

**FIT3162 – Computer Science
Software Project
Final Project Report
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Table of Content

1. Introduction
2. Project Background
3. Outcomes
4. Methodology
5. Software Deliverables
6. Critical discussion on the Software Project
7. A cohesive conclusion
8. Appendix
9. References
10. Contribution Annexation

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1. Introduction

Violence against women is a serious and widespread problem in Australia, however, a lot of the incidence of violence against women is preventable. Therefore, our team is working on a project to develop a mobile application that will help reduce violence/crime against women and increase women's safety in Melbourne.

The United Nations describes violence against women as any act of gender-based violence that causes or could cause physical, sexual or psychological harm or suffering to women, including threats of harm or coercion, in public or private life. Our team adopted the United Nations' description of violence against women as a benchmark to conduct our research on violence against women in Melbourne. Our analysis and research on violence against women in Melbourne includes a variety of sources and data, however, as our project pertains to a very specific issue centred on a specific gender and city the bulk of our research is based on statistics that are relevant to women in Melbourne.

After our team conducted extensive research and analysis on the matter of violence against women in Melbourne we concluded that women's safety in Melbourne is an urgent matter, therefore we decided to work on new and innovative solutions that can be developed to address this pressing issue.

After carefully analysing the data on violence against women in Melbourne our team decided we must develop a product that is accessible and portable so that all women can benefit from our project. Our team decided against developing hardware that must be purchased at a shop or ordered online as our analysis concluded that this will increase the cost of our production thus reducing accessibility for everyone. As we were placing great emphasis on the portability of our product we decided on a web application as it is highly likely that most women carry a smartphone on them, a web application also addressed the issue of accessibility as this reduces the costs related to producing dedicated hardware to host our application. Initially, our team considered developing a mobile application. However, after careful consideration, we decided to develop a web application due to the complexity of completing a mobile application in just one semester. One of the key reasons we decided to develop a web application as this provides the same benefits as the mobile application because it does not require any dedicated hardware and we have developed our application to work on mobile devices.

Our team completed the planning and initial development work for our web application within the first ten weeks of the semester and started the actual development of our product in the next semester. We have used a whole host of API and software development applications that allow us to collaborate and efficiently develop our application. For our project management, we decided on a hybrid of predictive and agile approaches as this allowed us to complete simple yet large tasks in a traditional waterfall approach but did not restrict us from dividing and collaborating in our more complex tasks in developing our application. On reflection, we significantly benefited from following a hybrid approach rather than restricting ourselves to a single agile or traditional waterfall approach.

2. Project Background

Background

As identified by Haun[1] in her research on women's safety around the world, at least 50% of

the world's population faces threats to their safety every day and Women of all ages and backgrounds are constantly dealing with unsafe situations, whether when walking home alone, riding in taxis, or simply existing in public places. There have been many international initiatives by the United Nations and national and state-level initiatives within Australia and Victoria to address the issue of women's safety however there has been very little progress in mitigating this pressing issue of women's safety, especially in Australia. It has been accepted by all Australians that more needs to be done to address concerns about women's safety in Australia and around the world. Our team's hypothesis for the failure of many projects and initiatives that were conducted to address the issue of women's safety was due to their general nature, we must account for the diversity and differences in many different countries and even cities within those countries for a project such as women's safety to succeed. Therefore our team is working on a project that is specially catered to women who reside in Melbourne, we will devote all our time to researching an issue that stands in the way of successfully addressing the concerns around women's safety specifically in Melbourne and the solutions will be catered to address their concerns considering their specific circumstances.

As our team project pertains to a very specific issue of addressing women's safety in Melbourne our research was centred around statistics of violence and crime against women in Melbourne. We used a variety of sources to get data that concludes that there is a disproportionately high number of women who experience violence/crime in Melbourne as compared to men. Surveys and polls conducted by independent organisations point to the fact that women feel more unsafe in the Melbourne CBD after the pandemic and this is a symptom of a larger issue that points to the fact that efforts to boost women's safety in Melbourne have not borne fruit.

As identified by The Age[7] for many women in Melbourne, it now comes at a very heavy cost. For many, to feel safe is no longer a given or a reality. The alleged horrific attack last week of a young woman in Melbourne's north makes that all too clear. There are many more incidents that don't get publicly reported, some shockingly brutal, many brazen in their everyday occurrence - unwanted harassment on a tram or at work. They all matter. They all make women feel unsafe, degraded or humiliated. But after each terrible attack, after each #MeToo moment, after each court case, the public focus is fleeting. People move on.

Melbourne appears unable to break the cycle. Unable to make it an everyday problem - one that needs to be tackled not just when it is more horrendous than most or catches the media's attention, but every day, and night, of the week. This a problem not just for police and politicians, but every company, sporting group, volunteer organisation and community group.

Melbourne needs to do more. Not just to tackle the spate of horrendous attacks on women during the past few years, but at the everyday level of women facing harassment in their daily lives on public transport, at work, or going out at night. The state government has made a start, setting up the authority Respect Victoria to combat family violence in particular, and more generally harassment of women. That should only be the start. Fixing an everyday problem requires all facets of society to commit to tackling the issue. It's time half the population in Melbourne stopped paying the high price of fear.

Rationale

Our team understands that there are many projects and initiatives internationally and within Australia at the government level and private levels, we believe the only way to address

pressing concerns such as women's safety in Melbourne are only possible through new and innovative ideas. Our team intends to enrich all the current projects and initiatives that are underway to address the safety of Women in Melbourne. What makes our project innovative is the emphasis on the portability and accessibility of the system that we are developing. The rationale behind our project is that violence against women is a serious and widespread problem in Australia. But violence against women is also preventable and to prevent violence against women we need to understand it. Our team has based every aspect of our project, its research and the final application that we want to develop on the premise that to prevent violence against women we need to understand it, we have researched to understand why violence against women occurs more than violence against men and why women feel unsafe in the Melbourne CBD. We believe that the first step to developing a successful product to address pressing issues is to understand the issue first and therefore we are confident that we have an innovative solution to address the concerns around women's safety in Melbourne.

The need for a women's safety and panic alert app is, unfortunately, increasing in current societies across the world. One of the biggest roles that have been played in ensuring the safety of women, has to be the digital transformation and advancement in technology. Especially in a world where 3 out of every 5 people have smartphones and use dozens of mobile apps every day.

Our Web app is an exceedingly useful alert and response solution based on tracking the location and providing safety indicators for each suburb. The app's best features and functions are that it works on all mobile networks. Works on virtually all smartphones with GPS in them, which almost all smartphones already have [6]

Research conducted on Women's safety in Melbourne

There has been extensive research conducted on the topic of women's safety in Australia and around the world, to truly understand the violence/crime that happens against women in Melbourne we must first identify similarities and common themes across many different countries and states when it comes to women's safety. The extensive research conducted by the organisation Our Watch gives us great insight into the unfair and tough situations that women in Melbourne have experienced. The research concludes that Violence against women is a serious and widespread problem in Australia. But violence against women is also preventable. To prevent violence against women we need to understand it.[2] Only when we get a deep understanding of the safety concerns that women have in Melbourne, can we develop concepts and applications that will help address those concerns. Therefore our team made the initiative to first get a deep understanding of violence against women through carefully identifying statistics and data from surveys and polls, this is what makes our project innovative as we can accurately address all the concerns women may have when it comes to their safety in Melbourne, especially in the CBD.

Our analysis and consideration were primarily based on data from surveys, polls and statistics. Data shows that there is a disproportionately high number of women who experience violence/crime in Melbourne as compared to men. The following statistics highlight what women in Melbourne experience:

- On average, one woman a week is murdered by her current or former partner[3]
- 1 in 3 women (30.5%) has experienced physical violence since the age of 15.[4].

From this we can conclude that women's safety is an urgent matter, therefore new and innovative solutions must be developed to address this pressing issue. There are many new

initiatives underway to help increase the safety of women in Melbourne, one of the most prominent initiatives is the increase in funding by the state government to improve women's safety in the CBD at night.[5] Almost 1 in 10 women (9.4%) have experienced violence by a stranger since the age of 15 and evidence from many surveys also shows that women feel unsafe in public [3].

The careful analysis of the discussed data is one of the primary reasons that our team wanted to develop a platform that will be portable, this is the reason why we ensured that although we are no longer developing a mobile application we will optimise our web application to work with mobile devices. Our team's core objective to enrich all the current projects and initiatives that are underway to address the concerns around the safety of women in Melbourne has still been maintained throughout our changes. What makes our project innovative is the emphasis on the portability of the system that we are developing and we want to ensure that this remains consistent.

Literature review conclusion

Our team concluded through careful consideration and analysis of the diverse data gathered by many different organisations on the concerns women have over their safety and the violence/crime they face in Melbourne, that we must build an innovative system/application that is both accessible and portable for optimal benefits. Although initially, we intended to develop a mobile application, we decided against this due to the complexity of implementing a mobile application within one semester. However our team wanted to ensure that we provide the same benefits as a mobile application, therefore we decided to implement a web application that can also be used optimally on a mobile device. The core function of our web application is to provide our users with a map that will display four indicators on the map by suburb:

1. Severity of Crime
2. Perception of Security
3. Residents Kindness
4. Comprehensive Safety

3. Outcomes

a. What has been implemented?

For our application, we have implemented a database to store all the crucial data required by our web application to display accurate information about the 4 different indicators on the map. We successfully implemented the location tracking feature that allows the user to see their own location on the map. One of the most important security features of the web application is a secure login and accounts service where the user's login details are securely stored, our team implemented this by creating a database that is responsible for securely storing the user's personal details. Our website was implemented to be very user-friendly as it provides the users with a section to understand all the services provided, a dedicated contact form that will send the user's queries to the website management team to reply and another section that describes the rationale behind the website. We have implemented an interactive suburbs list that provides the users with information about the suburbs from the Victoria state government site and a map.

b. Results achieved/product delivered

Our team managed to achieve excellent results from our web application development and were able to successfully deliver our finished product in a timely manner. Our team had decided to follow an agile strategy for the development of the web application as it is a large project, we decided to divide our program into smaller tasks that can be delegated to each of us. We broke down our program by creating functions and subroutines that were assigned to each team member. At the start of the semester our team created a wide range of unit tests for the JavaScript code, we used these unit tests to measure the successful completion of an assigned task. By week 9 of the semester, our team was at a point where we had passed all the test cases for our program and thus we had successfully completed the web application development and obtained excellent results. We had set two core products that had to be delivered by week 9, the database and the web application and we had successfully delivered both of them before the deadline.

c. How are requirements met

The critical requirement for the success of our project is to ensure that our product is accessible. The main two requirements to ensure the accessibility of our product are to ensure that it is portable and free. In order to meet the requirement of portability our team ensured that our web application was optimised to be used on mobile devices, this way users will be able to access our site on their mobile devices at any place and anytime. Another key requirement to ensure the accessibility of our product is to ensure that our product is free to use, the way this requirement is addressed is the same as if it was a mobile application.

d. Justification of decisions made

Initially, we intended to develop a mobile application but we decided against this due to the complexity of implementing a mobile application within one semester. However our team wanted to ensure that we provide the same benefits as a mobile application, therefore we decided to implement a web application that can also be used optimally on a mobile device. Our implementation requires a large amount of data to be stored such as users account login details, crime data and suburbs data. Due to the requirement of having to save a large amount of data, our team decided to develop a database to efficiently store all the required data.

e. Discussion of all results

One of the key reasons our team was able to attain results of a high standard was due to our project management strategy and the project management tools that we utilised. As discussed in the methodology section, our team utilised a hybrid project management approach of agile and waterfall and this allowed us to divide up the complex tasks into simple bits and delegate them to each member on the basis of their strengths and competencies. However, our hybrid approach to project management did not restrict us from following the traditional waterfall model for simpler tasks that could be assigned and completed in one go. Upon reflection one of the best decisions we made for our project management was following a tailored approach that will work for our project rather than using a predefined agile or waterfall approach as this created a lot of flexibility to make changes in our project and efficiency while working on the coding tasks or assignments.

f. Limitations of project outcomes

One of the key limitations of our project is that it lacks a dedicated application that can be downloaded onto the mobile phones of the users since we changed our initial approach of implementing a mobile application to a web application. Another key limitation is that our location tracking system does not work without a stable internet connection. The way these limitations could have been addressed was to implement a dedicated mobile application that will be built into a hardware device and implement a GPS or satellite system that can be used to track locations.

g. Discussion of possible improvements and future works

One of the key improvements or developments for the future that we have identified is to develop a dedicated mobile application that will be built into a hardware device and implement a GPS or satellite system that can be used to track locations.

h. Critical discussion on outcome

Our team had a very successful project outcome and we were able to finish all our work ahead of time. We believe that we had a successful outcome because our project was very efficiently managed. Our unique and tailored approach to project management by following a hybrid of agile and traditional waterfall approach was the main reason why our team was able to maintain very high efficiency and successfully deliver our project outcomes ahead of schedule. One of the best decisions we made was to switch our initial idea of developing a mobile application to a web application and do it very early on in the semester, this allowed us to develop a successful application as we were not doing anything that was above our skillset.

4. Methodology

4.1 Plan of Design

In the last semester, we discussed how to effectively protect the safety of women in Melbourne. One in three women over the age of 15 in Melbourne has experienced violence. Making these women feel safe in their living place requires visual data. And solutions to crises. For these women to feel safe in their homes, there needs to be visual data on how safe each place is, to predict the avoidance of violence. And for unpredictable crimes, we also need to have solutions for crises. Based on this, our initial solution was to develop an IOS mobile software. Because we have no experience in software development. Developing IOS apps makes it easier to version control.

We start with two project goals or project requirements, the first of which is the distress button. The Distress button is originally designed to be a button that will be displayed on the screen which the user can hold down if they are walking down an unsafe street and if the button is let go, the application will share the current location with emergency services unless the password is entered within five seconds. And the second one is a safe and risky zone with the Melbourne CBD displayed on the map. The application will display locations on a map that users should avoid as they are risky due to the high crime rate, or a recent violent crime incident that has happened there. All of the above is the design of our project in

the FIT3161/FIT3163 course.

Based on this design, we learned the required skills by ourselves during the winter vacation, such as Xcode, swift and Dart. But as we learned more, we found that developing mobile complicated our projects. Because the core of our project is to collect data and present it to the user in a visual form. We need to build a database to hold our information, and this information needs a PHP web page to pass to our mobile software. So why don't we just create a mobile-accessible website? This can greatly reduce the amount of knowledge we need to learn on our own and achieve the same project requirements. In other words, it saves a lot of time.

We discussed the idea of changing the project requirements in the first week. And all the team members agreed that this change was necessary, otherwise, we might not be able to finish our project within the deadline. Because of this change, we decided to define the most important goal of the project first, and all work will be reset to achieve this goal. We felt that our first project requirement was to analyse the data and present it to the user in visual form. This is similar to the second project requirement we covered in the FIT3161/FIT3163 course. But in this design, our statistical scope became 11 suburbs of Melbourne which not only include Melbourne CBD. The increase in statistical data makes us focus more on the data processing part.

4.2 Final Implementation

First of all, we need to build up a database with enough supporting datasets that follow our project requirements of constructing a reliable system. What we have collected, is the suburbs information from Victoria's government website with a static PDF map and the floating and fixing population of the area; the Crime data of each suburb of Melbourne, where the relevant information can be found on the website of Crime Statistics Agency Victoria; the data of the social indicator of Melbourne which describe many indicators about Melbourne, and we extract the parts that involve the safety and female as our dataset, and the data is from the website of data of the city of Melbourne. After the collection, we then processed the data in the format we needed in recent years. For example, we've divided crimes into five categories based on their level of harm to women: Crimes Against Person, Crime Against Property, Inchoate Crime, Statutory Crime and Financial or Other Crime. Then we store these datasets in the database which is Mysql in the XAMPP bundle. The Choice of MySQL has the advantage of inside-build SQL functions instead of writing the SQL commands and we could not remember the commands clearly. By using the XAMPP bundle, it is convenient to import data from the database to our website. Then we need to build a website to present our content to users.

About building a website, we have to say our back-end and front-end. The back-end is the server side, which is used to receive the request from the client and transfer the data from the database back. It is implemented by JavaScript using Node.js which imports Express and Mysql modules. The front-end is the client side, specifically, the website, which presents all the appearances and features of the software. The website contains many pages, and each page is linked to local js files to achieve the required functionalities on the page. For instance, the map page is connected to Google Maps, which is created in map.js, and also all the methods of controlling the map like location tracking, zooming on the suburbs and so on. The website is written in HTML, and it also uses the bundle of bootstrap to doctorate the appearance of the website we applied the online template with styles for each aspect of the website.

At the end of the website construction, we needed to test the software from each part to the integration, and we used a machine test of our website functionality by using the framework Jest and the required-promise module installed by Node.js. While the usability test was

conducted manually by a third party, from another student. After we finished every test, we clearly understood that there are many limitations and problems in our website that can be improved in our future work.

5. Software Deliverables

5.1 Summary of Software Deliverables

i. Description of Deliverables

Following the project requirements of creating an easily accessible and portable software that can be used in the mobile platform, we now have achieved this goal through the explanations from the outcomes section, in which we have designed and developed this software, a dynamic website with multiple interaction abilities. Thus, what will be delivered, including different aspects.

The full source code was written under the back-end framework of Javascript with Node.js, and the front-end was the pure HTML website structure. The website design and layout were mainly imported from BootstrapMade, an online free open-source website template site. (BootstrapMade site, 2022). But, all functionalities were built by ourselves, which require high-level customization based on our requirements of features. Some code may refer to the official source of the tutorial, such as the implementation of the Google map, and we customised this map by only displaying the selected 11 suburbs in the Melbourne CBD, which required me to register a personal google map account that is charged for a fee but has a free trial, and I get the individual map Api by designing the display of map and import the API to the project.

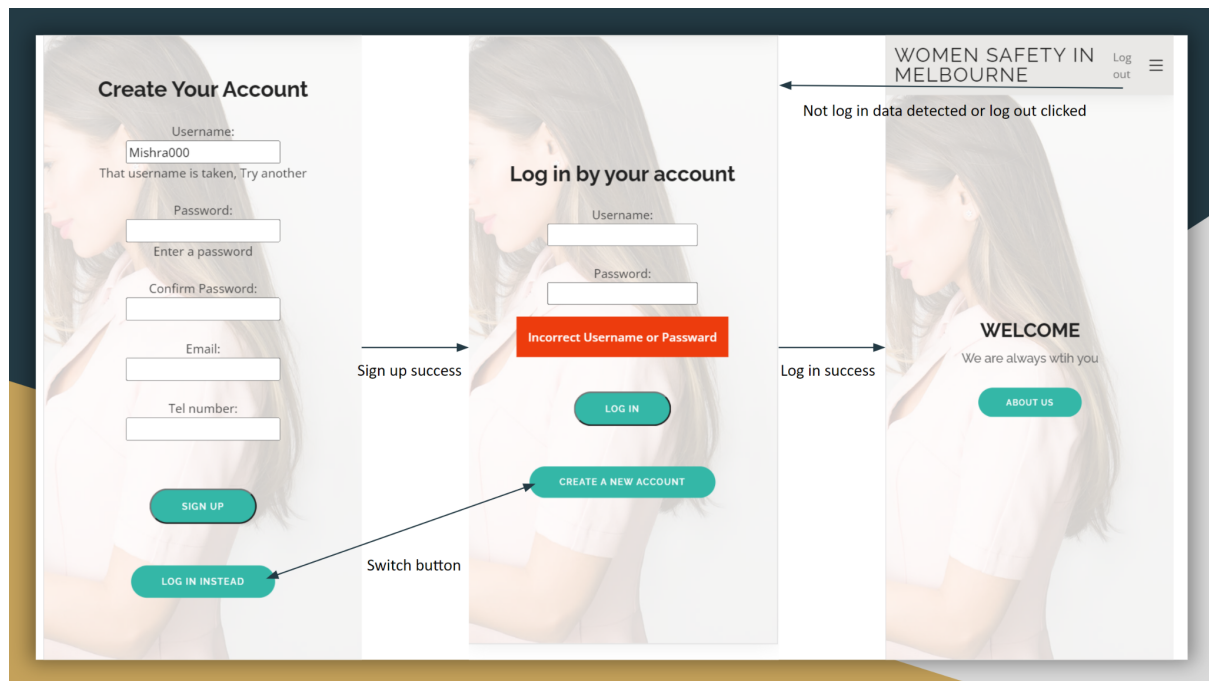
The library only involved a database that we have used the bundle application XAMPP to host the MySQL database and store all the website data. Then we created some tables corresponding to each set of data, such as the crime incidents, suburb descriptions, and safety questionnaires. Now, the database also includes some tables only for testing, which have duplicated the same data. In the project, we installed the MySQL command to the software code so that it could link the database to the server.

The main content of the deliverables in this project is pointed to the well-designed website interfaces and pages, which serve different purposes. In this project, we define a full deliverable as a page or a suite of pages with several interfaces, which can execute some functions to reach a certain purpose. Then we classified these website deliverables by their usage and named them to be: User account, About us, Suburbs list, Map, Services, Contact us, and they will be further explained in the following section. The website we have not published it to the Internet, so we only made it to be hosted locally in a specified URL.

Additionally, in the designing principle of portability that can be accessed in the mobile phone platform, we managed to enable our website to adapt the mobile phone in small screen resolutions. Thus, mobile phones can also view the website with a good user experience.

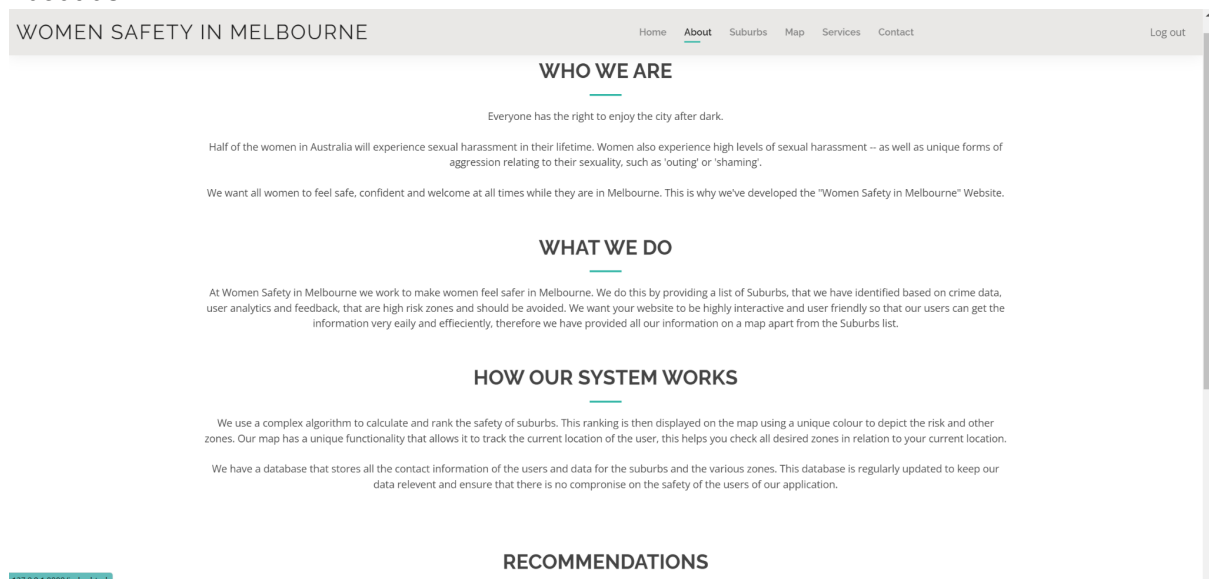
ii. Samples of Software Usage

In this section, we will introduce the main software usage in terms of each website deliverable. User account:



This usage aims at account management, which includes three features on pages: Sign-up, Log-in, and Log-out. In Figure 5.1a, it shows an internal logical cycle in the website about these three features. When the users enter the main website page by the given URL, which points to the home page, the system will detect whether the user has logged in before, by checking the browser stored data of that user. If it finds the data, the user can enter the home page, otherwise, the page will jump to the Log-in page. The log-out button on the home page binds a function, which clears the stored logging data and reloads the page, to achieve the feature of log-out. Users can click the button to switch between the pages of Log-in and Sign-up, and both pages have a function that sends a request to the server to check whether the user inputted data matches that in the database and verify the input format like checking the existing usernames to prevent signing up duplicated usernames.

About us:



The usage of about us is the introduction of the software and the developer team. If new user wants to learn more about the web application we created, they can navigate to the "About" section of the website. Users will be able to learn more about the rationale behind creating the website, the basic idea behind the content the website offers, and how

the system works. The three developers of this project also offered their suggestions for the website and its purpose.


Suburbs list:

WOMEN SAFETY IN MELBOURNE

HomeAboutSuburbsMapServicesContactLog out

Carlton

Carlton is a lively suburb, well-known for the Italian cafes and restaurants of the Lygon Street Italian precinct. It is also known for its Victorian buildings and leafy parks and gardens.



Lygon Street Italian precinct

The City of Melbourne municipal boundary includes all of Carlton and parts of Carlton North, comprising the historic Melbourne General Cemetery and Princes Park, home to the Carlton Football Club.

Carlton is a diverse suburb. Growing beyond its largely Italian residents, these days Carlton has a greater proportion of residents from eastern Asia, south-eastern Asia and India.

It also has the second largest population of our municipality. Many of Carlton's residents are local and international students who attend the nearby University of Melbourne and RMIT University.

As well as entertainment, cultural and leisure activities, Carlton has educational, business, retail and residential facilities. Carlton Gardens contain the contemporary Melbourne Museum and the domed 19th century Royal Exhibition Building that has World Heritage status.

Carlton Maps

City of Melbourne Suburbs: Carlton
City of Melbourne Suburbs: Carlton North

On the page of the suburb, the usage is to present the detailed information and data that contribute to the safety in the area about every suburb in the range of Melbourne CBD we covered. The suburb page is composed of a collection of 11 pages to describe each suburb respectively, by selecting a certain suburb to switch to the corresponding page of that suburb. The source of the information about these pages is directly retrieved from the Victoria Office website of Melbourne, which also provides maps in PDF form for every area in the suburbs.

Map:

Buttons for showing the categorised data into the map by classes

Severity of CrimePerceptions of SecurityInhabitants KindnessComprehensive Safety

Index with colours

LowMediumHigh

MapSatellite

Current location tracking

Clickable choropleth map in the range of Melbourne CBD coloured by the Indexes of each Indicator class

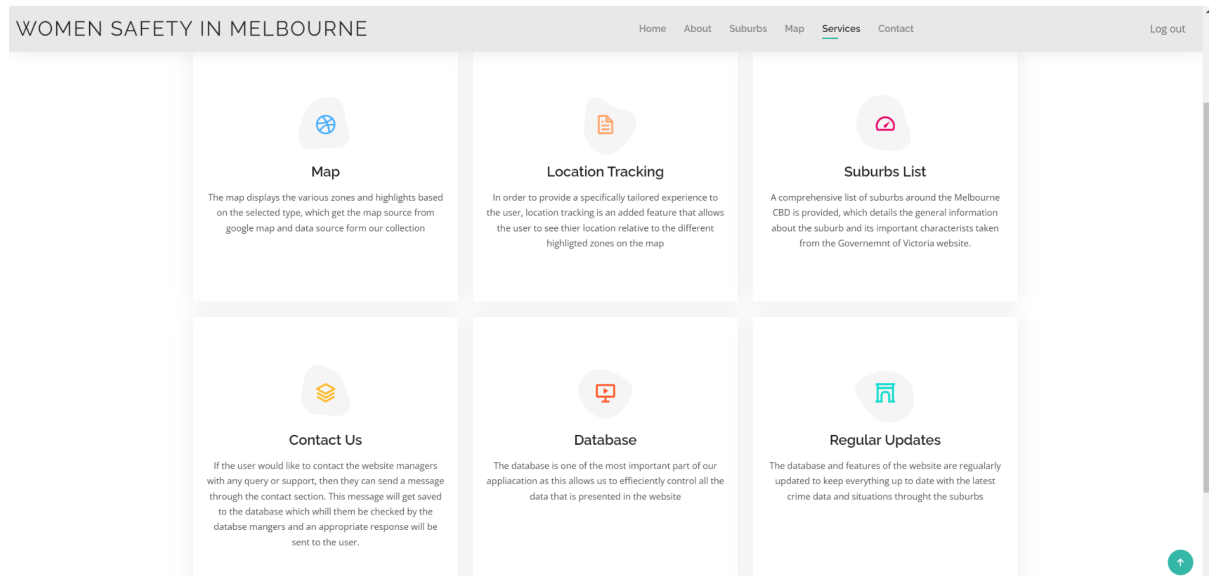
CarltonCarlton NorthDocklandsEast MelbourneKensingtonFlemingtonMelbourneNorth MelbourneParkvillePort MelbourneSouth WharfSouthbankSouth YarraWest Melbourne

Buttons for directly locating to the target suburb and zooming up the map

This is the most significant feature of the website, its usage takes up different features of map interactions. As we mentioned, the map implementation is via Google map with our customisation, so we have added several functions according to the requirements like Location Tracking, Display Specific Suburbs, and Display Indicators. It displays a clickable

choropleth map based on the dataset we collect for a category. We can select the top buttons to show the map with different colours. To access the location tracking feature, after clicking the "Pan to Current Location" button displayed at the top centre of the map app, and allowing the popping of a request of the website wants to know your location, the map will go to your current location and check whether it is in our service range.

Services:



Services usage is for providing users with a comprehensive overview of the web application and its various capabilities. This section is helpful for new users who want to learn about the different services offered by the site and get detailed information about them. This web page is very attractive, its design is simple, and it provides 6 different rectangular tabs that are highlighted when the mouse hovers over them, each tab gives details of a unique feature of the site.

Contact us:

If users have any queries, questions, or any other information they would like to convey to the site manager, they can contact the site manager. Users can contact the site administration by navigating to the "Contacts" section of the site and filling out a form, which will forward their information to the appropriate place. We will collect the sent information from users into a database table, and regularly check that table of the added messages. Alternatively, users can also use the website displaying any other contact information, such as the location, directly send an email or call the number to get in touch with us.

5.2 Discussion of the Software Qualities

The website though can perform normally and meets the expectation in general circumstances, however, if we want to know its software qualities, we must consider multiple capabilities of the software in different situations.

i. Robustness

Robustness is the property to measure the ability to tolerate perturbations that might affect the system's functional body. We referred to the method from Zhang, Ruan, and Fieldsend (2022) of testing the system to resist change without adapting its initial stable configuration, as we have done the performance test in the Test report. In the performance test, we conducted this test by changing every value in some applicable datasets to a common number, such as in the crime table, every incident is 50, see Figure 5.2a. As the result reflected in the website, see Figure 5.2b, we can obviously see that the two choropleth maps display different colours in a layer of 11 suburbs, and the map of replaced data presents all the suburbs with the same index which meets the expectation of common value in the replaced dataset. Therefore, the performance test proves the robustness of the software to some extent, which changes the software body of data and still receives the expected performance.

ii. Security

In the study of website security from Hammoudeh, Alobaid, Alwabli, and Alabdulmunim (2021), they listed the most common threats of cybersecurity, and websites always face these threats, which is considered a big problem. By our understanding, the greatest potential hazard of the project should be in the database, which collects every user's information and messages. However, by our technical ability, at most, we are able to do that to prevent direct access to the database and each user can only read their own data, which may not reach the secured standard in the study of website security.

iii. Usability

In Nasir, Ikram, and Jalil (2020) researched inspection of the usability from the novice and the expert and the summary that the website should consider both types of users to obtain better usability. In our test report, we have tested the usability as well, see *Figure 5.2c*. By testing the three properties: Ease of use: This tested how simple the website is to use for a novice user; Bugs: This tests to check if there are any bugs that our other testing may have missed; Browsing time: This checks how quickly tasks can be performed by beginner users. Then we found the limitations and the improvements revealed by the usability tests to update the interfaces in pages.

iv. Scalability

Sharma, Roy and Raj (2021) created a scalability analysis for the Internet of things, including the website, which examines the scalability as well as a performance measurement to determine the extension for the software. In fact, our project has not been considering further scale extension of service, which is also a problem mentioned in the test report. If there is a large amount of access happening at the same time, the database server may not support some extreme situations and has the potential to break down.

5.3 Sample Source Code

In this section, we will briefly demonstrate source code from the aspects of Javascript and HTML, according to client and server requirements. The cut of code is presented in the appendix.

In code 5.3a, this is the core part of the software, the hosting of the server, which uses the Express module to create the application of the server named app by `const app = express();`, with the port in 8080, `const port = 8080;`. Then the app uses a static method `app.use(express.static('public'));` to load the resources under the public folder, which is the location for every HTML file. Next, the app uses the router named user `app.use('/user', userRouter);` which imports the contents of the router and can be hosted together. The next method is to handle the error, when the incorrect request is the server received, it will raise the server error. In the final line, it set up the app to listen to every event or request directly to the port, to start hosting the server.

In code 5.3b, here is the router exported to the server, and it is connected to the database via the Pool module `const pool = require('../pool');` and listening to all database access requests as the router `const router = express.Router();`. In the router, we made several with vents, but with this code cut, we only present 3 request events, which are register, log in, and get crime indicators. Firstly, in the register event, the router listens to a post method request with parameters (`req, res, next`), corresponding to the received request, sending back result, next step of error. Then `let obj = req.body;` to be the request content, and `let sql = 'INSERT INTO users SET ?';` to be the SQL command that used to access the database. In the next line, it will fill the missing `?` part in sql by obj, and use this complete command to access the database and get the result. If an error occurs, it will use next to handle the error by sending it to the application and seeing it as the server error. Then once a result of database access has been obtained, it will verify it by `result.affectedRows > 0`, to test whether it affected more than 0 rows. If this is true, it will send the true result `res.send('1')`, otherwise it will send the false result `res.send('0')`. Similarly, a log-in event is also a post-method request with the same function, but the difference is that its request content contains several items and should be an array, and the SQL command selects based on these items, and the result that needs to be sent back is not only the true but all the found result. While the third event about the crime is the get method, which requests all the data in the crime table, so it doesn't have the obj with request content.

In code 5.3c, it is the HTML code of every header of the website. Briefly speaking, it is the list of our 5 main pages, which are the href symbols that enable users to click and jump to a certain page. Each block of the box has a class and id, which is the method for controlling the style of the whole website. In the style of this header, it needs to automatically adapt the phone viewing appearance. What we have done is that, on the desktop, it behaves as normal, but on the phone, it uses `@media (max-width: 991px)` to detect, hides the list of the navbar, and displays the content in mobile-nav-toggle, an expansion bar for mobile only.

6. Critical discussion on the Software Project

6.1 Deviation in the Process

In discussing whether our project process was deviated, we made a careful comparison between the current project process and the original design. In general, our way to finish our project is different, but we achieve more desirable results and meet the requirements of the

project. In the course FIT3161/FIT3163, our original intention was to develop an IOS mobile software, but in the end, our outcome was a web page accessible by the mobile terminal. But if we read our initial plans carefully, we can say that both achieve the same goal. The reason for this is based on the initial functionality requirements of our design for the project.

In our initial design, we designed five features for our IOS software. First is the location tracking ability, which can let us track the user's location. Now the web side can also be used to complete the command easily. Second is the location risk evaluation, which is also done well in our project. The third feature is the User comment module, and we also meet the requirement. We have done all the main functionality in our initial design except the distress button functionality and the following functionality, emergency call. The reason we dropped it was that if the user was constantly worried about mistakenly touching, This makes users anxious, which is contrary to the purpose of our project. So instead of developing IOS software, we actually did all of our design. If we hadn't changed our project requirements in time, we don't think we could have achieved such a high degree of completion since we still can't skillfully master the use of swift, dart and Xcode.

However, we realised that the biggest difference between our project and the initial plan was the Test plan. We had no experience with large project tests, and we had no knowledge of Unit tests when we completed the initial design report. This creates a very big problem for us. The reason is that the Unit test was not carried out timely when completing each part of the task. Making it very difficult for our code to Unit test after merging. We had to tear the code apart again and redo the Unit test. Even though we've done an Integration test. The main reason we think we deviate from our initial plan is usually lack of relevant experience. When we found problems, we made timely corrections, which helped us finish the project smoothly.

6.2 Thinking about Team Management and others

After a 12-week project cycle, we found out that timely and effective communication was the most important way to promote the project during the development process, especially in a small team. This has greatly improved our ability to solve problems. Keeping other team members informed of their progress will save a lot of time. The situation where a team member has completed a personal task and waits for other team members will never happen in our group..

Solving problems depends on communication, and finding problems depends on how the project is managed. Our project management approach is a Hybrid approach of agile and waterfall. We think our approach to project management is very suitable for us, although we still make serious mistakes in the operation. This mistake refers to the fact that we did not conduct deeper research during the initial design of the project. In the course of FIT3161/FIT3163, we searched for materials and self-studied relevant knowledge many times, but we never realised that our design was difficult to complete. In areas where we lack experience, we cannot accurately calculate the cost of our time. The problems with the first design also made us very cautious about making changes to the project later. We think more about time and money costs and try to reduce them. On this basis to design reasonable project requirements.

And we also realised that in the winter vacation after the completion of the initial plan, we only had 3 group meetings and did not find the problems of the project in time. And identifying problems too late means that much of the work done before the problem is discovered is useless. So for the next 12 weeks we actively adjusted. Twice-weekly meetings keep us on track. At the same time, the end of the holiday also made the communication between the group become more frequent. So for the next 12 weeks we actively adjusted. Twice-weekly meetings keep us on track. At the same time, the end of the

holiday also made the communication between the group become more frequent.

The final problem is the code testing. We wrote the code without thinking about unit tests, which made our code very difficult to extract and do the unit test. In order to remedy this problem, we discussed and ultimately decided to rewrite the similar code for important parts to unit test them. This is also an unexpected problem. We didn't have the knowledge and experience to design the unit tests, so we let them flow to the end. This also has a lot of impact on the follow-up work. The immediate result is that the test task is extremely complex which leads to the task of each member being very heavy when submitting the test report.

On the whole, we consider our project a success. In terms of project outcomes. We completed the project requirements we designed, although we used web pages instead of IOS software development. At the same time, we actively adjust our problems. In terms of teamwork, the participation of the whole group is very high. The communication between team members is also very efficient and frequent.

7. A cohesive conclusion

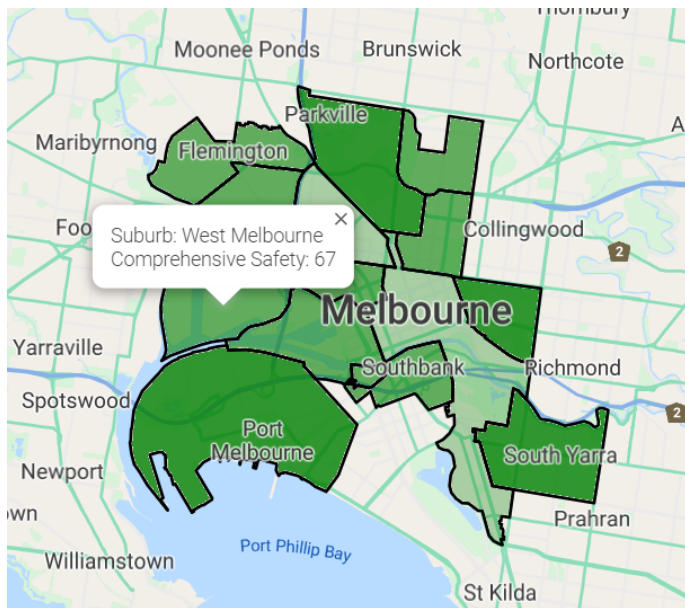
The project now is at the end stage of project closing, which means we have completed all the set goals, and are improving the software's qualities and user experiences. The software behaves well in the deliverables of the website which has nicely shown the properties of easy accessibility and portability on mobile devices, as it meets the project requirements. From the aspect of team management, experienced over the whole project duration, we have done good teamwork based on effective team communication and the pre-designed project management approach, which is the combination of predictive and agile project management methods to control the progress and direction of our projects. Although in the process of the project, there were many troubles and even though we changed the direction, in the end, we overcame the problems and worked effectively and efficiently to complete the project following the requirements, the software as the project outcome is satisfying and meets the expectations.

8. Appendix

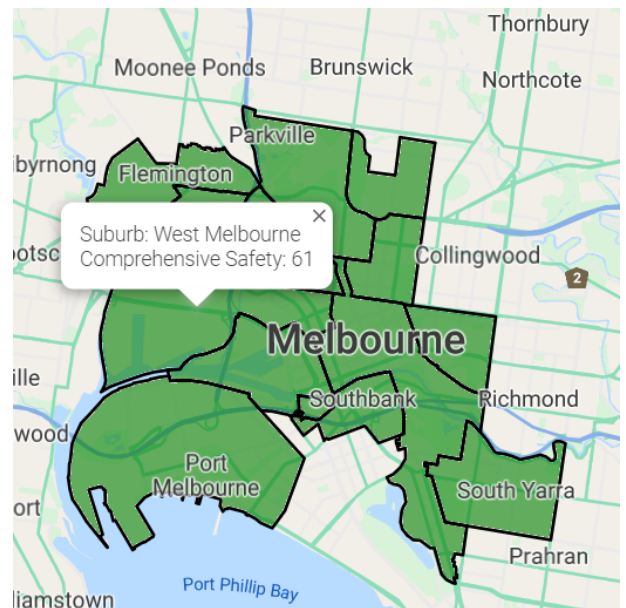
Figure 5.2a

Suburb	A_Crimes_against_the_person	B_property_and_deception	C_Drug_offences	D_Public_order_and_security_offences	E_Justice_procedures_offences	F_other_offences	Grand_Total	Year
Port Melbourne	50	50	50	50	50	50	300	2022
Port Melbourne	50	50	50	50	50	50	300	2021
Port Melbourne	50	50	50	50	50	50	300	2020
Port Melbourne	50	50	50	50	50	50	300	2019
South Yarra	50	50	50	50	50	50	300	2021
South Yarra	50	50	50	50	50	50	300	2019
South Yarra	50	50	50	50	50	50	300	2022
South Yarra	50	50	50	50	50	50	300	2020
Parkville	50	50	50	50	50	50	300	2022
Parkville	50	50	50	50	50	50	300	2021
Parkville	50	50	50	50	50	50	300	2020
Kensington and Flemington	50	50	50	50	50	50	300	2021
Parkville	50	50	50	50	50	50	300	2019
East Melbourne	50	50	50	50	50	50	300	2019
East Melbourne	50	50	50	50	50	50	300	2020
East Melbourne	50	50	50	50	50	50	300	2022
West Melbourne	50	50	50	50	50	50	300	2019

Figure 5.2b



Original



Replaced

Figure 5.2c

Finding	Type	Details
Map Usage	Browsing time	The user was able to master the use of the map within 5 mins of requesting the user
Services Section	Ease of use	In the Q/A session after the usability testing the user stated that the Services session helped in understanding the website
Text gets covered	Bug	The text gets covered by the login in button when the site is being used on a mobile with a small screen
Incorrect credentials Warning	Bug	Even after the user has entered the correct login details the warning will not vanish.
Filling out contact form	Browsing time	The user was able to master the use of the map within 2 mins of requesting the user

Code 5.3a

```
const express = require('express');
//import router
const userRouter = require('./routes/user');
const app = express();
```

```

const port = 8080;
app.use(express.static('public'));
app.use(express.urlencoded({
  extended: false
})))
app.use('/user', userRouter);
app.use((err, req, res, next) => {
  res.send({
    code: 500,
    msg: 'server error'
  });
})
app.listen(port, () => console.log(`port: ${port}!`));

```

Code 5.3b

```

//router response to the database request events
const express = require('express');
//import pool
const pool = require('../pool');
const router = express.Router();
//events
router.post('/reg', (req, res, next) => {
  let obj = req.body;
  let sql = 'INSERT INTO users SET ?';
  pool.query(sql, [obj], (err, result) => {
    console.log(result);
    if (err) {
      next(err);
      return;
    }
    result.affectedRows > 0 ? res.send('1') :
res.send('0');
  })
})
router.post('/login', (req, res, next) => {

```

```

    let obj = req.body;
    let sql = 'SELECT * FROM users WHERE username = ?
AND password = ? ';
    pool.query(sql, [obj.uname, obj.upwd], (err,
result) => {
        console.log(result);
        if (err) {
            next(err);
            return;
        }
        result.length > 0 ? res.send(result) :
res.send('0');
    });
})
router.get('/crime', (req, res, next) => {
    let sql = 'SELECT * FROM crime WHERE 1';
    pool.query(sql, (err, result) => {
        if (err) {
            next(err);
            return;
        }
        result.length > 0 ? res.send(result) :
res.send('0');
    })
})

```

Code 5.3c

```

<h1 class="logo me-auto me-lg-0"><a
href="index.html">Women Safety in Melbourne</a></h1>

    <nav id="navbar" class="navbar order-last
order-lg-0">
        <ul>
            <li><a href="index.html">Home</a></li>

```

```

        <li><a href="about.html">About</a></li>
        <li><a href="suburbs.html">Suburbs</a></li>
        <li><a class="active"
href="map.html">Map</a></li>
        <li><a href="services.html">Services</a></li>
        <li><a href="contact.html">Contact</a></li>
    </ul>
    <i class="bi bi-list mobile-nav-toggle"></i>
</nav><!-- .navbar -->

```

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10. Contribution Annexation

Shresth Mishra: Introduction, Project Background, Outcomes.

Sheng Quan: Software Deliverables, A cohesive conclusion, Front cover sheets.

Li Ma: Methodology, Critical discussion on the Software Project as a whole.