**Chapter 2**

**REVIEW OF RELATED LITERATURE AND STUDIES**

Conducting a literature review was a very crucial step in the development of this project. This allowed the proponents to reinforce the concepts applied in this system with information and other principles that has been thoroughly studied and tested by experts in such fields.

This chapter shows the relevant literature and studies of technology and other ideas applied to the project.

**Foreign Literature**

In most parts of the world, democracy plays a huge role in forming a government. According to Zalte, Gajare, & Gujarathi (2018), the people decides which parties or specific individuals will rule and eventually play the major role in the development of a country. They also noted that people all over the world have been using different methods and techniques of voting. The most common form of it is by using ballots paper and boxes.

However, conducting elections in a paper-based voting process has repercussions (e.g. very non-efficient, time-consuming, financially not suitable and many human errors occur in this system), which prompted the invention of various voting machines (Zalte et al., 2018). These voting machines improved continuously over time, coupled with different technologies and innovations being applied for each of these devices. At the advent of the commercialization of the Internet, efforts to utilize its full potential for providing secure elections have been attempted many times. Software systems for web platform were created with the purpose of providing a timely, convenient and fast voting service (Kadam, 2016).

Providing a trustworthy process and a reliable result are also vital in conducting an election, since the proposed system is on a web-based platform. One might even question the security and the accuracy of the election data and results, yet still, technology offers a lot more security as compared to the manual method of voting. Summers (2016) pointed out that even though numerous flaws and other loopholes exist in using the web technology, these can be prevented by formulating a good implementation plan. He used the country Estonia as an example of a successful model in implementing elections in a national level by using Internet since 2005, which makes casting of votes more secure and convenient than the traditional ballot box.

What makes a system trustworthy is the thorough testing of the product itself. Testing a system involves different techniques which will secure it against tampering, sabotage and attack (Andrews & Whittaker, 2006).

**Local Literature**

Here in the Philippines, even though 2010 Automated Election System (AES) for national level was a fairly new concept, the kind of technology used is already familiar. Angkaya (2011) pointed out that the technologies being used in tests for National Secondary Aptitude Test (NSAT), Civil Service Commission (CSC) Licensure Examinations, and other examinations given by the Professional Regulatory Commission (PRC) are all similar to what the 2010 National Elections utilized.

This voting method consisted of 2 laptops, 2 digital scanners, 2 card readers, a hub and a printer. The voters shade their choices in paper ballot with ovals, which will be scanned by using an Automated Counting Machine. Punay (2010) in his article wrote that the critics of AES conceded that the implementation of the system was a success. This proves that the use of technology with a proper implementation plan will definitely bring success to an election no matter what level it is, because if it can be done in the national level, then definitely it will be applicable to smaller elections.

Since the proposed system in is web platform, it is also important to take note on how dependent and adept the Filipinos are with the Internet. On a study conducted by Ignatius and Hechanova (2014) among 176 Internet users from four regions in the Philippines, they concluded that digital natives (those born during the Internet age) will become the largest workforce in the future, and that new methods of Internet usage may be explored and implemented to further enhance effective functioning. They also posited that new technologies can be used to increase productivity and efficiency, and that digital immigrants (those who were born before the Internet age) should be given the opportunity to learn new technologies.

Also, on a study done by Dr. Grace Cruz (2013), in Filipino youths aging from 15-24, six out of 10 are regular Internet users, and 78 percent of them having mobile phones. She also noted that they spend an average of six hours a week online.

**Foreign Studies**

In the year 2005, Estonia conducted its (Cybernetica, 2005) first internet voting in local elections using the system named as i-Voting, where at the time only 2 percent (more than 9,000 voters) of the total population of voters casted their votes online. It was considered a success and the system has been used continually in elections of national level ever since, in which the most notable is the June 2009 and May 2014 European Parliament Elections. According to the e-Estonia, in every election, about 11,000 working days are being saved by using i-Voting.

New South Wales (NSW), a state in Australian Continent, also implemented a Remote Electronic Voting System known as the iVote system which was used in the State General Election (SGE) in March 2011 (NSW Electoral Commission, 2016), which was originally meant for voters that are visually impaired. Eventually, through legislation, the eligibility to use this system was broadened those who have reading difficulties, other disabilities, those who are far from the polling place, and those who will be outside the state or overseas on the election day. The Allen Consulting Group (2011) conducted a study right after the 2011 NSW SGE where they found out that 92 percent of people who are registered to use iVote used it to cast votes. The study also concluded that the people who used iVote found it more convenient as a way of voting, especially when they are out of the State, as it also reduced travel and time costs.

Khater (2011) stated that if a secure and convenient electronic voting system will be implemented, it will be continually used to gather people’s opinions for political and social decisions. He also stated that different cryptographic standards such as Data Encryption Standard (DES), and Advanced Encryption Standard (AES), Rivest, Sharim and Adleman (RSA) are needed in order to secure the confidentiality and integrity of the votes.

Aziz (2011) defined in his study the different types of online voting system. These types include poll site, regional poll site, kiosk, and remote internet voting systems. A poll site voting system consists of staffed polling places where voters go and use computers to cast their votes. A regional poll site voting system lets the voters got to any polling place within a particular region, where the system tracks everyone who has voted already and delivers the ballot paper to its respective owners based on where the voter resides. There are also voting systems which do not require supervision of election personnel like the kiosk internet voting system, where the voters go to kiosks placed on convenient places like malls, and the remote online voting system where people can vote anywhere as long they have access to the internet through their PCs, mobile phones, and other gadgets.

**Local Studies**

The University of the Philippines Linux Users Group (2004), also known as UnPLUG, developed the first prototype of an open source online voting system which they called Halalan. However, the implementation of this project was withheld for a few years, until eventually it was used in campus wide Student Council Elections of UP Diliman on the year 2009. It was the first campus wide automated election that was ever conducted in the said institution. In an interview conducted with its project manager Rystraum Gamonez, Reyes (2010) cited that the system has been used by a large homeowner’s association, a university located in Buenos Aires, Argentina, and a local government in Tanzania. This proved that such voting systems can also be used in elections for other institutions if designed dynamically.

Castillo, C. K., Castillo, D.S., Timpug & Oreta (2015) defined voting system as a set of procedures that determine how people are elected in office, how the ballot is structured, how people cast their votes, how those votes are counted, and how the winners are decided.

Heramis & Tibshrani (2017) pointed out in their STI Voting System project that it is possible to encrypt voting records in order to avoid direct data manipulation. The National Privacy Commission recommends the AES-256 as the most secure encryption standard in the Philippines to maintain the privacy and security in every system that contains personal data, pursuant to the Data Privacy Act of 2012.

The Laravel Framework (Otwell, 2011) offers AES-256 encryption support thru OpenSSL, enabling the proposed system to comply with the requirements of the National Privacy Commission regarding the encryption standard set by the agency.

Other local systems also proved that aside from making it easier to manage, control, secure and lessen the processing time in an election, an online voting system enables the users of the system to access it on any mobile gadgets (Andrada, Apuyan, Daza, Sabado, & Yu, 2015)