**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 have 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.

The New South Wales in Australia also implemented a similar online voting system called iVote (NSW Electoral Commission, 2011)

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.

**Local Studies**

Introduction goes here. The researcher gathered information related to their study to prove the effectiveness of the proposed system. This information was based on the knowledge of which served as guide to the researcher to pursue the study.

Hermida (2006) stated that barcode technology works of off a principle called symbology. Symbology at its basic form is what defines the barcode; it determines the mapping and interpretation of the encoded information or data. This encoding allows the scanning device to know when a digit or character starts and when it stops, similar to a binary representation. We recognize barcodes as an array of parallel lines alternating between white and black lines. Barcode technology provides a simple and inexpensive method of recording data or information in a number of applications.

Mariano (1992) found that symbologies of the barcode technology can be arranged or mapped in a variety of ways. A continuous symbology is marked by the characters beginning with a black line and ending with a white line or space, while discreet symbologies have characters encoded as a black line a space and then another black line. This takes care of the characters and how each individual number or letter is read. The lines of a barcode also have variances in encoding the widths of the lines. Some barcode technology systems use two separate widths to determine the character while others use multiple width lines. The use of any of these encoding styles depends, of course, on the application for which the barcode technology is being used.

Cabuhat et al. (1992) observed that the line or linear barcode technology is sometimes referred to as 1D encoding. While we are most familiar with these barcodes, there are more complex codes that employ the use of dot matrixes to achieve a more complex encoding process that can store and identify far more information. These are referred to as 2D or, in some cases data glyphs. They are comprised of miniature dots, like the old dot matrix printers, which create patterns that are read in the scanning process. They are not limited to this format and can be comprised of circular patterns or a collection of shapes and modules inserted into a specified image for a user.

In order to read the data of barcode technology it needs to be scanned by a laser and then interpreted. The scanners, or lasers, used to read the barcodes measures the light reflected form the linear barcode technology and can distinguish between the white and black lines. Calibration of the laser and system needs to be done to ensure the proper interpretation of the code itself. This has to do with whether it is a continuous or discreet symbology, 1D or 2D images, and whether it uses two width or multiple width lines. The most common lasers used are helium neon lasers due to their low energy consumption and efficiency.

Manuel and Galang (2015) concluded that the complex or 2D barcodes cannot be read by a simple laser as the linear barcode technology can. The barcode needs an all encompassing reader as the full image needs to be read. Linear barcode technology only needs to be swept across to read it as the lines are the same regardless of the position of the laser. 2D codes must be read or scanned by an image based scanner, similar to the scanners used at home or in offices to scan documents and images. They are more costly but supply more information and data. These are used in encoding URLs for cellular phone use and higher end applications (Reyes, 2000).