Malaysian-Japan International Institute of Technology

SECD2613-15 System Analysis Design

PROJECT P2

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1.0 Overview of the Project

1.1 Executive Summary

The online voting system is built mainly to revolutionize the traditional voting process in the country by implementing a secure, efficient and transparent digital system. The project utilized the latest technology to authenticate voters' identity and eligibility via thumbprint and identification card to protect their data with extra security, distribute digital ballots, and tabulate results of the poll in real-time settings. This system will also address the prevalent issues of election fraud.

1.2 Background

Election fraudulent is an illegal activity that happens when manual elections are in used. Some of its common cases are double voting, ballot stuffing and tampering with calculation for result tabulation. To terminate these fraudulent election cases, a system where it's completely digital is the only solution to stop unethical people from tampering with election results and processes. The Online Voting System is fully controlled by computers from authenticating user up to ballot creation and distribution until result tabulation. The system will be protected with a unique security system that won't be defeated by any cyber threat.

1.3 Objectives

- To protect the voting integrity from being tampered by unresponsible organization
- To ensure transparency of election result for a fair outcome
- To protect the security of user data from being spread widely
- To make the system accessible and convenient to everyone around the globe.

2.0 Problem Statement

Conventional election systems are susceptible to fraud such as vote stuffing, double voting, and tampering with election results. The integrity of elections is in danger, and public confidence in democratic processes is being undermined by these dishonest practices. Furthermore, the manual nature of these systems frequently causes inefficiencies and delays in the tabulation of results and vote counting. A safe, transparent, and effective voting system is desperately needed to avoid these problems and simplify the election procedure.

To overcome these obstacles, the Online Voting System (OVS) offers an entirely digital platform for holding elections. To maintain vote authenticity, this system will generate and distribute digital ballots,

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ensure secure voter authentication through biometric and ID verification, and offer real-time result tabulation to improve transparency. Voting will become accessible and convenient for everyone, regardless of location, with the adoption of OVS, which will also safeguard the confidentiality of voter data.

Key Challenges:

- Election Fraud: Eliminating double voting, ballot stuffing, and result tampering.
- Security: Ensuring the confidentiality and integrity of voter data.
- Transparency: Providing real-time, accurate election results to build public trust.
- Accessibility: Making the voting process convenient and accessible for all eligible voters.

The successful implementation of the Online Voting System will modernize the electoral process, making it more secure, transparent, and efficient while maintaining the highest standards of data protection and accessibility.

3.0 Proposed Solutions

In order to improve the electoral process and address the issues raised, the Online Voting System (OVS) will put the following fixes into practice:

3.1 Secure Voter Verification:

- Biometric Verification: To make sure that every voter is individually recognized and verified, use thumbprint recognition technology. This stops the same person from casting more than one vote.
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- Identity Card Integration: Make sure that only eligible voters cast ballots by cross-referencing voter identities with official identification cards.

3.2 Creation and Distribution of Digital Ballots:

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- Secure Ballot Creation: Create digital ballots that, following successful authentication, are distributed to voters using their individual user IDs in a secure manner.
- Encryption from beginning to end: Use strong encryption techniques to safeguard the integrity of ballots during production, distribution, and submission, making it impossible for votes to be tampered with.

3.3 Real-Time Result Tabulation:

- Automated Vote Counting: Utilize algorithms to count votes automatically as they are cast, minimizing the chance of manipulation and human error.
- Transparent Reporting: Ensure that the voting process is transparent and that voters can follow the results of the election as they happen by providing real-time updates on the results through the OVS platform

3.4 Robust Security Measures:

- Data encryption: To safeguard all sensitive voter data and communications, use advanced encryption standards (such as AES-256).
- Intrusion Detection and Prevention: To identify and stop unwanted access attempts, use real-time network monitoring tools such as Snort.

3.5 User Convenience and Accessibility:

- Multi-Platform Support: To accommodate a wide range of user preferences, make sure the OVS platform is available on computers, tablets, and smartphones.
- User-Friendly Interface: Create a user interface that is simple to use and intuitive so that anyone, regardless of technical ability, can vote more easily.

3.6 Comprehensive Training and Support:

- Training Programs: Provide comprehensive training resources to teach voters and election administrators how to utilize the OVS, such as user manuals and video tutorials.
- Technical Support: Assist users with any problems or inquiries they might have during the voting process by forming a specialized technical support team

3.7 Compliance and Legal Adherence:

- Legal Consultation: Make sure the OVS complies with all applicable national and international election laws, privacy standards, and data protection laws by working with legal professionals.
- Open-minded Policies: To gain the trust of voters, make all policies and procedures pertaining to data handling, user privacy, and election integrity clearly understood.

4.0 Information Gathering Process

In order to develop a comprehensive and user based Online Voting System (OVS), we had used various methods to gather information and achieve our objective of creating a great system.

4.1 Method Used

1. Interviews: Conducted interviews with a few of High Commision Officer in Election Commision of Malaysia, network security expert and software developers.
2. Questionnaires: Distributed an online questionnaire targeting a large group of voters from various age range to gather quantitative data and general public opinions.
3. Observation: This activity is performed to further understand the problem and issues regarding implementing Online Voting System OVS in a general election.
    1. Interviews: We had conducted interviews with a few of High Commision Officer in Election Commision of Malaysia, network security expert and software developers.
    2. Questionnaires: We had distributed an online questionnaire targeting a large group of voters from various age range to gather quantitative data and general public opinions.
    3. Observation: This activity is performed to further understand the actual function of Online Voting System OVS in a general election.
    4. Unobtrusive Methods: Include the process to analyze existing documents, system logs and previous voting records to gather information about voting system.

4.2 Summary from Method Used

4.2.1   Interviews

- ❖ Example: An interview with a MACC officers
- ❖ Purposes: To understand the security and election voting process in Malaysia
- ❖ Questions:

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Conducted the interviews using question created according to funnel structure to provide an easy and non-threatening interview.

Top of the tunnel

1. Can you describe what a process of general election is?
2. What do you think are the benefits of an online voting system?

Narrowing the funnel – Intermediate Question

1. What are the main security challenges you have encountered with a physical online voting
2. How do you overcome the issues regarding integrity with current system of election.

Narrowing further – Specific Question

- Narrowing further – Specific Question
1. Could you explain why the current voting system has issues involving integrity and security?
2. Can you provide a few issues that could be avoided if online voting system is implemented?

Tip of the tunnel – Focused Question

1. What requirement should we focus to create a safe and reliable Online Voting System (OVS)
2. What should we add to the system to ensure it's running a smoothly?

4.2.2 Questionnaires

- Example: Distributed a Google Form to various platform in social media
- Purposes: To gather general public opinions about current voting system
- Questions:
  1. How confident are you with the election process in Malaysia?
  2. Are you comfortable with using online system?
  3. Will the online system increase your trus in the credibility of election result?

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4.2.3　Observation

- Location: Voting booth are in a compartment with an open side where only one voter is able to stand at each side.
- User: A few numbers of user faced difficulties with authentication
- Staff: Support staff weren't there to help with user to protect the voting confidelity hence is the reason causing a traffic during the voting.
- Technical: Due to network issues in certain places, there had been a delay but was solved immediately

4.2.4　Unobtrusive Methods

Example:

- Analysis of system log on voting record
- Studying old voting records to understand demographic trend of participation rate
- Investigate the cause of issues in past voting history

5.0 Requirement Analysis

Through the research and questionnaire, we have come up with some of the main requirements needed to develop this system.

1. Voter database: the database is used to identify the user's login and retrieve the information to generate a ballot. This database will be provided through MySPR.
2. Stakeholders(voters, MySPR): the stakeholders involved in this system include the voters, MySPR, and the government. Stakeholders will be crucial to the development as the budget plan will be dependent on them.
3. Servers: in order to manage a huge volume of entry from users, a server room is needed.
4. Thumbprint scanner: this will be used for voter verification.

5.1 Current Business Process

We can come up with a few scenarios of how the online voting system works:

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1. Voters can login on the OVS using their IC number as included in the database. The system will then identify the voter's name, age, as well location of voting to generate the ballots for the voter.

2. Admins of the program can retrieve the total vote count concurrently as voters cast their votes. The system automatically calculates the number of votes more efficiently and accurately with little to no error.

3. The OVS will prevent any fraudulent voting as the system will request authentication through the user's device and IC number. Voters are prohibited from voting twice and if caught for fraud, legal action will be taken.

4. Ghost votes can be prevented as the system won't allow the user to exit out of the system without an input.

5. The politicians competing for seats will not be allowed to vote. Entering their IC number will identify them as part of the election and will only display their electoral information.

6. The OVS will available on mobile platforms which increase the mobility of users to vote at anywhere they may be.

There are various benefits of developing this system and can prove to be beneficial to both the citizens and the country.

1. Faster and more accurate results: The OVS can calculate the votes live which will produce faster voting results.

2. Cost effective and time effective: The development of this system will greatly reduce the country's spending voting center locations for the voting campaign as well as reducing time spent on voting.

3. Easy to use: users will only need to input their IC number and thumbprint for verification before proceeding with the vote which shortens the voting process.

4. Mobile and accessibility: The OVS is online system that can be used on all mobile platforms which means users are able to vote anywhere they may be. This is especially convenient for the disabled as this saves them the hassle of going to the voting center.

This is how we would like to imagine how our system would work.

1. Login: The user enters their IC number and thumbprint for verification. If either is wrong, the system will prompt the user to try again.

2. Ballot generation: once the system has identified the user's registered address, the system will generate a ballot based on the address and show the candidates.

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3. Vote calculation: The votes will then be calculated by the system and generate the result once the election duration is over

5.2 Functional Requirement

Input:

1. Interface: Design a user-friendly interface and prompting clear instructions for users.
2. Admin Interface: Provide administrators with tools to manage the voting process, monitor system performance, and troubleshoot issues.
3. User Authentication and Authorization: Users will enter their IC number and thumbprint into the system and the system will then verify the data through the government database. It will then show the name, age, zone and district for their voting.

Process:

1. IC number and thumbprint validation: identify whether the data is within the database and return the needed data to generate the vote ballot.
2. Ballot Generation: Generate personalized ballots for each voter based on their registered address.
3. Vote Submission: The votes get submitted into the system
4. Vote Calculation: The system calculates the total votes
5. Encryption: Ensuring the voting information is confidential

Output:

1. User interaction: prompt the user's vote as successful
2. Vote results: Generate results based on the latest vote calculation.

5.3 Non-functional Requirement

1. Performance: High spec servers is needed to be able to stand large volumes of users logging in at the same time
2. Control: Ensuring crowd control by creating voting sessions to lessen the heavy traffic.
3. Security: Ensure that all voters' vote options personal information is secure and prevent any data leakage.
4. Scalability: The system shall be scalable to accommodate increasing numbers of voters without performance degradation.
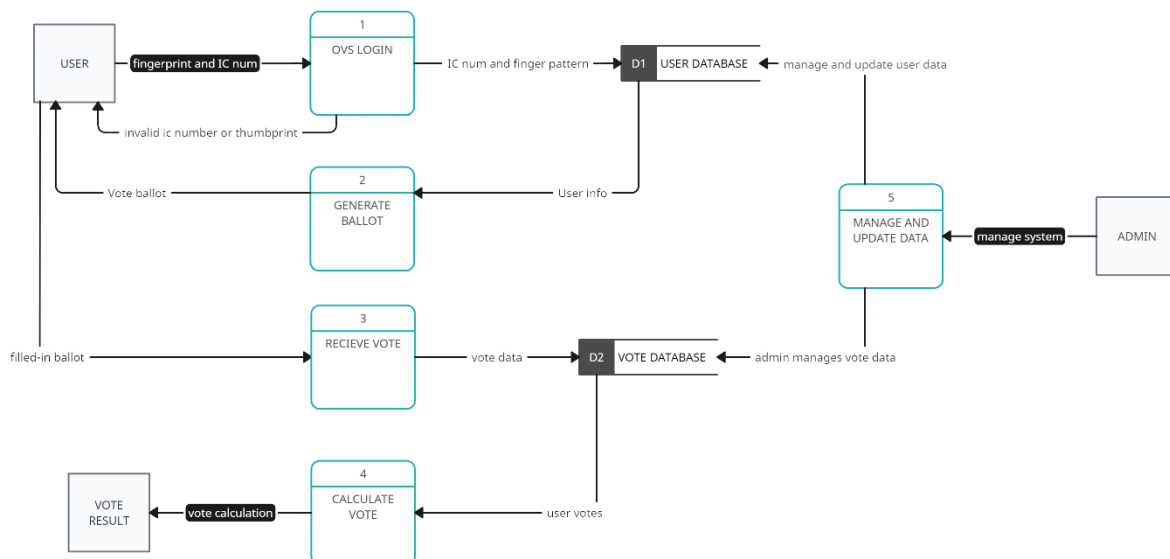5. Usability: Providing clear instructions to help guide users to use the system

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6. Compliance: Ensuring the system is in compliance with the existing laws for voting and that the system enforces the laws.
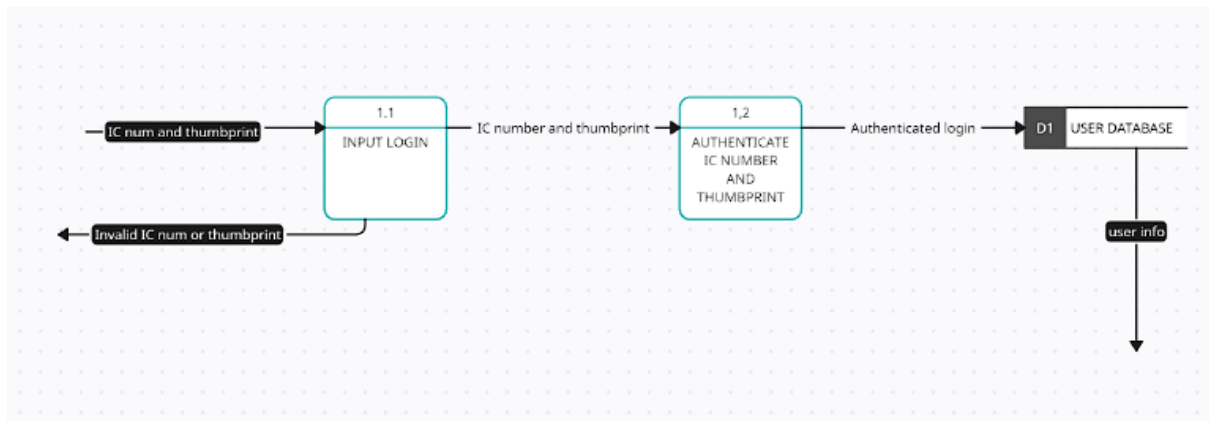
5.4 Logical DFD AS-IS System

5.4.1 Context diagram
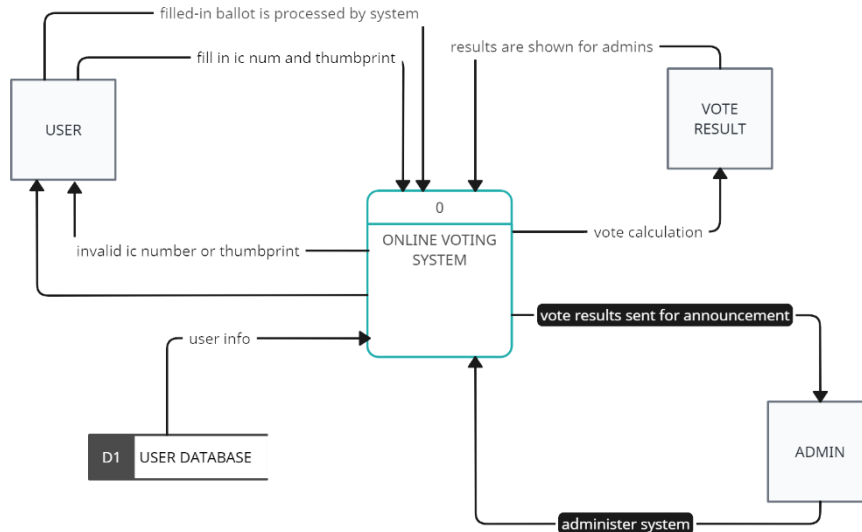
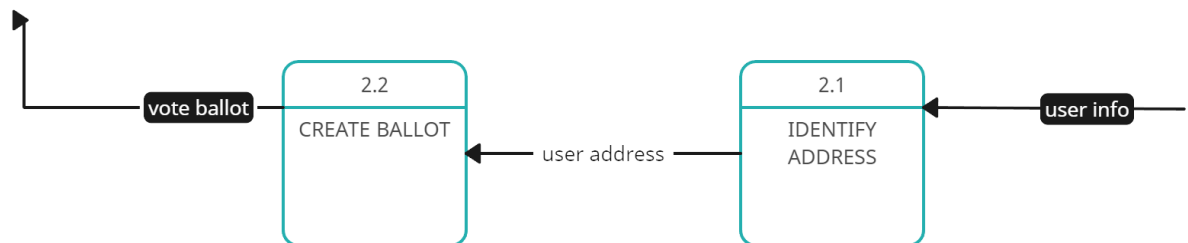#### 5.4.2 Level 0 diagram

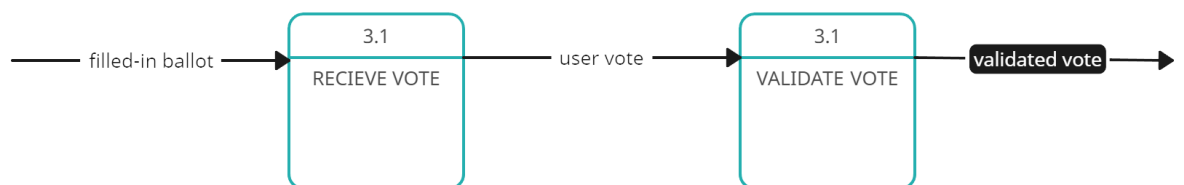#### 5.4.3 Child diagram
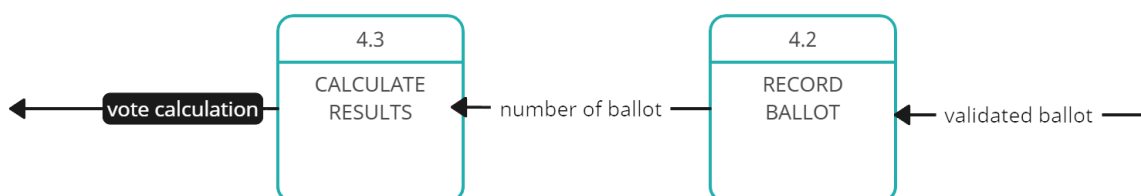
1. OVS login

2. Generate ballot

3. Receive vote

4. Calculate vote

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6.0 Summary of Requirement Analysis Process

The requirement analysis process for Online Voting System has allowed us to further understand user needs in our early development process. We had identified and document the functional and non-functional requirement to ensure the system usability and security is guaranteed. The summary for Requirement Analysis Process is as below:

1. Interviews
   1.0 Purpose: To understand the security and election voting process in Malaysia
   2.0 Participants: High Commision Officer in Election Commision of Malaysia, network security expert and software developers.
   3.0 Method: Constructed the interview question using funnel method
2. Questionnaires
   1.0 Purpose: To gather general public opinions about current voting system
   2.0 Participants: Malaysian ages range in 18 - 85
   3.0 Method: Distributed the questionnaires using through social media to target various age range and opinions

3. Observations

   1.0 Purpose: To further understand the problem and issues regarding implementing Online Voting System OVS in a general election Participants: Malaysian ages range in 18 - 85
   2.0 Method: Observations conducted at voting booth to identify issues regarding OVS
   3.0 Findings: Identified difficulties with user authentication, lack of staff support and technical difficulties.

4. Unobtrusive Method

   1.0 Purpose: To analyze existing documents, system logs and previous voting records to gather information about voting system.
   2.0 Methods:
   - Analysis of system log on voting record
   - Studying old voting records to understand demographic trend of participation rate
   - Investigate the cause of issues in past voting history

5. Functional requirement

(a) User Authentication and Authorization: User able to eneter their IC number and system will show their data

(b) Ballot Generation: Generate ballots for each user

(c) Vote Submission: The vote submitted by user into the system

(d) Encryption: Ensuring voting information is confidential

(e) Vote Calculation and Results: OVS allows live vote calculation and will generate result based on its latest vote calculation

(f) Interface: Design a user-friendly interface to user and admins

(g) Admin Interface: Provide administrators with tools to manage the OVS

(h) Accessibility and User-Friendly: Ensure the system are easily accessible to various user

6. Non-Functional requirement

a. Performance: Servers are able to handle large amount of user simultaneously

b. Security: Ensure all data are secured to prevent data leaks

The requirement analysis process for Online Voting System (OVS) was conscientious. Various methods were used to ensure to gather data and information. By using the four stated data gathering process (interviews, questionnaires, observation and inobtrusive method) we had figured the Requirement Analysis for OVS. These functional and non-functional generated will guides us to the development of a secure, efficient and friendly Online Voting System (OVS).

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