ANDROID BASED MOBILE APPLICATION TO THE PRESIDENTIAL ELECTION FOR THE ELECTION COMMISSION OF SRI LANKA

VoteME

PROJECT REPORT

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This project submitted to the Department of Computer Science, Faculty of Applied Science for the award of the degree of Bachelor of Computer Science

May 31, 2022

Declaration

I hereby declare that the entire work embodied in this project document has been carried out by me. The extent of information derived from the existing literature has been documented and fully acknowledged at the appropriate places, the work is original and has not been submitted in part or full for any Diploma or Degree in this or any other University. I confirm that there is no plagiarism in this thesis and if detected, I abide for the action that will be taken for such plagiarism by the Faculty of Applied Science, Eastern University, Sri Lanka.

……

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Certification of the Supervisor

This is to certify that project document entitled "ANDROID BASED MOBILE APPLICATION TO THE PRESIDENTIAL ELECTION FOR THE ELECTION COMMISSION OF SRI LANKA - *VoteME*" submitted by V.D. Siriwardhana for degree of Bachelor of Computer Science is a record of project work carried out by his under our guidance and direct supervision and that it has not been previously formed the basis for the award of any degree, diploma, associate ship, fellowship or any other similar title.

This is also to certify the thesis represents the original independent work of the candidate

…… ……..

Signature of the Supervisor Date
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Acknowledgement

I am glad that, I was able to complete this project and understand many things. Throughout preparation of this Android based project was an immense learning experience and I inculcated many personal qualities during this process such as; responsibility, punctuality, confidence and etc.

First and foremost, my heartily profound gratitude and appreciation are addressed to my supervisor Mr. M. Ramanan for his valuable supervision. His advice, discussions and guidance were the real encouragement to complete this work. I highly appreciate his creativity, simplicity, generosity, work ethics, and the ability to balance work and life. It has been an honor to work under his supervision. I will always be thankful to him for the valuable time that spent in supervising my progress.

I would also like to thank the Dean, Faculty of Applied Science, Trincomalee Campus, Eastern University, Sri Lanka and all the lecturers of the faculty for facilitating my project work.

Finally, I am indebted to my parents who have supported and encouraged me through their kindness and affection so that I could concentrate on my studies. They touched me more deeply than I could have ever expected.

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1. Title of the project

Android based mobile application, to the presidential election for the Election Commission of Sri Lanka, called *VoteME.*

2. Introduction

The importance of technology to our everyday life and activities is undeniable and unending. The availability of the mobile app is on the increase such that it produces a noticeable change in the way humans feel and experience computing. On account of having many advantages in mobile devices such as; portability, user friendly, easy to use and etc., mobile applications became more popular worldwide.

The Sri Lankan government transforming their existed systems gradually into digital platforms mobile and web applications and through that opportunity, Freelancers, information technology companies are providing their knowledge & services to the government in order to get the things success and also it has become a golden opportunity for all Sri Lankan citizens to get a passive income through providing their services to the government. Moreover, the government has focused on taking opportunities to earn foreign revenue to Sri Lanka using information technology by developing the infrastructures that are needed and also, they empower the entrepreneurs and as well as students for the development of the industry.

The Election Commission of Sri Lanka is accountable to the Sri Lankan Parliament in regard to its responsibility in undertaking the election and Parliament, in turn, is responsible to the people. In 1931, with the proposals of the Donoughmore Commission Sri Lanka was conferred Universal Franchise. Universal Franchise is; the right of taking decisions about the country is on its citizens notwithstanding the race, religion, language, ethnicity, caste, education, ownership of wealth, birth and gender etc. The machinery to implement franchise is the election. Elections are conducted to elect the President and representatives to Parliament, Provincial Councils and Local Authorities and Referenda when the approval of the people is required on national problems. The authority to conduct elections is the Elections Commission. The government has to formulate legal provisions to conduct elections. This system is called representative democracy. Under this system, people select representatives and govern the country through them [2].

Online voting was introduced in Estonia in 2005. Moreover, Estonia is the only country that implemented an online voting system for its entire electorate. Furthermore, some authorities in United States & Australia's regions allow certain groups of voters such as; disabled & military to use their vote online. Germany, Switzerland and Norway are some countries, some experiments & trials have been carried out but are nowhere introducing their own system [3].

The Presidential Election in Sri Lanka plays a crucial role compare to all the other elections as it is the election the leader has been elected by the Sri Lankan citizen for the coming 05 years of time. Voting is the fundamental right of a citizen in Sri Lanka who have completed 21 years of age were granted universal franchise. In order to protect citizens' right of voting and as well as create a conducive environment for a fair election, the governments in some countries involved directly with good solutions that affect for the election, country and as well as for the citizens in a good manner but that has not been focused by Sri Lankan government yet.

As many industries in both private & government sectors have been gradually converting systems to digital platforms and most companies are already using digital platforms, digitizing the elections will be affected positively for the future of Sri Lanka. Technology is there to make it easier to use and work with, since Sri Lanka has so many resources, infrastructure and as well as opportunities, we should use the technologies and trends, in order to move forward and to get adapt with this rapidly developing, fast moving world, if we want a sustainable development in every hand.

2.1.Background

The inefficiency and the unreliable has been increased in the Sri Lankan people because of the classical voting system. Many of the people are complaining against each other regarding the frauds that took place during the elections and the public is fed up with the existing system. As Sri Lanka is a democratic country everyone has the right of selecting their representative in a fair way. And they should have the witnesses that the election took place in a fair manner.

People take leave during the period of election for days, because the results get delayed as it is more time consuming. For a presidential election probably, it takes two days and people sometimes take leaves for 3 days as people are tired of seeing the results published in the media. Some who work far away from their hometown usually cannot go to work as soon as the election finishes, because of lack of public and private

transport services in this period. Due to these kinds of reasons, they take 3 or 4 days to report to work. That affects the development and the economy of Sri Lanka. It is the responsibility of the Election Commission of Sri Lanka, to hold a fair election in order to achieve the aspirations of the voters. We all know that counting millions of votes using humans is not effective as the error percentage is higher compared to a computer-based system. Therefore, we cannot count on the results issued by the Election Commission as those are the exact number of votes that took place.

As we all know, fraudulent voting is not easy nowadays, but there are still some remaining loopholes. As an example, if someone gets a visa from another country and he goes there it is not recorded anywhere in the book which is sent by the district office to 'gramasewaka'. In case someone else can vote instead of the particular person. These are the things which are still happening in Sri Lanka.

The major problem is consuming lots of money for the election. For the administration, for advertising purposes, for the workers, etc. Considering the cost for the employees engaged in election duties for counting votes and the cost for the paper works and stationary items is higher for every election.

As the government has, authorities are mostly using desktop machines and laptops for the official work converting them into mobile or portable android devices in order to use the '*VoteME*' application is much more expensive. Therefore, I have decided to implement a desktop version of '*VoteME*' for the admin portal and for the technical officer portal in order to save the public money, but the government has to spend on any mobile or tablet devices to give this golden opportunity to the public, to experience the benefits of this application. Comparing the cost that has been spent for each and every election for the stationery and the time taken to count votes etc., my opinion is; the expenditure for the '*VoteME*' is more worth it than all those expenses as it is one-time.

Furthermore, the Sri Lankan government spent much money for the election. Especially for the presidential election. There are 5 election types that are conducted by the election commission of Sri Lanka. Those are; Presidential election, Parliament General Election, Provincial Council Election, Local Authority Elections, Referendum. Therefore, the cost of stationery items can be reduced using digital platforms and it saves a lot of money and time in every election. Hence, as a solution for the existing system of conducting presidential elections, what I propose is; "*VoteME*" originally designed for the Presidential Election for the Election Commission of Sri Lanka. Some advantages of my system are, saving time of Sri Lankans, saving money of the government and as well as the ability of conducting a transparent, fair election and reducing frauds while casting votes and as well as while counting votes.

2.2.Objective

The main objective of this research project is; holding a fair election to elect the president of the people.

- Increasing the reliability.
- Increasing the efficiency and the effectiveness.
- Decrease of violations of election laws
- Saving the money of the public for paper works and stationery to an extent.
- Saving the time of the employees.
- Empowering the voters to cast their ballots reliably.
- Making the results public sooner.

Going through all of these things we see; this research project is for the all-Sri Lankans, to protect their rights to an extent than the existing system.

2.3.Problem Statement

The voting process by registered voters in Sri Lanka is very complex. So many cases of election law violations, frauds within the voting period and in the votes counting period and also high cost for the stationary items and a lot of time is taken for counting votes and making it public.

Such cases can be solved by insisting on voters exercising that task using '*VoteME'.* Moreover, the Election Commission of Sri Lanka can conduct a reliable and efficient and fair election, protecting all Sri Lankans' aspirations.

2.4.Scope of Study

It is focused on studying the existing system of voting in Sri Lanka & to make sure that the people's votes count, for fairness in the elective positions. This also will produce;

- Less cost for stationary, less effort & less labor intensive, as primary cost & focus primarily on creating, managing & running a secure mobile application voting portal.
- Reliable automated system to count votes and that makes it more trustworthy than the existing system since the errors and frauds can be made while counting.

3. Overview of Existing Systems

In recent years, voting equipment which was widely adopted in many countries can be divided into five types [4].

1. Paper Based Voting: The voters get a blank ballot & use a pen or a marker to indicate that person wants to vote for which candidate. Hand counted ballots is a time & labor and papers and stationery items consuming process, but it is easy to manufacture paper ballots & the ballots can be retained for verifying, this type is still the most common way to vote. In Sri Lanka we are currently experiencing this paper-based voting method.

2. Lever Voting Machine: Lever machine is peculiar equipment, & each lever is assigned for a corresponding candidate. The vote pulls the lever to poll for his favorite candidate. This kind of voting machine can count up the ballots automatically. Because its interface is not user friendly enough, giving some training to voters is necessary.

3. Direct Recording Electronic Voting Machine: This type, which is abbreviated to DRE, integrates with keyboard, touch screen, or button for the voter press to poll. Some of them lay in voting records & counted the votes very quickly. But other DRE without keeping voting records are doubted about its accuracy.

4. Punch Card: The voter uses metallic hole-punch to punch a hole on the blank ballot. It can count votes automatically, but if the voter's perforation is incomplete, the result is probably determined wrongly.

5. Optical Voting Machine: After each voter fills a circle corresponding to their favorite candidate on the bank ballot, this machine selects the darkest mark on each ballot for the vote then computes the total results. This kind of machine counts up ballots rapidly. However, if the voter fills over the circle, it will lead to the error result of optical scan.

Recent years, a considerable number of countries have adopted E-voting for their official elections. These countries include: America, Belgium, Japan & Brazil.

In Sri Lanka, there is no system for E-voting for any official elections conducted by the Election Commission of Sri Lanka that save a lot of public money, time and provide trustworthy and fair elections.

4. Target Work Force

This research project focuses on decreasing the cost for stationary items and labor cost that has to be spent for every presidential election in Sri Lanka. And also, to increase the efficiency by counting votes & make it public and conduct a fair election.

5. System Architecture

This research project has been implemented using below Hardware and Software components.

1. Android Mobile Phone
2. Laptop
3. Android Studio
4. Notepad++
5. Microsoft Edge Web browser
6. Firebase Service

6. Algorithm

6.1. Algorithm for the Mobile Application

6.1.1. Algorithm for the Technical Officer

Step 01: Start

Step 02: Enter Mobile Number

Step 03: Enter National Identity Card Number

Step 04: Login

Step 05: End

6.1.2. Algorithm for the Voters

Step 01: Start

Step 02: Select Language

Step 03: Type Identity Card Number

Step 04: Type OTP code

Step 05: Confirm

Step 06: Select Candidate

Step 07: Vote

Step 08: Confirm

Step 09: End

6.2. Algorithm for the Web Application

6.2.1. Algorithm for the Admin

Step 01: Start

Step 02: Login

Step 03: Create Voters

Step 04: Create Candidate

Step 05: Create Technical Officer

Step 06: Create Voting Center

Step 07: View Results

Step 08: Logout

Step 09: End

6.2.2. Algorithm for the Technical Office

Step 01: Start

Step 02: Login

Step 03: View Current Signed in Voters Details and status of voting

Step 04: Logout

Step 05: End

7. Methodology

The proposed application developed using Rapid Application Development (RAD) Methodology.

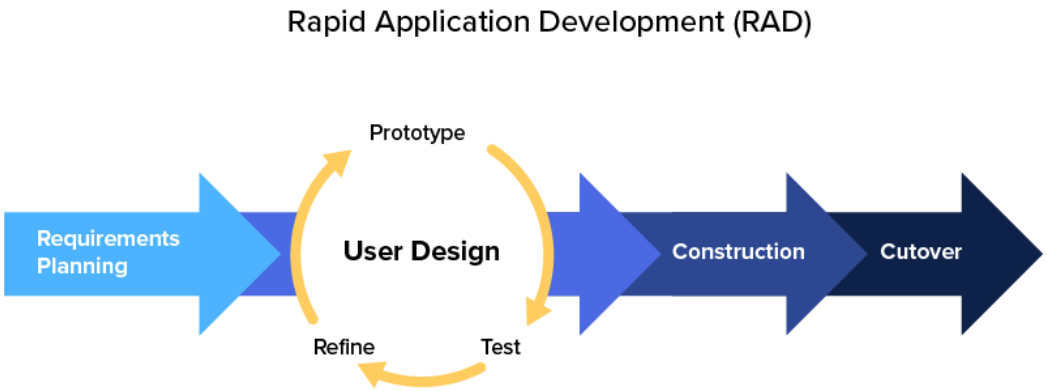


Figure 7.1: Phase of RAD

Rapid construction

This phase takes the prototypes from the design phase and converts them into the working model. Because the majority of the problems and changes were addressed during the thorough iterative design phase, developers can construct the final working model more quickly than they could by following a traditional project management approach. The phase breaks down into several smaller steps:

- Preparation for rapid construction
- Program and application development
- Coding
- Unit, integration, and system testing

The software development team of programmers, coders, testers, and developers work together during this stage to make sure everything is working smoothly and that the end result satisfies the client's expectations and objective

7.1.Requirement Planning

7.1.1. What is Requirement Planning

Requirement Planning, also known as Requirement Engineering, is the process of defining user expectations for new software being built or modified. In software engineering, it is sometimes referred to loosely by names such as requirements gathering or requirements capturing.

This phase is equivalent to a project scoping meeting. Although the planning phase is condensed compared to other project management 13 methodologies, this is a critical step for the ultimate success of the project. During this stage developer, clients (software users) communicate to determine the goals and expectations for the project as well as current and potential issues that would need to be addressed during the build.

7.1.2 Defining the requirements for the project

<u>As Admin</u>

- Login for system
- Create, update, delete and view Technical Officer
- Create, update, delete and view Voting Center and assign Technical Officer there
- Create, update, delete and view Candidate

- Create, update, delete and view Voters and assign them into voting centers
- View Final Results
- Logout

As Technical

- Login for system
- View Currently signed in voter's details
- Logout

As Users

- Login for voting using National Identity Card Number & OTP
- Select a candidate
- Vote
- Confirm Vote
- Logout

7.2.Design

Once the project is scoped out, it's time to jump right into development, building out the user design through various prototype iterations. All the bugs and kinks are worked out in an iterative process. The developer designs a prototype, the client (user) tests it, and then they come together to communicate on what worked and what didn't.

7.2.1. Human Computer Interaction Through the System

Human-computer interaction (HCI) is a multidisciplinary subject that focuses on computer design and user experience. It brings together expertise from computer science, cognitive psychology, behavioral science, and design to understand and facilitate better interactions between users and machines. This mobile app fully developed the HCI manner. It contains professional colors, small size images (PNG), navigation menu and responsible layouts.

7.2.2. Visual System Design

7.2.2.1. Use case Diagram

Use case diagrams model the behavior of a system and help to capture the requirements of the system. Use case diagrams describe the high-level functions and scope of a system. These diagrams also identify the interactions between the system and its actors. Use cases once specified can be denoted by both textual and visual representation (i.e., use case diagram). A key concept of use case modeling is that it helps us design a system from the end user's perspective. It is an effective technique for communicating system behavior in the user's terms by specifying all externally visible system behavior

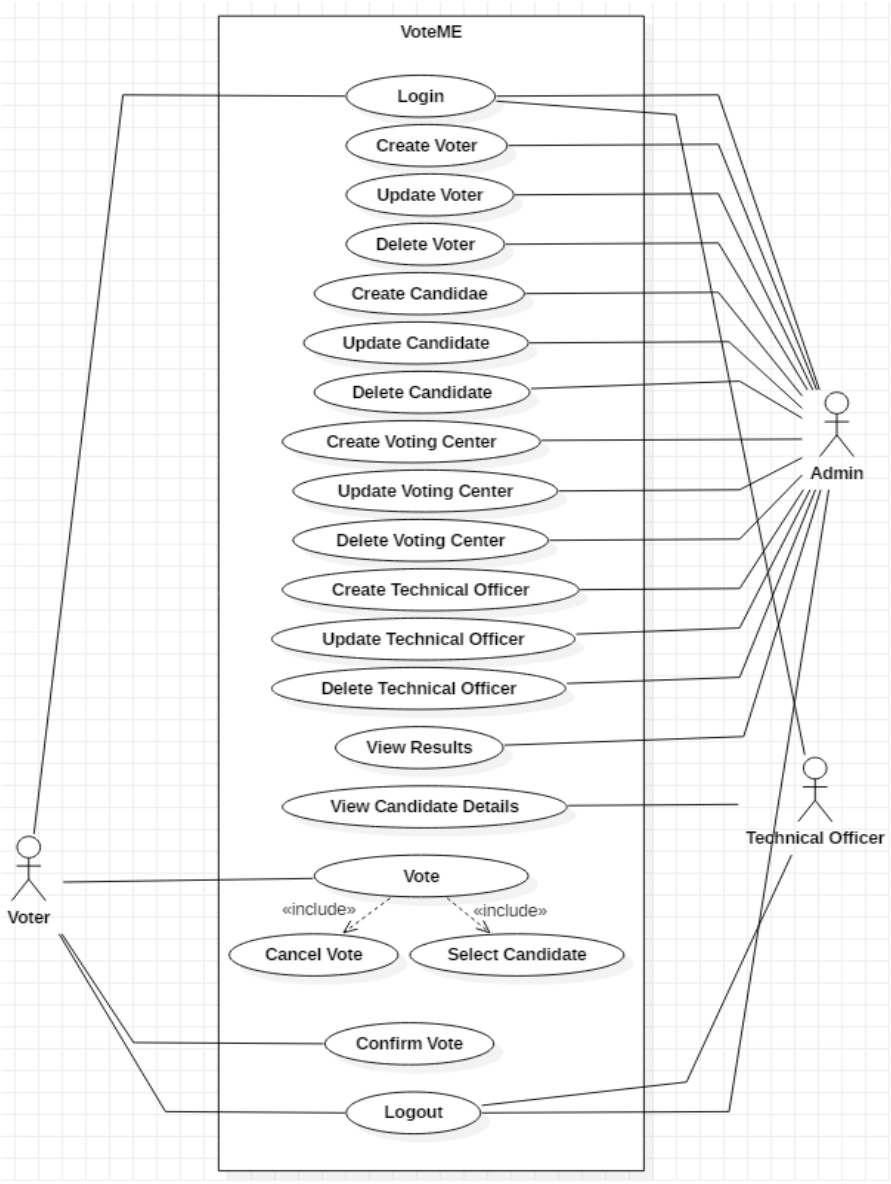


Figure 7.2: Use Case Diagram

7.2.3. Database Design

A good database design starts with a list of the data that you want to include in your database and what you want to be able to do with the database later on. Database design is a collection of processes that facilitate the designing, development, implementation, and maintenance of enterprise data management systems.

Properly designed databases are easy to maintain, improve data consistency, and are cost-effective in terms of disk storage space. The database designer decides how the data elements correlate and what data must be stored. Here, this project used a Real-time database named Firebase. The Firebase Realtime Database is a cloud-hosted NoSQL database that lets you store and sync data between your users in real-time

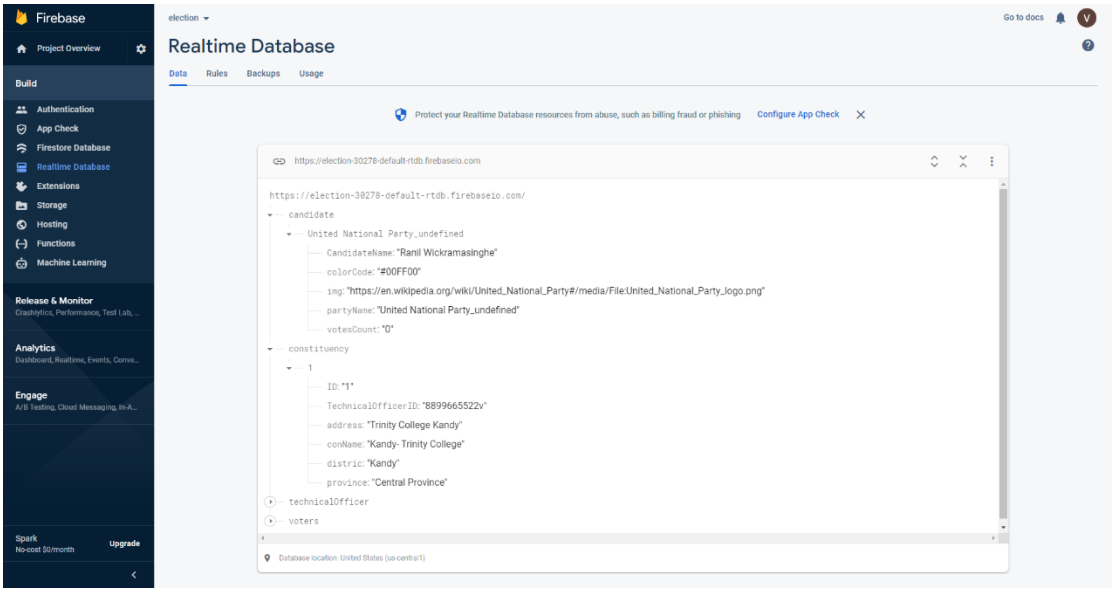


Figure 7.3: Firebase Real-Time Database

7.3.Prototype Implementation

Prototypes help designers and developers to build partial product implementations, which potential end-users or customers use to provide feedback to the development team before full-scale development begins.

Prototype Implementation an important stage in software and hardware development because this stage builds the system into a working system according to the design. The system has been developed in a modularized way and finally integrated all the modules as a complete system. This chapter mainly discusses the adequate tools and techniques used for the development and how the implementation is done.

7.3.1. Tools and Techniques

7.3.1.1. Hardware Requirement

- PC/ Laptop with minimum 8GB RAM and 50GB storage capacity.
- Router/Modem with for Internet Access
- Mobile phone with Android OS - with minimum 5.0 OS version

7.3.1.1. Software Requirement

- Android Studio
- Java JDK
- Notepad++
- NodeJS
- Firebase web services

Step 01:

As the first step, I installed software requirements and have Android Studio Chipmunk | 2021.2.1, Java JDK 1.8.0_321, NodeJS 14.18.0.

Next, I needed a Firebase account and it has been created to archive real-time syncing.

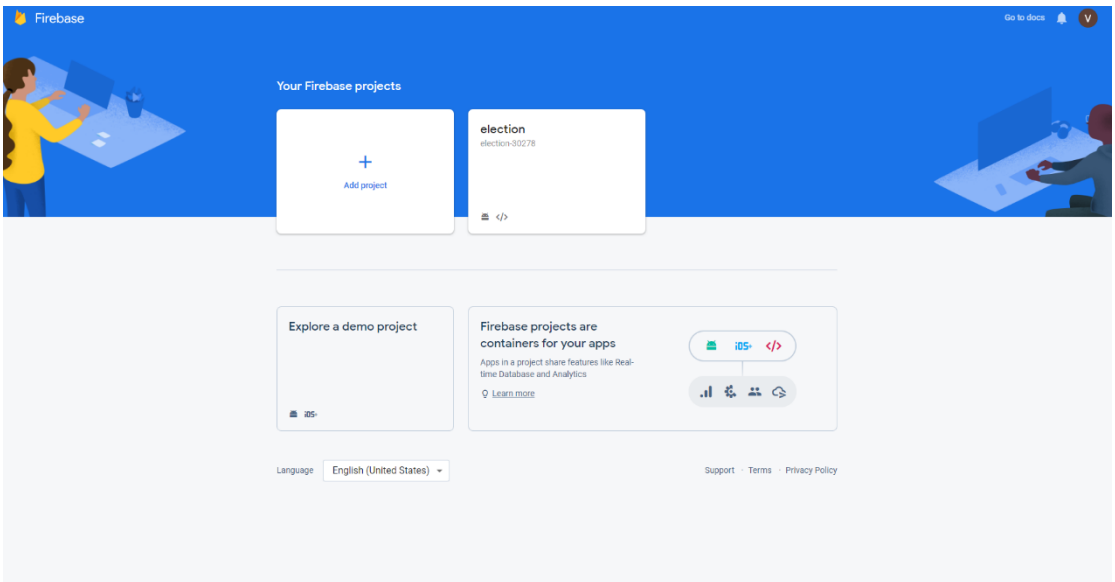


Figure 7.4: Firebase Account

After successfully creating the Firebase account you can see the console page in Figure. Here they allow creating a limited number of projects initially. If we need to create more projects then we need to make a request from them. Then they allow creating projects with or without payment. That will be defined by them.

Step 02:

Create all web application UI design for the web application and also for the mobile Application.

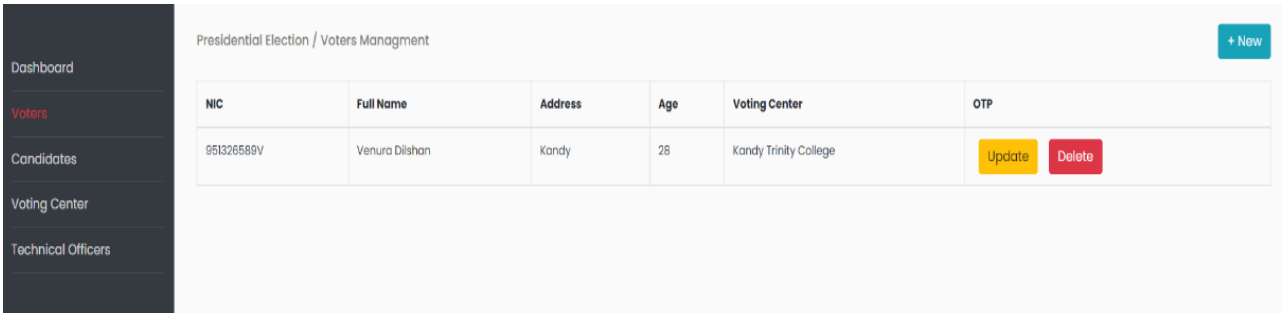


Figure 7.5: Admin Portal to Create, Update, Delete & View Voter

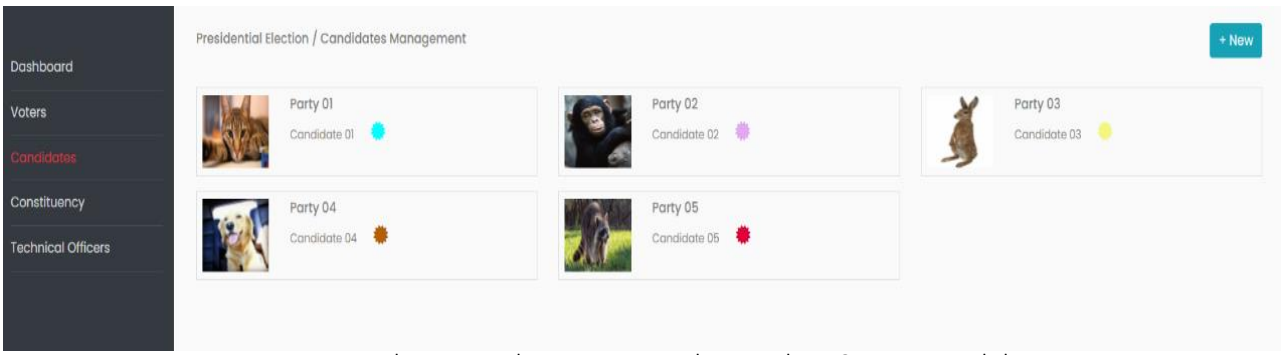


Figure 7.6: Admin Portal to Create, Update, Delete & View Candidate

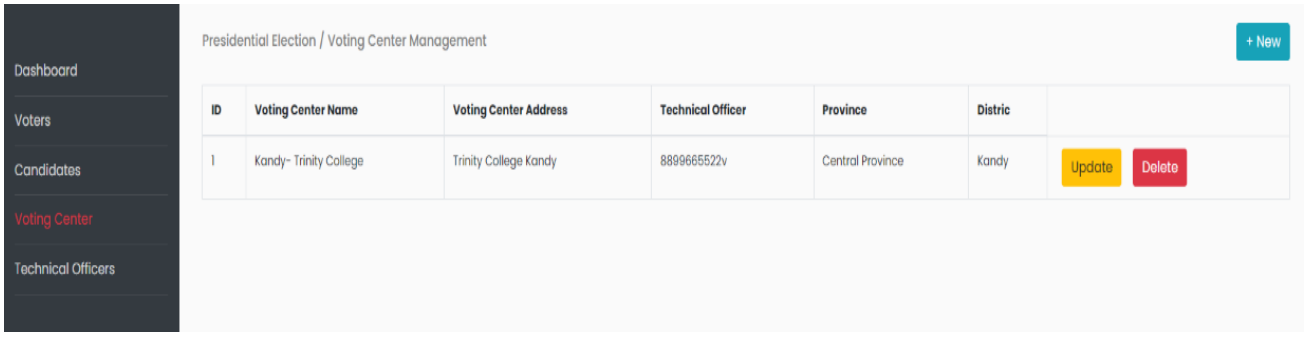


Figure 7.7: Admin Portal to Create, Update, Delete & View Voting Center

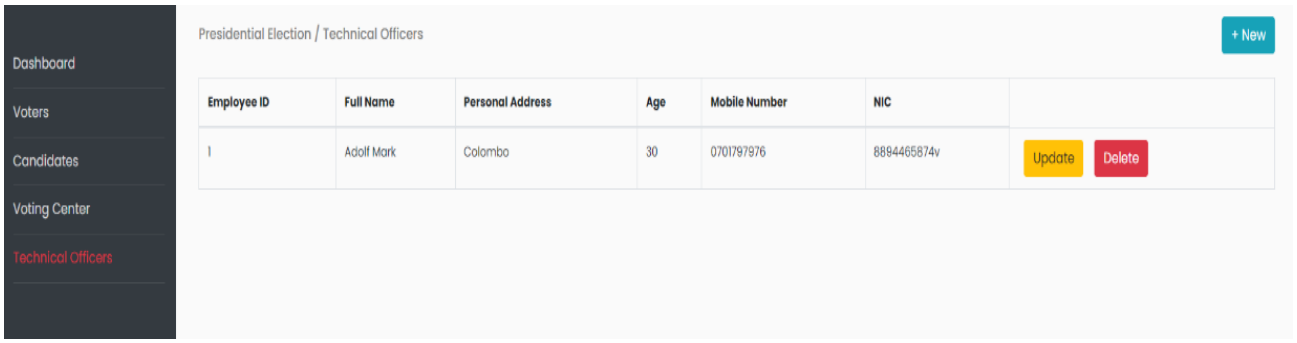


Figure 7.8: Admin Portal to Create, Update, Delete & Technical Officer

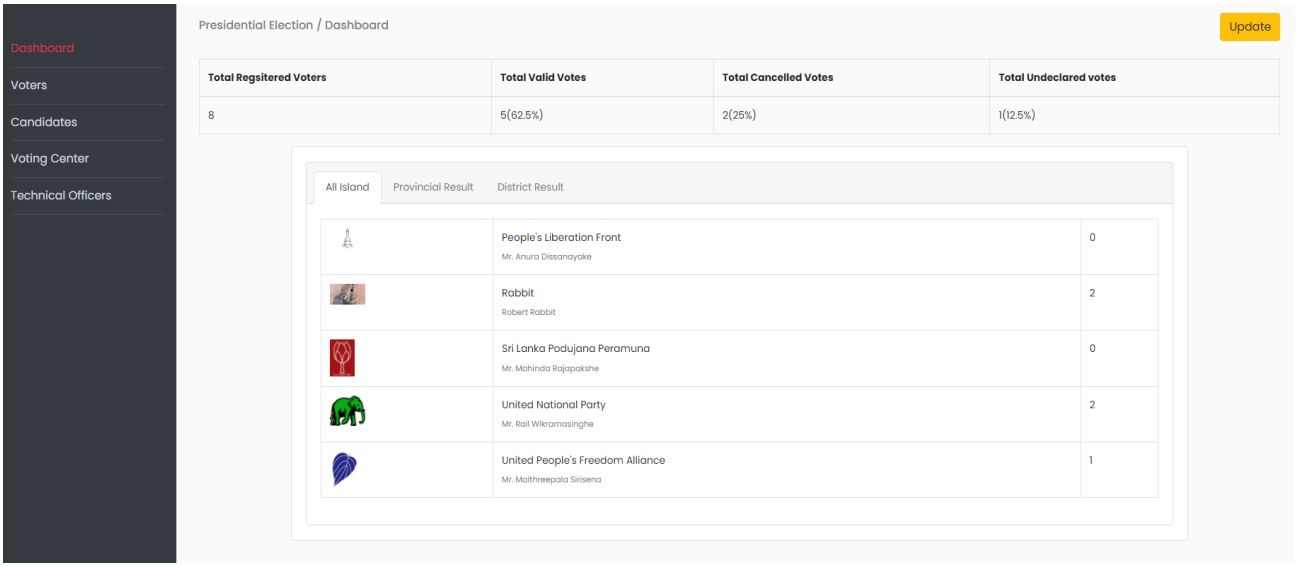


Figure 7.9: Admin Portal to View Result

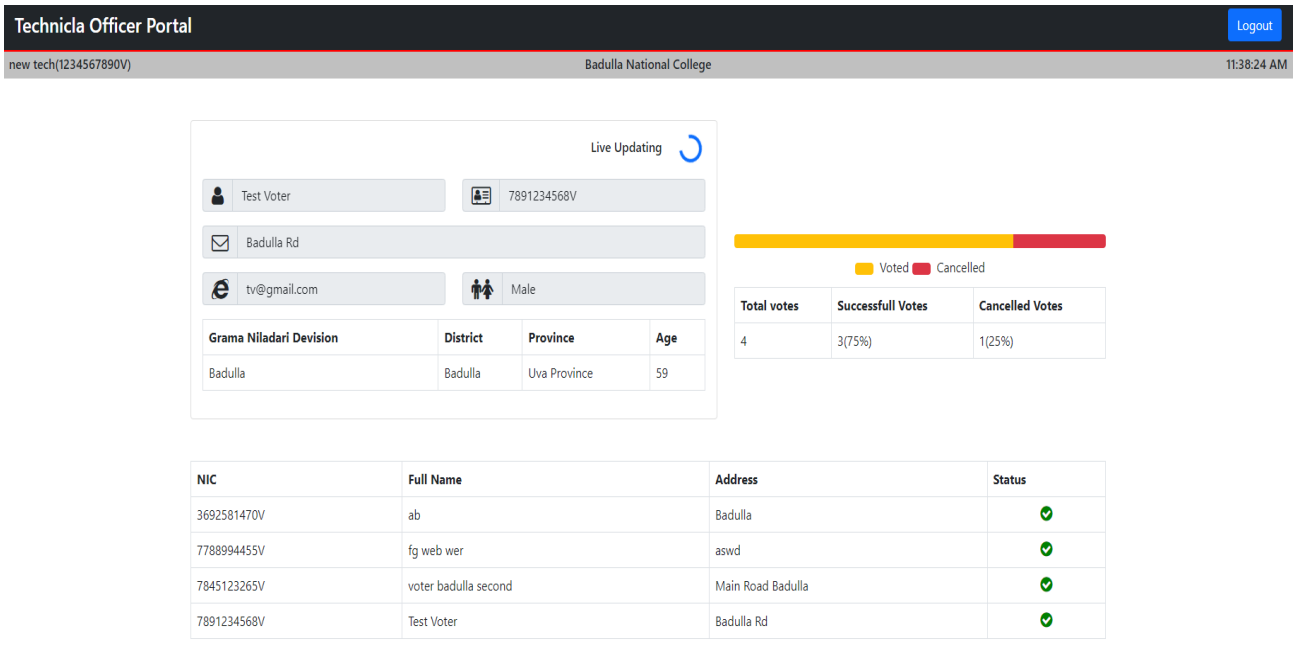


Figure 7.10: Technical Officer Portal to view voter details and status of voting

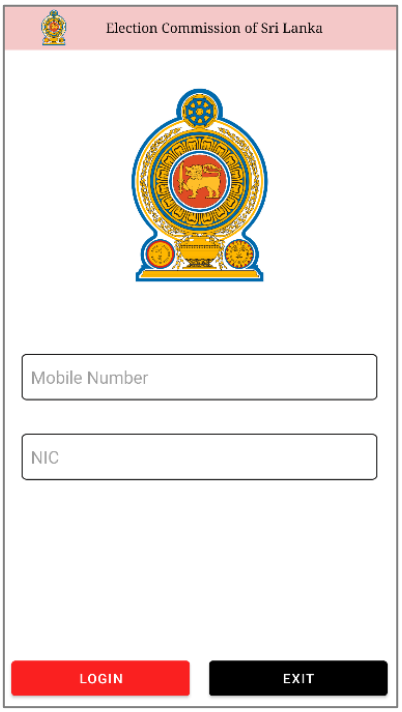


Figure 7.11: Technical Officer Login Interface

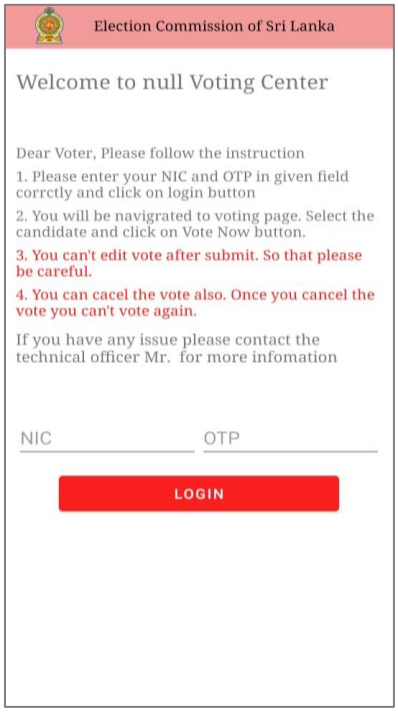


Figure 7.12: Voter Login Interface

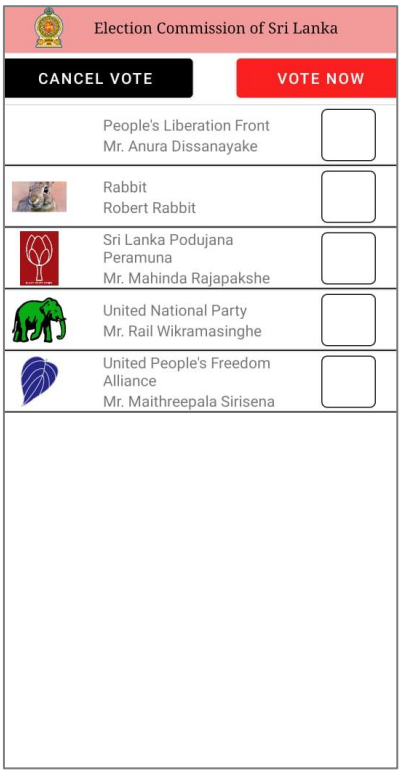


Figure 7.13: Voting Interface of Voters

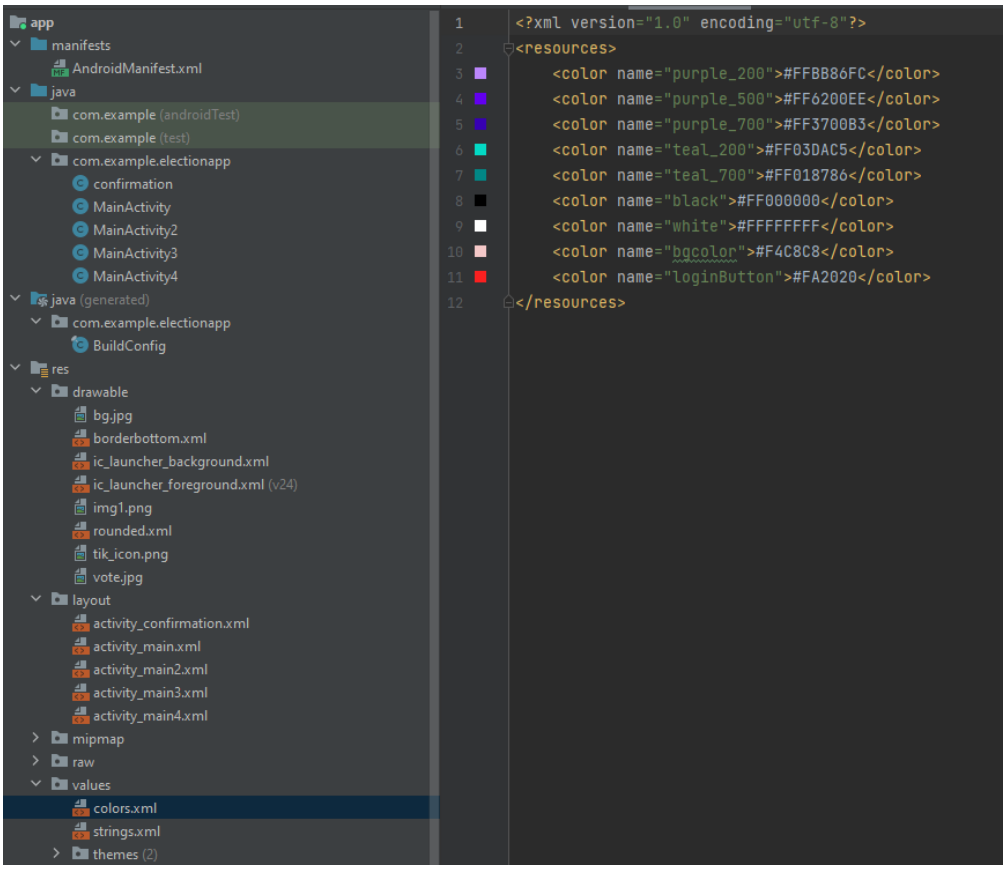
Step 03:

After creating the interfaces, Application functionalities of the button click, sign up, register etc. has been developed.

The following figure is the android manifest file that includes important metadata about the Android app. This includes the package name, activity names, main activity (the entry point to the app), Android version support, hardware features support, permissions, and other configurations

```
<?xml version="1.0" encoding="utf-8"?>
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
    package="com.example.electionapp">
    <application
        android:allowBackup="true"
        android:icon="@mipmap/ic_launcher"
        android:label="@string/app_name"
        android:roundIcon="@mipmap/ic_launcher_round"
        android:supportsRtl="true"
        android:theme="@style/Theme.ElectionApp">
        <activity
            android:name=".MainActivity4"
            android:exported="false" />
        <activity
            android:name=".confirmation"
            android:exported="false" />
        <activity
            android:name=".MainActivity3"
            android:exported="false">
        </activity>
        <activity
            android:name=".MainActivity2"
            android:exported="false" />
        <activity
            android:name=".MainActivity"
            android:exported="true">
            <intent-filter>
                <action android:name="android.intent.action.MAIN" />

                <category android:name="android.intent.category.LAUNCHER" />
            </intent-filter>
        </activity>
    </application>

</manifest>
```

Here, I have used the strings and colors values in another xml file to maintain the consistency of the application.



Here, we can see the database connection of the web application to the firebase, and this source code is provided when creating a database in firebase itself.

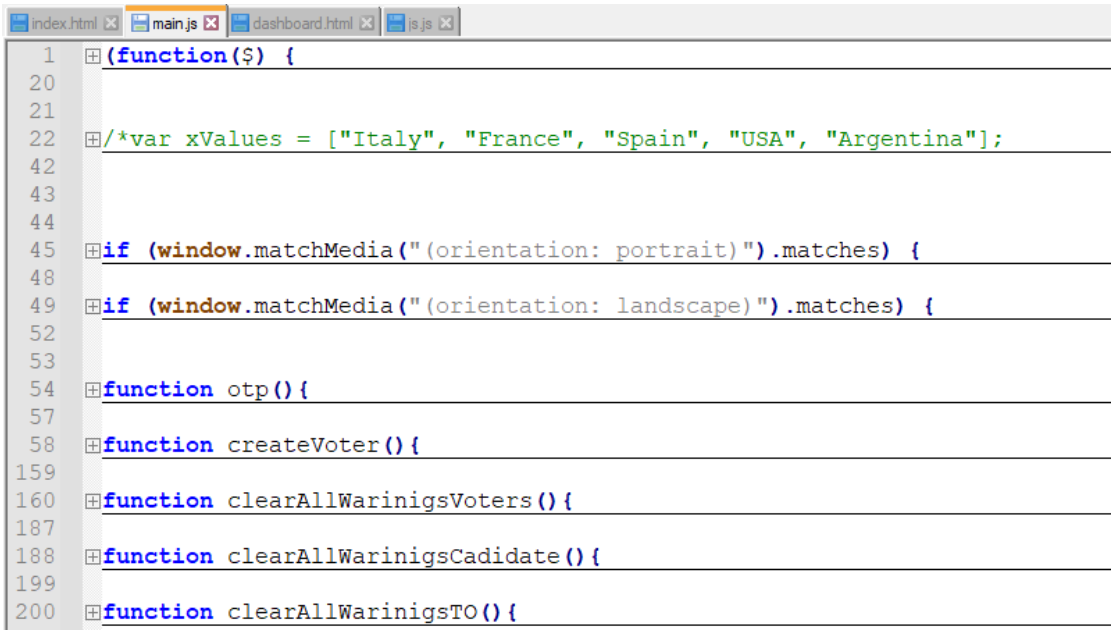
```
var firebase = require('firebase');

const firebaseConfig = {
  apiKey: "AIzaSyBjE93YZu4zOub7MmGci_4fd5zGomHbMns",
  authDomain: "election-30278.firebaseapp.com",
  projectId: "election-30278",
  storageBucket: "election-30278.appspot.com",
  messagingSenderId: "50283522913",
  appId: "1:50283522913:web:3eac98ec2d46bb67d8b320",
  measurementId: "G-94H2VF5NHM"
};

 firebase.initializeApp(firebaseConfig);
var database = firebase.database();

app.use((req, res, next) => {
  res.header('Access-Control-Allow-Origin', '*');
  next();
});
```

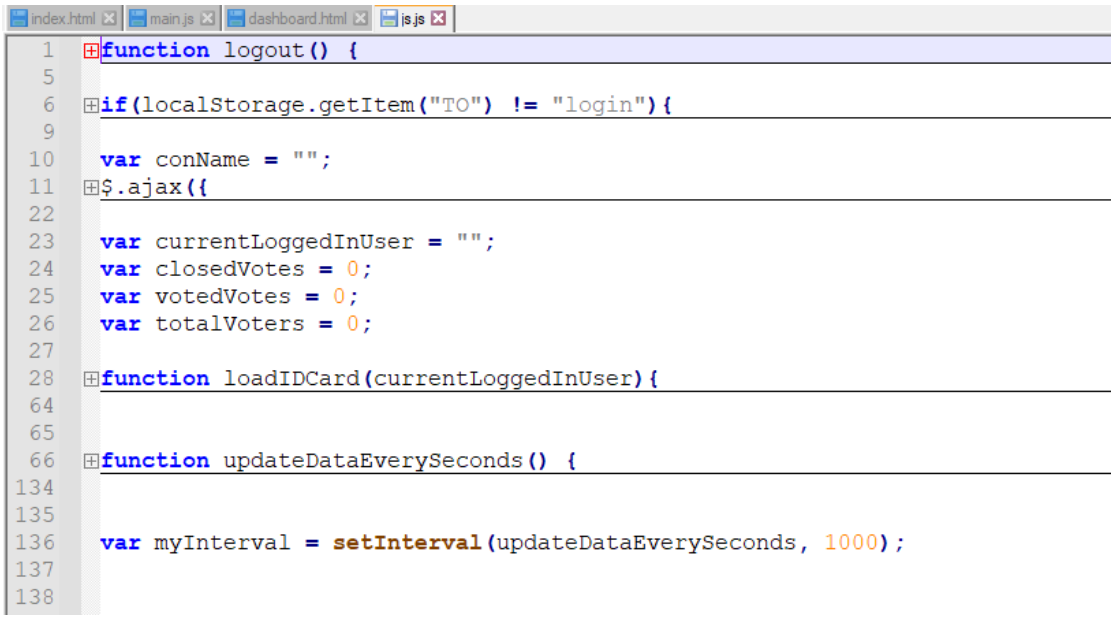
Moreover, all the HTTP methods (GET/POST/PUT/DELETE) are declared in this '*server.js*' file

index.html | main.js | dashboard.html | js.js | server.js

```
1   const express = require('express');
2   const bodyParser = require('body-parser');
3
4   const app = express();
5   app.use(bodyParser.urlencoded({ extended: true }))
6   app.use(bodyParser.json())
7   var nodemailer = require('nodemailer');
8
9   var firebase = require('firebase');
10
11  const firebaseConfig = {
12    apiKey: "AIzaSyCC9oXDyn9PtrK0BqVmQVczui8nd3cgcGE",
13    authDomain: "election-41364.firebaseapp.com",
14    databaseURL: "https://election-41364-default-rtdb.firebaseio.com",
15    projectId: "election-41364",
16    storageBucket: "election-41364.appspot.com",
17    messagingSenderId: "24893477661",
18    appId: "1:24893477661:web:e352ae2a91f5caea7c07f4",
19    measurementId: "G-H1PT5RVBXS"
20  };
21
22   firebase.initializeApp(firebaseConfig);
23  var database = firebase.database();
24
25  app.use((req, res, next) => {
29
30
31  //Get All Voters
32  app.get('/voters', (req, res) => {
42  //get One Voter
43  app.get('/voters/:id', (req, res) => {
55  //Insert New Voter or Update Voter
56  app.post('/voters', (req, res) => {
102 //Delete Voter
103 app.post('/voters/:id', (req, res) => {
116
117
118
119 //Get All Technical Officer
120 app.get('/TO', (req, res) => {
130
131 //get One Technical Officer
132 app.get('/TO/:id', (req, res) => {
144
145 //Insert New Technical Officer or Update Technical Officer
146 app.post('/TO', (req, res) => {
176
```

The below figure shows all the functions declared in web application for both admin and technical officer portal sequentially. Here, I implement the functions using as the data can be get, deleted, inserted and updated using the API service calling through '*server.js'* file.





- The whole source code of both web and mobile applications with documents can be reached using the link below. of my GitHub Account.

  https://github.com/siriwardhanaVD/VoteME.git

7.3.2. Testing

Performing thorough quality assurance (QA) testing during the mobile app development process makes applications stable, usable, and secure. To ensure comprehensive QA testing of your app, you first need to prepare test cases that address all aspects of app testing. Similar to how use cases drive the process of mobile app development, test cases drive mobile app and web app testing.

Test cases are for performing test steps, recording testing results for software quality evaluation, and tracking fixes for retesting. A best practice approach is involving your QA team in the Analysis and Design 27 stages. The familiarity with your app's functional requirements and objectives will help produce accurate test cases.

7.3.2.1 User Experience Testing

7.3.2.1.1 Functional Testing for Mobile Application

Technical Officer

Test Case	Input	Obtained Output	Remark
Login	Valid Mobile Number and Valid NIC Number	Voters' Login portal	Pass
Login	Valid Mobile Number and Invalid NIC Number	Invalid username or password	Pass
Login	Invalid Mobile Number and Valid NIC Number	Invalid username or password	Pass
Login	Invalid Mobile Number and Invalid NIC Number	Invalid username or password	Pass

Voter

Test Case	Input	Obtained Output	Remark
Login	Valid Mobile Number and Valid NIC Number	Voting Portal	Pass
Login	Valid Mobile Number and Invalid NIC Number	Invalid NIC or OTP	Pass
Login	Invalid Mobile Number and Valid NIC Number	Invalid NIC or OTP	Pass
Login	Invalid Mobile Number and Invalid NIC Number	Invalid NIC or OTP	Pass

7.3.2.1.2 Functional Testing for Web Application

Admin

Test Case	Input	Obtained Output	Remark
Login	Valid Username and Valid Password Number	Admin Portal	Pass
Login	Valid Username and Invalid Password	Invalid NIC or OTP	Pass
Login	Invalid Username and Valid Password	Invalid NIC or OTP	Pass
Login	Invalid Username and Invalid Password	Invalid NIC or OTP	Pass

Technical Officer

Test Case	Input	Obtained Output	Remark
Login	Valid Username and Valid Password Number	Technical Officer Dashboard Portal	Pass
Login	Valid Username and Invalid Password Number	Invalid Mobile Number or OTP	Pass
Login	Invalid Username and Valid Password Number	Invalid Mobile Number or OTP	Pass
Login	Invalid Username and Invalid Password Number	Invalid Mobile Number or OTP	Pass

7.3.2.1.3. Performance Testing

'*VoteME*' Mobile Application takes normal RAM and CPU usage in middle range price android phone, tablet or device.

7.3.2.1.4. Device and Platform Testing

Check for Redmi 9C, OPPO F9, Google Pixel XL, Google Pixel XL4

8. Limitations of the System

- This mobile application is working only the android version 5.1 or above.
- It assumes an always-on data connection.
- As the screen time out should be disabled and this is a mobile device its battery drains when using continuously over hours.
- When scaling the project, then have to manage large datasets. Then firebase charges a higher cost to provide its services.

9. Future Enhancement

9.1. Identifying Voters

To identify the voters happens as per the existing system currently in this project. We can add a face recognition system to identify that the voter comes to the voting poll and login using face identity or finger print at the relevant voting poll in order to cast votes.

9.1. Implement for other elections in Sri Lanka

As this project considers only the presidential election in Sri Lanka, since it is the most important election of us all as Sri Lankan, we can also implement the project for every election such as; Parliament General Election, Provincial Council Election, Local Authority Elections, Referendum.

9.1. Firebase

Firebase database has many functionalities and it's very comfortable with lots of frontend and backend technologies. When scaling the project, then we have to manage a large amount of data. It will cost higher to get its services. Therefore, changing to other cost-effective technology by considering project requirements at the moment is better.

Conclusion

The main aim of this project '*VoteME*' is to reduce the cost spent for the presidential election in Sri Lanka. Here, I mainly focused on reducing the cost for stationery, cost for the people who enroll during the election period and after the election for the election duties, holding a transparent fair election that can be more reliable than the existing system, save the time that taken for counting votes and as well as avoiding the frauds that can be took place during the vote counting period.

Making people count on the system of voting, increases the percentage of voters as they can rely on it and make them confident in the choice of their candidate.

Finally, I have learned a lot of things to an extent about how to develop web and mobile application projects using android studio, NodeJS and firebase. And I got the best knowledge in User Interface designing using Adobe XD tool and it was really helpful for me designing any user interface very quickly as we expect.

For each and every election '*VoteME'* is the best option in my opinion. And I think by launching this both mobile Application and Web Application to the Election Commission of Sri Lanka can achieve more benefits

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