admin which is the SCOMEL can easily control the website. It has different buttons to manage all the needs on voting. Like the manage school year button, the admin can change the school year for the future elections in the university. There is also manage candidate button where the SCOMEL can add, edit or delete candidates to prevent problems. It helps a lot because status of the candidates is the most important of all. The report button that shows the statistics of how many students voted as the time goes by. Those are the example buttons which the admin can use to handle the online voting system. In users page which is the students/voters, there is only a submit button after they click on their chosen candidates . If the voter does not want to vote that candidate in a specific position, they just click the abstain button to proceed to the next step. If they are finish to decide who deserve to be in the positions, voters just click the submit button and that’s all. It is very convenient to all students.

On mobile voting, voters will just follow the steps on the tarpaulin that will going to post inside the school. They will first text “vote” space “student number” and the following keywords for the position. For example for president, the keyword is p1. But if he likes the other candidate for president, he could type p2 or p3 same as the other positions. Then, there is a number posted to where you can send your vote. The students vote will directly go to the database of the system and automatically being tallied.

According to the survey came from the students of different colleges in the university, 95% of them have computer at home. Because of that, there is a possibility that many students will vote because they can stay at home and do not have to bother to go to the school just to vote. In terms of the election system, students are 67% satisfied with the current CSC manual voting system. While 33% of them are not satisfied with the current manual system because they said it is time consuming, especially in tallying and counting of votes, not organize and waste of resources because it uses a lot of papers but not all the students are interested to vote. Especially, it causes the delay of the announcement of the results on the election. About our proposed TUA-CSC online and mobile voting system, 90% of the trinitians are in favour of it. Some reasoned that it is a fair election because there is not going to have multiple voting. The votes are automatically sent to the database of the system and being tallied. No one have the control of that. The result of the survey simply shows the current manual system is needed to improve and that is why TUA-CSC online and mobile voting system is the solution.

Online voting system is done using PHP in creating the web pages. This language can edit files remotely and do basic files and maintenance. Mysql also is used this system. It allows the user to access, process, update, add, delete, and edit data that are stored in the system. The webpage can easily manage with the help of these languages. On mobile voting system, we used vb.net. For the compiler, is Microsoft Visual 2010. We also used Mysql as the database of the system. We used only one database for the online and mobile system.

Students cannot vote twice or more because developer made a feature that will prevent duplicate entry in the database and also a session type log in so once a student casted a vote, his/her account will be automatically logged out. By this feature, the election will be fair unlike in the old manual system, they can cheat on the results of the votes. Through fair election, candidates are placed in a position that they really deserve. If that happens, the university will be improve and discipline because the chosen leaders are entrusted by the students which are the voters.

**Chapter VI Conclusions and Recommendations**

**Conclusion**

From the past years of being a student in this university, we encountered a manual voting system. The use of ballot papers, ballot boxes and some other materials are needed to make the election successful. But despite of this kind of system, the university still encounters some problems. The election was failed which happened last school year because the number of voters did not reach the required percent needed to make the election results valid. Because of that, they need to do again a special election. The problem also is having a long time in tallying the votes. Manual system delays the time of the committee to serve in the university and a hindrance on focusing to the important goals that should be implemented.

With these problems, we decided to create a more accurate and efficient system. TUA-CSC Mobile and Online system will change the time consuming, tiring and expensive election system that was held from the past years. You can now vote anywhere with just a mobile phone or computer. Unlike manual system, you should go to the polling place and do some instructions on how to vote. Especially students with no class on the day of election cannot vote because it is a waste of time and money to go to school just to vote.

Student election is no longer a waste of time for students. Student these days are fond of gadgets or technological devices especially on computers and mobile phones. Through our system, the voters will increase and reach the percent needed to have a valid election. Because of that there is no need to have a special election.

Time is very precious to us. By the new and improved system, voters which are the students can save time and do their other important activities. While the SCOMEL which handles the whole election process will not get tired and save a lot of time. Voting is just a simple click on their mobile phones or computers anywhere. It will not take more minutes to vote on their chosen candidates. With this system, voting is more interesting to the students and helps them exercise their right to vote.

In terms of expenses, the committee provided a big amount of money to spend with manual system. More materials are needed in election like ballot papers, ballot boxes, stamp pads, inks and many more. With the help of the new system, the committee will no longer need to spend money buying those materials every election. The committee will just have the system that records and automatically tallies the votes of the students. And the students who have their own mobile phones or computers can simply click on it.

As the days goes by, our environment are getting modern. Modern things results to a more saving time and effortless matters and that’s what everybody wants. TUA-CSC mobile and online system is a big help in the improvement of the university. It will decrease time and effort so the committee and the students will have more time focusing on their studies and duties. Successful election leads to good leadership. Student vote who deserves to be in the said position. Modern system will result of having more votes. More votes will result of having a successful election. Successful election will lead to a better future because of the chosen candidates who had entrusted by the voters.

**Recommendations**

In using this mobile voting system, the researchers recommend that during the enrolment, students or enrolees should include their mobile number in the student form. The system also requires GSM modem (broadband) for the three mobile networks. Applying for a monthly plan for the networks is less expense.

Online Voting

* Fast internet connect
* Uninterrupted Power Supply (UPS)

Mobile Voting

* Understandable and readable tarpaulin
* Uninterrupted Power Supply (Ups)
* Mid-range to high-end GSM modem
* Sim card subscribed to a Unlimited text to all network

**Chapter VIII Appendices**

**Evaluation Tool**

This is the survey sample that the researchers used in order to know the opinion of the students.

Dear Trinitians,

We are students from the College of Computing and Information Sciences and currently working on a thesis. We would like to ask your opinion regarding the student council election. Your opinion will be a big help in developing our thesis. Your answers will be kept confidential so there’s nothing to worry. Thank you for your cooperation.

Date:

Name:

Year Level:

Course:

* Do you have a mobile phone?

Yes\_\_\_\_\_ No\_\_\_\_\_

* Do you have a computer at home?

Yes\_\_\_\_\_ No\_\_\_\_\_

* Are you satisfied to the current voting system in Trinity for electing the next officers of the council?

Yes\_\_\_\_\_ No\_\_\_\_\_

(if your answer is No, please state the reason)

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* Are you in favour of having a TUA-CSC Online and Mobile Voting System?

Yes\_\_\_\_\_ No\_\_\_\_\_

This is the result of the survey conducted last January24, 2013. 90% said they are favour of TUA-CSC Online and Mobile voting system while 10% said they are not favour.

**Sample Input/Output**

**Curriculum Vitae**