

SWEN 303

AS.2

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Political voting system

Updated:

I have not updated very much from the first assignment as I received a lot of positive feedback. I have however reformatted some of the model overview to help with clarity. Most of what these changes influence are made bold. I have also added personas relevant to each task as that was what was recommended and it makes sense to do so. These personas are labeled just below the use case name before the grid.

Introduction:

The system I have chosen to develop is an e-voting system that allows for users to submit their political nominations/votes remotely. An online voting system such as this is becoming more realistic for countries to implement as the modern information age develops. Currently New Zealand still uses ballot papers and humans to count the ballot papers. This system works well for New Zealand as it is a well developed country with a strong democracy. The purpose of this first project is to develop an understanding of what an e-voting system would look like and behave if used for developing countries elections. Developing countries have been chosen as the primary users for these systems as their elections are already unreliable without technology creating a demand for a new system (covered further in business objectives).

Existing solutions:

E-Voting & Remote E-Voting - Overview

Before discussing potential solutions it is important to differentiate between the two primary types of electronic voting. The first is referred to as “e-voting”, this system is not remote and still supervised by government officials. Like a standard voting booth but using an electronic screen as opposed to a pen and paper. The second system is “remote e-voting”, which refers to an online electronic voting system that allows people to vote from any location which therefore requires unique authentication methods. The general consensus of the western world (where it could be implemented as people have greater access to electronics) is that online voting systems are too vulnerable, opening up many new pathways of election fraud. E-voting systems are far more difficult to audit and may malfunction. This e-voting system I am developing an interface for is a theoretical project to demonstrate what such a system may look like if the security and other issues discussed above could be resolved by self authenticating, bullet proof, and auditable code.

Describing Existing solutions

There are few examples of remote e-voting systems as they have only been used for local body elections and have very tight security to prevent interference. With this in mind I am basing my existing solutions off e-voting systems that can be used for voting on anything but are not actually implemented into political voting systems yet. This will still provide me with strong examples as they will share similar interfaces and voting concepts.

Example 1 - Election runner - <https://electionrunner.com/>

I picked this system as my first example as it is a sand box voting system that allows stakeholders to design their own voting system. It also lets stakeholders import ballot and voter results into CSV files and excel spreadsheets easily. Finally it lets users access the voting from any device via their email. This system is far to open for an electoral voting system but still has great concepts for retrieving votes.

Example 2 - SWISS Post E-Voting - <https://www.evoting.ch/en>

I picked this system as my second example because it is the most developed and informative government based e-voting system I could find. This system has a strong security system using fingerprint authentication to ensure the user is who they are meant to be. The demo system has been taken down but images of the system showed its interface was simple and clear to understand so those with little to no experience using electronic systems could still vote with ease. This gave me insight into the importance of making the system as simple as possible for the voters.

Business objectives:

Underdeveloped countries have trouble running fair elections using paper ballot systems this is due to numerous reasons but the three main ones being. Paper ballots not being able to include all of the parties on a single page leading people to not being able to find the party they want to vote for and accidentally casting miss votes. This is solved with an e-voting system as all parties can be categorised and easier to find. Local authorities influencing vote results to benefit their own agenda is another issue which remote e-voting makes much more difficult to accomplish. Lastly in times of crisis it can be dangerous for many people to be meeting in a single place such as during a pandemic; so being able to vote remotely can ensure elections can still go ahead.

An issue that comes with a remote e-voting system is that low socio-economic places do not have access to the technology required to be able to vote. The program is therefore being designed so that it can also be deployed into e-booths which are then placed in such areas, as well as have physical vote inputs taken from paper ballots for places with no power.

Importance to Stakeholders:

In this case the stakeholders are the government and they would want to develop such a system to ensure future elections are as fair as possible, and can go ahead even in times of crisis such as the corona virus which would prevent people from mass gathering in places to vote. Media and government officials also want quick and easy access to the current results of the election so this system must provide a quick and accurate output of the current votes.

Model Overview:

The persona generation technique I used was founded off of the persona lecture provided by Simon. I included activities as a subheading because I felt it was important to ensure that the system is designed around people who use computers regularly and those who don't. Attitudes were included as well as someone's attitude can influence the tolerance they have for technology and ensure the system is designed in a way that people are never left confused. Aptitudes was included so that the system is designed around users that are both confident and not confident with technology and to account for administrators ability to use technology. Weaknesses was included for the same reason and aptitudes but to give insight into the persona from both the strengths and weaknesses. Domain knowledge and system knowledge is included to firstly ensure the system is designed for votes with no domain knowledge but also to design the back end interface in a way that ensures they have the domain and system knowledge to run it. Interaction was part of my sub headings as the persona will influence the design of the system differently based on the interaction they will be having with the system. Priorities and motivation were included to ensure the design of the system don't miss the key priorities of motivation for someone voting/using the system. Tinkering was included as subheading as different parts of the system have to be designed differently based on the personas of people using that side of the system, as back end administrators will want to test the system more than that of the voters and their system design has to account for this.

Model personas I considered were polling staff, returning officers, auditors, voters, and media workers. The two I decided to develop and model the design off were the **voters** and **IT administrator**.

The **voter persona** is going to model the user of the system and encompasses potentially the entire country who is eligible to vote, including those who will be voting and working for the government running the voting system. Due to this I decided to make **two different model personas to represent the voter**. One persona modeled around the **lower-class voters** and another modeled around the more **upper-class voters**. I believe the middle classes voting experience and interaction with the system will be similar to that of the upper-class as they are also well educated and have access to similar technology. But I think it is important in this case to ensure I am also designing the system with the less fortunate in mind as their experience with such technology may be far less.

The **administrator persona** is going to represent a IT based worker on the electoral committee that has been employed to work with the new voting system and provide the other electoral staff with the information they require. Electoral staff working with the administrator could include polling staff, returning officers, auditors and media workers etc. working with the voting system during the elections. Recording votes, displaying vote totals, auditing the votes and ensuring all

of the parties are in the system; are going to be common actions during an election and therefore a persona for people working on this end of the system is a must to ensure the system functions well for both the voters and the people running the election.

The process I used to create the tasks/essential use cases involved reading about the personas and trying to empathise with the experience they would have when using the system well ensuring all of the required actions a voting system needs would be functional for these users. Obvious use cases were identified and almost all were inline with the required actions a voting system needs. The difference being that the obvious use cases had to be adapted to fit all the personas, especially those people who have never used technology before. This included adding extra messages to certain core actions to ensure the user was aware of what the computerised voting system was doing at all times.

I prioritized these tasks based on what action required another action before it could be used. In this case authentication was at the top. Though it was noted by Simon that everyone needs to authenticate but it is probably still not the most essential use case to a system, I believe in this case as people voting and accessing the system that aren't meant to will lead to corrupting the entire voting process it was the most important use case. The administrator authentication was also the most important out of all of the authentication use cases as if the administrators cannot access the system or the wrong person accesses the administrator section it can also corrupt the entire voting process. The second most important use case I believe was the retrieval of votes as if you cannot retrieve the data from the back end of the system then all of the entered votes are for nothing. The third most important use cases were the voter input use cases. These use cases are important because the system needs to have a good voting system in order for any data to be gathered. The final use case was the displaying of parties and candidates which is important but not as important as being able to vote on the given candidates and retrieve information of those results.

Personas:

Lower Class Voter:

Name: Jimmy Milner



Jimmy Milner is 45 year old tradie who works on building projects as a builder. He lives on the outskirts of a small town with his family. He never uses technology other than old TV his wife got him as a wedding present. Jimmy is reluctant to use the new E-voting booths in town as he doesn't understand computers and is worried he will be unable to vote.

Activities:

Jimmy spends most of his time at the local bar with his workmates before retiring home to his wife and family on the edge of town.

Attitudes:

Jimmy is stubborn, and doesn't like to be told how to do something. Because of this Jimmy also gets frustrated easily when he doesn't understand how something works.

Aptitudes:

Jimmy is good with his hands and reliable, and always gets the job done on time.

Weaknesses:

Jimmy is uneducated and does not know how to use a computer and is almost illiterate.

Domain Knowledge:

Jimmy has never used a computer before.

System Knowledge:

Jimmy has no knowledge on how to use an e-voting system, as he has never used a computer before for any task.

Interaction:

Jimmy will only interact with the system one time when he goes to vote in town at an e-voting booth system.

Priorities:

Jimmy wants to be sure that he has voted for the party and candidate he wanted to vote for and that the system is reliable and does not lose his vote.

Motivations:

Jimmy is using this voting system because he has been following the news in a local bar and feels strongly about a new and upcoming candidate in the democratic party who promises to support the builders.

Computer Self-efficacy:

Jimmy has no confidence with any computer tasks and will often get frustrated with technology he cannot understand easily.

Tinkering:

Jimmy does not experiment with technology at all.

Upper Class Voter:

Name: Brian Thomas



Brian Thomas is 32 and the son of a wealthy businessman. Brian lives in a mansion located in a wealthy suburb in the capital city. He is excited to vote using the new E-Voting system as he believes it is progressive for the country and a step in the right direction. Brian is happy the system is also going to be on his phone so he can vote from home.

Activities:

Brian spends his time travelling and playing golf with his friends.

Attitudes:

Brian is confident and enjoys a challenge. Because of this he likes to push himself outside of his comfort zone.

Aptitudes:

Brian is charismatic, and is a strong verbal communicator of his ideas and beliefs. Brian is also literate.

Weaknesses:

Brian is narrow minded and has a very sheltered world view. Brian finds it hard to empathise with those in worse positions than him.

Domain Knowledge:

Brian has used computers throughout his entire life.

System Knowledge:

Brian is familiar with touch screen technology as his phone is a touch device.

Interaction:

Brian will only interact with the system when he votes online using his phone.

Priorities:

Brian just wants to vote for the same party as last time and wants it to be as quick as possible.

Motivations:

Brian is voting using the system because he has been called to vote for the party the family have always supported.

Computer Self-efficacy:

Brian is confident when using computers and finds them intuitive as he understands the standard design of a touch interface well.

Tinkering:

Brian is confident in his ability to use technology but does not experiment with programs.

System Administrator:

Name: Rick Jag



Rick Jag is a 45 year old male living in a single bedroom apartment in the center of the capital city. He is a computer scientist who has worked on many voting system projects. He helped maintain and run poll.com, a website used to create random polls online. He has taken on a role as an IT-administrator for the voting system where he will be a bridge between election administrators and the IT voting system being used in this election. During this role he will retrieve votes, candidate lists, party lists and other information processed by the system.

Activities:

Rick spends his time working on the back end of IT systems and then retires to his gaming setup where he owns noobs in Halo.

Attitudes:

Rick is sure of himself with computers because of this he comes off as arrogant to those working with him if they question his ability.

Aptitudes:

Rick is very numeric, a quick learner and great with computer systems.

Weaknesses:

Rick struggles with social scenarios which means he enjoys being alone.

Domain Knowledge:

Rick has worked with databases and numeric data his whole life.

System Knowledge:

Rick is familiar with electronic voting systems as he has worked with online polling systems before.

Interaction:

Rick will be using the system to vote. Rick will also be working on the back end of the system retrieving data from the system and translating that to other team members running the election. Rick will be a bridge between the non-IT team members and the back end of the system.

Priorities:

Rick wants it to be clear what information non-IT members need from the back end so that his social interaction with them is as short as possible.

Motivations:

Rick is working with the system because he wants to move into a new apartment and the government job pays well with good benefits.

Computer Self-efficacy:

Rick is very competent with computers and will begin problem solving right away when a problem occurs.

Tinkering:

Rick loves to test the limits of a system and loves to experiment with the different technologies he works on.

Essential Use Cases:**IT Administrator Authentication:****- IT Administrator persona**

User:	System:
Provide government provided administrator login details	
	Retrieve administrator login details
	Ensure provided details are valid
	Login administrator to system if correct
	Notify User of successful or unsuccessful voter authentication
Accept login status	

Voter Authentication Remote:**- Lower Class Voter Persona & Upper Class Voter Persona**

User:	System:
Provide Facial/Fingerprint Recognition	
	Capture Face/Fingerprint Recognition
	Ensure voters identity as valid voter
	Log voter into remote system if valid
	Notify User of login successful or unsuccessful if not valid voter
Accept Login Status	

Voter Authentication E-Booth:**- Lower Class Voter Persona & Upper Class Voter Persona**

User:	System:
	Display a message to the user that they need

	to put their finger on the fingerprint scanner etc. for authentication.
Provide Facial/Fingerprint Recognition/Display passport identification	
	Display a message to user that their information is being processed
	Retrieve voter information
	Ensure potential voters identity as valid voter
	Log voter into E-Booth system
	Notify User of successful or unsuccessful voter authentication
Accept login status	

Retrieve Party Votes *Requires IT Administrator Authentication:*

- **IT Administrator persona**

User:	System:
Select retrieve party votes	
	Update count of total party votes
	Return total count of votes for each party
	Display parties with total party vote counts next to them
View Party vote counts	
(Optional) Download party vote counts to PDF to be shared with the media etc.	

Retrieve Candidate Votes *Requires IT Administrator Authentication:*

- **IT Administrator persona**

User:	System:

Select retrieve candidate votes	
	Update count of total candidate votes
	Return total count of votes for each candidate
	Organise candidates under each party
	Display candidates with total candidate vote counts next to them
View candidate vote counts	
(Optional) Download candidate vote counts to PDF to be shared with the media etc.	

Remote Vote Input Requires Voter Authentication remote:

- Lower Class Voter Persona & Upper Class Voter Persona

User:	System:
Select vote now	
	Display ensure ready to vote message
Accept ready to vote message	
	Retrieve party list
	Retrieve candidate list
	Organise candidate list by party
	Display candidate and party list with vote box next to them
Select candidate and party to vote for	
Click finalise vote button	
	Display vote processed message

E-Booth Vote Input Requires Voter Authentication E-Booth:

- Lower Class Voter Persona & Upper Class Voter Persona

User:	System:
Select vote now	
	Display ensure ready to vote message
Accept ready to vote message	
	Retrieve party list
	Retrieve candidate list
	Organise candidate list by party
	Display candidate and party list with vote box next to them
Select candidate and party to vote for	
Click finalise vote button	
	Display vote processed message
	Send confirmation email to user confirming online vote complete

Voter View Parties Requires Voter Authentication/Remote Authentication:

- Lower Class Voter Persona & Upper Class Voter Persona

User:	System:
Select view parties	
	Retrieve party list
	Display party list

View party list	
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Voter View Candidates *Requires Voter Authentication/Remote Authentication:*

- Lower Class Voter Persona & Upper Class Voter Persona

User:	System:
Select view candidates	
	Retrieve candidate list
	Organise candidate list by party
	Display candidate list
View Candidate list	

Design Explanation:

Introduction:

During the design of this E-voting system I used two primary programs. Balsamiq.Cloud for the storyboard and planning side of the design and Adobe XD for creating a more accurate and aesthetically pleasing representation of the system. Though I discussed using such an E-voting system would be most effective currently in underdeveloped countries with an already suffering democracy; I decided when designing this system from an aesthetic standpoint to design it for the New Zealand elections. The functionality of the system would be similar regardless of the country though languages and symbols etc. may change. I am interested in Maori art work and design and that partially influenced my decision to design it aesthetically around New Zealand's elections.

Designed pages will only cover one of each type of page as there are many designed pages that share the same purpose and have only a few changes. I.E. Finger and Eye scanning pages are designed the same way but are separate pages. All pages including loading screens will be included in the video!

System overview:

I split the system into two primary applications. Both applications share the same database but interact with it in different ways. The first application is for casting votes during an election and the second application is for retrieving these votes from the system for electoral personal. This split was made so that voters cannot access data they should not be able to and administrators cannot input data they should not be able to.

Voter Application Overview - input:

The design of the first application in the system was centred around both the lower-class and upper-class voter personas. The platform chosen was a computer application as not everyone has access to a phone. Not everyone has access to a computer either but this application could be potentially deployed to E-booths (computer kiosks - like at bag check in at an airport) to ensure everyone has the ability to vote. Since this side of the system was to be used by potentially everyone in the country to vote I ensured it was designed for people with very little to no technological experience so everyone can vote using the system. A voting system should be very clear and simple to prevent confusion and miss cast votes which is inline with my decision to design it around people with little to no technological experience as they share similar aesthetic and functional design choices. A design for people with little to no technological experience should have very few options on each screen to prevent confusion. It should also have check pop-ups to ensure people are navigating the application the way they want to instead of accidentally pushing buttons and navigating to pages they didn't want to. I also tried to use as many simple large icons as possible to ensure people with little ability to read will still be able to

navigate the application though they may require some assistance. The general color theme of this application was centered around previous election ballot papers (link in references) so the E-voting system already has a sense of familiarity for the voters. Furthermore the color scheme of previous election ballot papers were chosen to be very neutral and not inline with any of the primary party's voters can choose from which is another reason why the color scheme fit so well.

IT Administrator Application Overview - output:

Design for the second application in the system was centered around the administrator persona and is an application for a computer platform. Every IT Administrator should have access to a computer so a computer application was the best fit as they would be more secure than hand held devices. This application was not the primary focus well designing the system as there are limitless options for view votes and voter information in different ways however the primary focus of design was to develop a system voters would use to vote. However I did include the basics (a couple of pages representing where voter data could be retrieved and displayed) as without this application in the system there would be no way to view the results provided by the voter application. The color scheme for this side of the application was blue as it is a soothing color and I want administrators using my system to not get frustrated if they have trouble with processing the results.

StoryBoard:

The story board I have designed using **Balsamiq.Cloud** covers the voter application that voters will be using to vote during the elections and the admin application the administrator persona would be using to retrieve the data of the election. A couple pages of the story board did not make it into the final Adobe XD design as they can be essentially represented by another page. E.g. successful login & unsuccessful login pages being represented by successful login page instead of including both. **The story board demonstrates how the two designed applications work together to form the E-voting system.** The **voter application** in the system is used for **inputting data/votes** into the database well the **admin application** is used to **retrieve and output data** from the database.

Key for arrows:

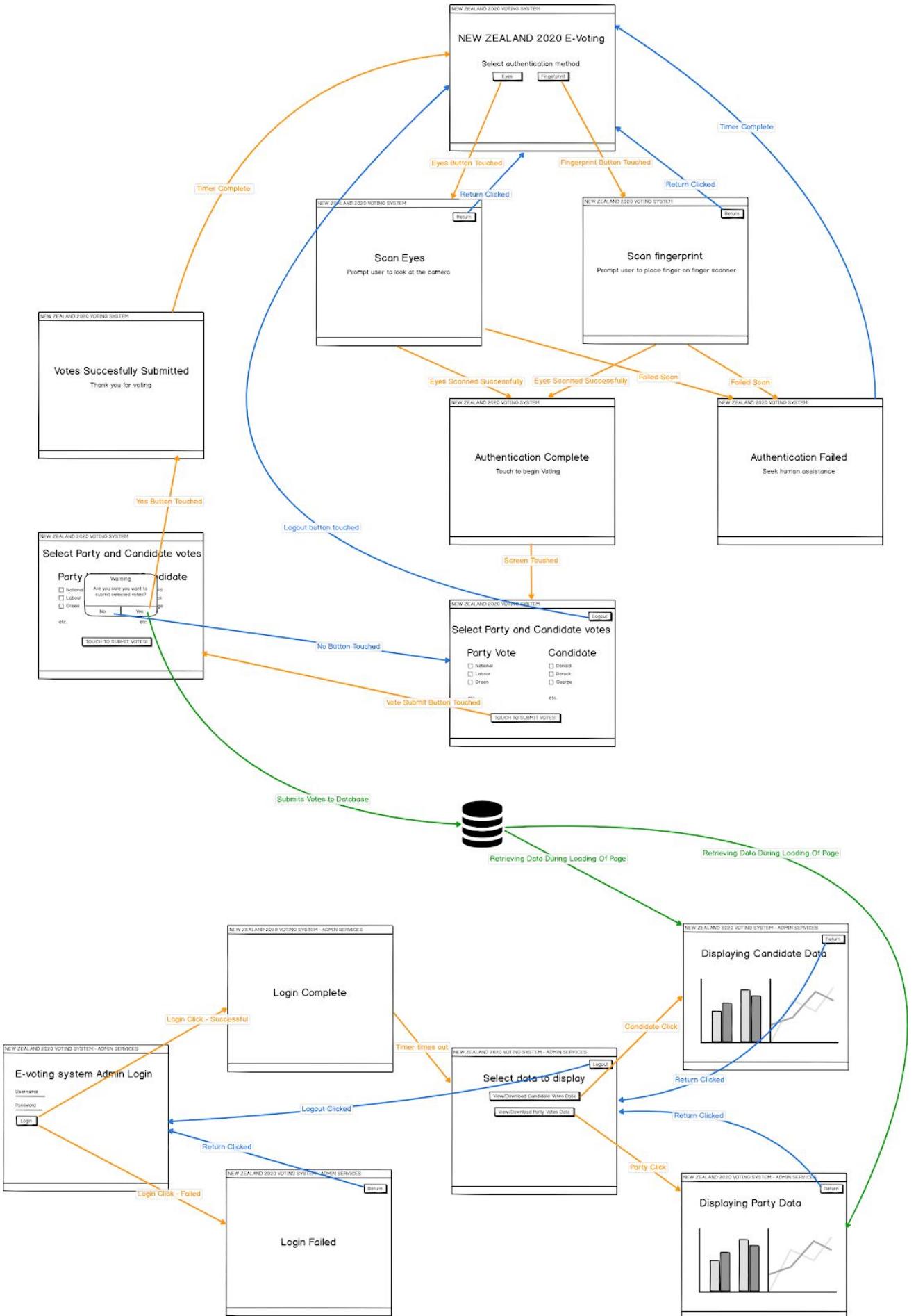
Orange = Advancing in the application

Blue = Returning to a previous page

Green = Database relationship

If it is difficult to read the text I am including another pdf of just the storyboard as quality may be lost when uploading to the google doc.

Storyboard in report on next page... :)



Designed Pages:

Voter Application - Welcome/Authentication selection screen:

Personas: Lower Class Voter & Upper Class Voter

Tasks: Voter Authentication Remote/E-Booth

This page sets the standard for the rest of the voting application. The icons on this page describe to the user what authentication method to select between without having any writing. The icons also have a sense of **aesthetic integrity** by both being symbols of the human body and being blackline designs. The symbols are also buttons which have **direct manipulation**, as instead of touching the icon then selecting the next button below you just have to touch the icon to navigate to the next page. This **navigation method** is effective and provides for simple clear **transitions** that would be easy for anyone to navigate even with very little technological experience. The page is meant to be very clear and simple well and drag your eyes to the center objects which is why their **color** has been differentiated from the background. There is **no user control** to change the look and functionality of the application provided on this page but the user will only be using this application to vote one time so no user control is implemented throughout the entire application. This page has a lot of **alignment** between objects which gives it **minimalistic design** giving the user a sense of **perceived stability** even though there is very little on the screen. The screen is **See and point** as no objects are hidden from sight. The **font** used in this application was chosen to fit with the icons being used and share a minimalistic simple blackline feel.

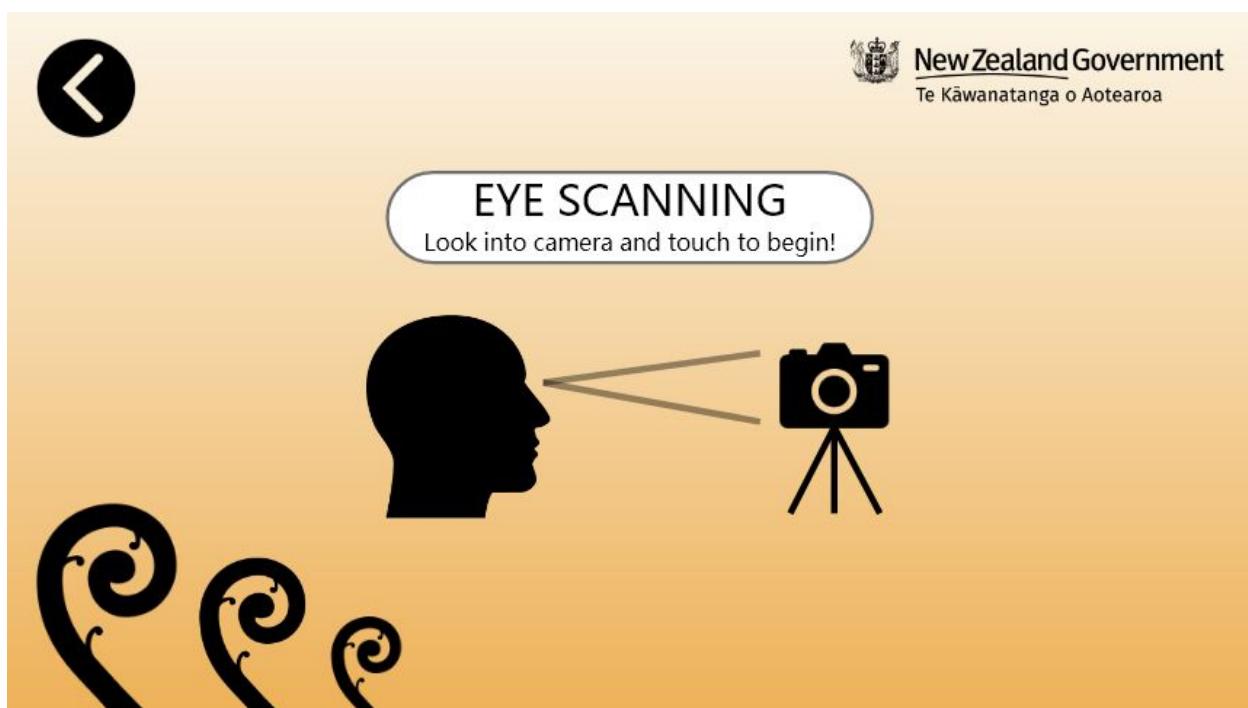


Voter Application - Eye Scanning:

Personas: Lower Class Voter & Upper Class Voter

Tasks: Voter Authentication Remote/E-Booth

This page shares very similar design decisions as the previous page; this creates a sense of **consistency to the application** as a whole. If a user were to be able to navigate to this page from the previous page they will definitely be able to continue navigating as they share the same navigation methods. This page also has a very obvious way to navigate back to the previous page ensuring the design of this **application is forgiving**. Both the design of the eye scanning page and the finger scanning page (shown in the video) is the exact same bar the images shown and instructions which creates a sense of **modelessness** as regardless of the method for authentication the design interaction with the application is the same. **Feedback and dialogue** occurs on this screen as the transition from the welcome screen to this screen will ensure the user knows right away what they have navigated to this page by displaying “Eye Scanning” in the center of the screen. The icons also have a sense of **aesthetic integrity** by both being symbols of silhouetted objects guiding the user on how to proceed correctly. This screen still fulfills **direct manipulation** and **see and point** design principles for the same reason stated in the welcome page.

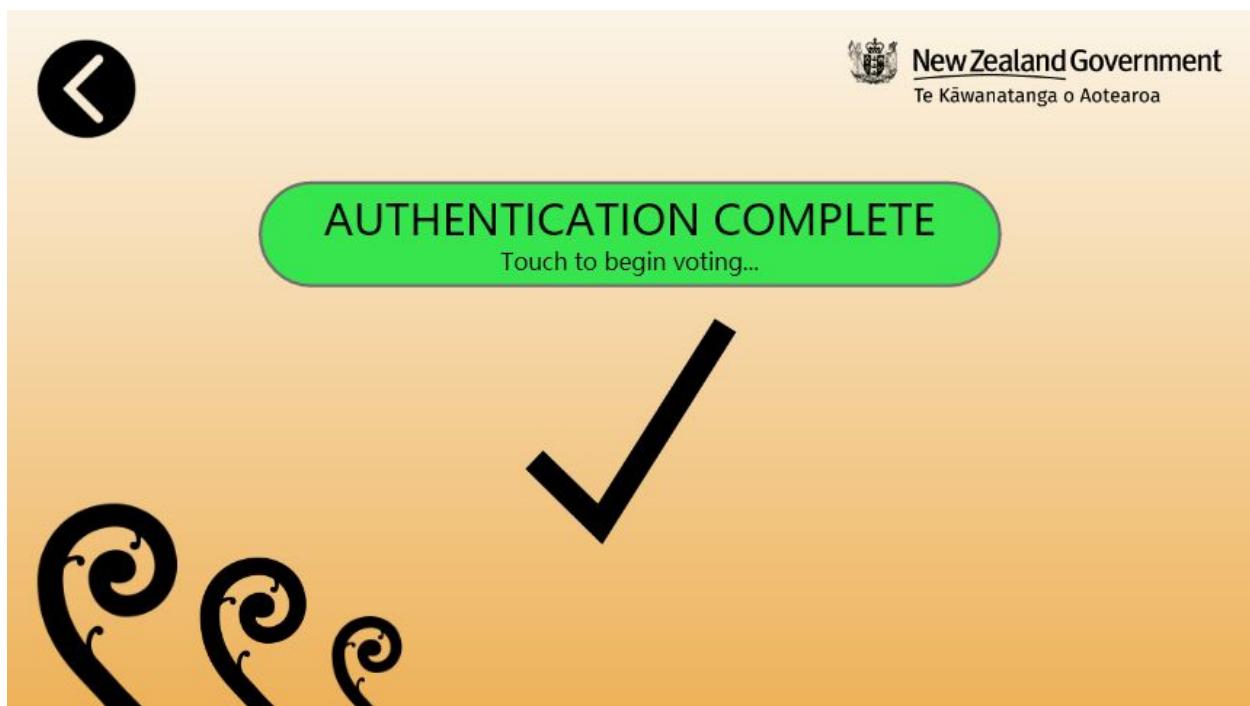


Voter Application - Authentication Complete:

Personas: Lower Class Voter & Upper Class Voter

Tasks: Voter Authentication Remote/E-Booth

This screen is **forgiving** as it provides the user with the ability to return to the previous page. **Feedback and dialogue** is the primary purpose of the design of this screen as the transition from the scanning screens to this screen will ensure the user knows right away they have successfully scanned the required body part and been authenticated to vote. The screen upholds the **consistency** of the application using a thick black lined tick. The notification is also bold and green therefore using the **color palette** to notify the user they have successfully authenticated without even having to read the text below. This screen still fulfills **direct manipulation** and **see and point** design principles for the same reason stated in the welcome page.



Voter Application - Voting page:

Personas: Lower Class Voter & Upper Class Voter

Tasks: Remote Vote Input & E-Booth Vote Input

This screen is **forgiving** as it provides the user with the ability to return to the previous page. The screen upholds the **consistency** of the application using similar colors and white headers to the most important information. The submit votes button is also bold and green therefore using the **color palette** to notify the user where to click once they have selected their votes. This screen still fulfills **direct manipulation** and **see and point** design principles for the same reason stated in the welcome page. Both the party votes and electoral votes use different **color palettes** to differentiate between the two different types of votes. The **layout** of the screen has a consistency in the spacing between titles and lists to ensure there is a minimalistic feel to the design.



Voter Application - Submission Check:

Personas: Lower Class Voter & Upper Class Voter

Tasks: Remote Vote Input & E-Booth Vote Input

This screen shares very similar design decisions to *authentication complete* screen. Though it also has green and red **color** palette choices to help guide the user on their decision.

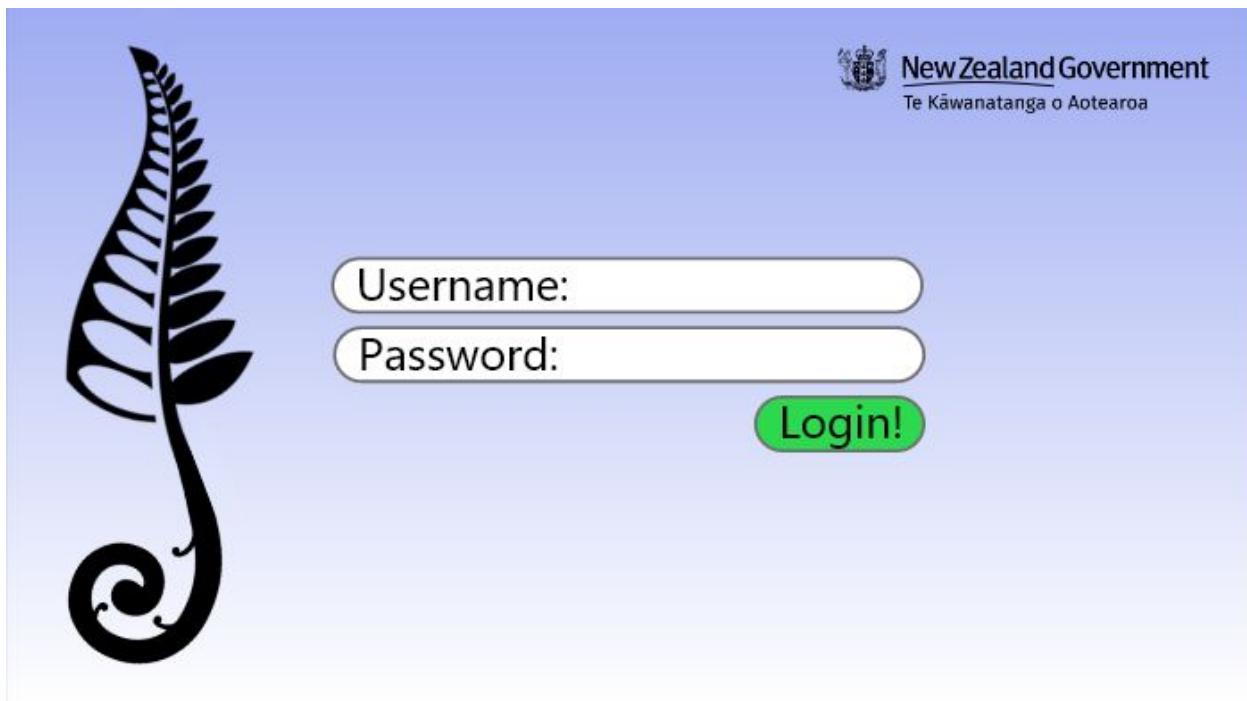


Admin Application - Login Screen:

Personas: IT Administrator

Tasks: IT Administrator Authentication

This screen shares many design decisions with that of the welcome screen for the voter application. Not any new design decisions to talk about. The Fern blended with the Koru graphic is very niceee :D



Admin Application - Data selection screen:

Personas: IT Administrator

Tasks: Voter View Candidates/View Party

This screen again shares design techniques already discussed and can obviously be seen here. Though it also has nice **color** consistency with that of the voter application when referring to party or candidate votes.

I believe this page is very underdesigned but is used in this design process as a placeholder to ensure the system could be represented as whole with both an input and output application. I know a page with this purpose would exist in this output application. Though until I know what my limits are with how to process data it is difficult to completely design. Ideally it would later be designed with a lot more options and complex ways display and retrieve data in different formats.

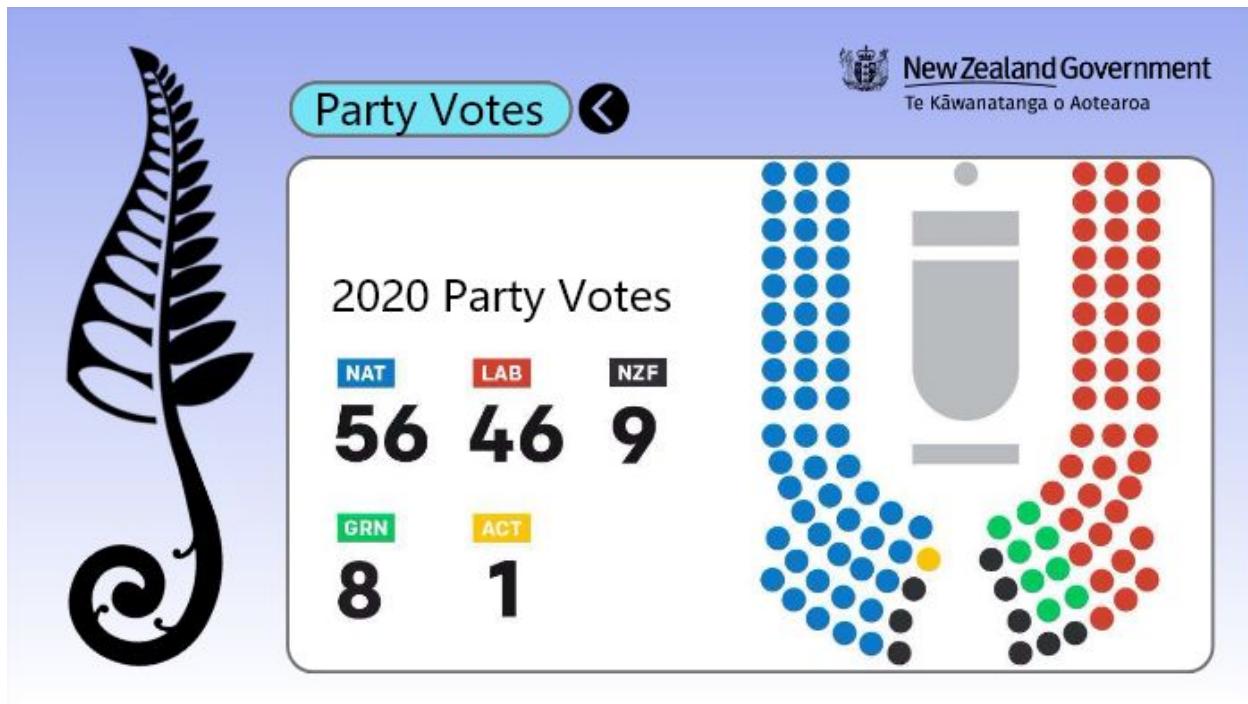


Admin Application - Data output screen:

Personas: IT Administrator

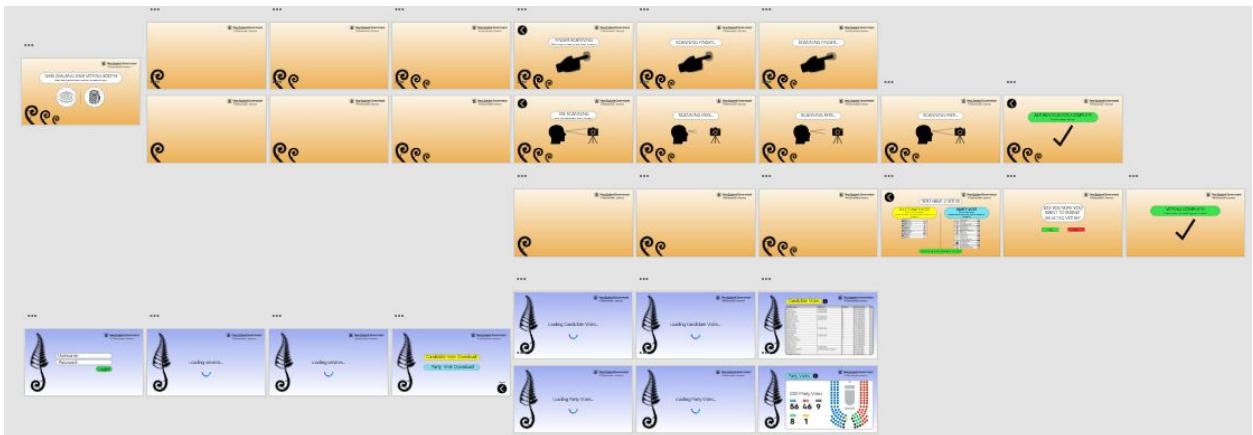
Tasks: Voter View View Party

Shares the same design paragraph as page above.

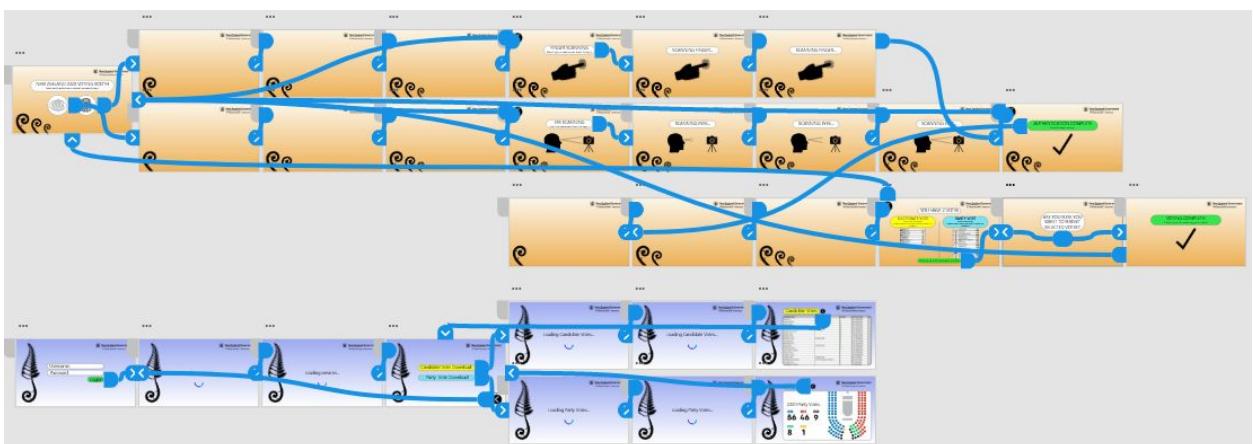


Adobe XD StoryBoard:

No connections displayed:



With connections displayed:



Video of entire application:

Link: <https://www.youtube.com/watch?v=jOh9iuDKdNk&feature=youtu.be>

This video shows the application as designed on Adobe XD in its entirety including loading screens and pages that aren't shown in design pages as they are too similar to pages already discussed.

Reflection:

Well designing this system I learn a lot the importance of storyboarding applications before designing them. I have designed applications before in SWEN 325 which is done with very little storyboarding. This meant there were times the design was not forgiving and the general flow of the application could be poor and sometimes even needed to be changed. This led to a lot of re-coding. I believe storyboarding is an awesome thing to do as it gives you insight into these issues before you code anything. Following a storyboard would make coding applications A LOT easier and make the application more enjoyable to use.

I also think Adobe XD is an awesome piece of software and with more time you could develop entire graphics and animations using photoshop and what not and make fully fledged custom application run throughs. I wish it had more utility for inbuilt scrolling as there are no scrollable options other than making the entire canvas(screen) scrollable.

In regard to the pros and cons of the design I believe the system as a whole has a real image now. Going through this design process made it clear in my opinion you need two applications to make this System a safe and functional voting system. This separation would have been hard to see without storyboarding but became abundantly clear when I wanted a very simple application to meet the needs of the voting users and a more complex application to meet the needs of the IT administrators. I regard to the reason for this separation I also wanted no way for IT admins to be able to input and mess up the results/total vote counts as that is a very easy way to lead to corruption and therefore having a single application for both input and output was huge pro in terms of overall design for this system.

The cons I found were that I should have put more time earlier on into the design process understanding what sought data electoral officials need. As With this information I could have developed a better design for the IT Admin application. Currently it is very bare and although the design proposes a nice template for how it would look, behave and relate to the database I believe there are going to be issues when coding such a system relative to the complexity and need of different types of data/output of results. If all of the needed types of data and functionality of the admin application were known from the electoral officials earlier through more extensive research then I believe I could have designed the application in a more complex manner to tackle these issues that may arise during the design phase so I would be better prepared for the programming side of things.

The extensive design of the voting system with less design of the admin system was the compromise in this design process as the fact I had two personas for voters and only one for administrator (a decision made early on in the design process) meant that it was always going to be further developed than the admin application. If I was to do this again with more time I think I

would really try and think of what side of the system is more complex then focus research more extensively in that area. As for example I do not believe the voter system design would have changed one had I just had one persona for voters focused on lower class voters as upper class voter persona did not really influence the design too heavily. I could not have seen that the design would have to have been so focused around the lower class as the upper class can still use the same system without doing the research though. But if I had foreseen this then I could have used the other persona to instead further develop my understanding of the administrative side of the system and which would have led to a more well rounded and developed system.

References:

<https://electionrunner.com/> - example

<https://www.evoting.ch/en> - example

<https://www.youtube.com/watch?v=ubGAyam5Z48> - E-voting test

<https://www.abc.net.au/news/2017-09-22/new-zealand-election-guide/8967298?nw=0> - Ballot paper half way down this news feed shows the design and color format of previous year ballot papers

https://en.wikipedia.org/wiki/Electronic_voting