ISYS3888

Project Final Report

Bushfire Management and Data Collection within the Illawarra Region

ILALC Bushfire Management (Group 1)

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1 Executive Summary

Flames Illawarra is a mobile app which allows for efficient data gathering to be combined with the traditional knowledge of Aboriginal people, for the purpose of improving bushfire risk management in NSW. The app uses an intuitive and highly usable interface to enable members of the local community to contribute information on local land conditions, in turn informing decisions made by fire authorities and Aboriginal communities on the optimal location and timing of hazard reduction burns. In our project, we employed an agile development approach with regular consultation and feedback from the client, the Illawarra Local Aboriginal Land Council (ILALC). This report will run through how we produced a high fidelity prototype as the final deliverable.

2 Introduction and Motivation

For millennia, Aboriginal people such as the Yuin people in the Illawarra region have safeguarded their traditional lands from the threat of bushfires by using frequent, low-intensity burning known as “cool burns”. Similarly, Australian fire authorities have long been conducting hazard reduction burns each fire season to reduce fuel loads, in the aim of lowering the risk and severity of bushfires. However, as climate change continues to make the climate hotter and drier, it is undisputed that bushfire intensity and frequency has increased in recent years (Climate Council, 2019). At the same time, this means it is becoming much more difficult to safely conduct planned burning (Climate Council, 2020).

Despite $110 million being spent on controlled burning in Victoria in 2019, only a “small amount of risk reduction” was achieved (Foley, 2020). In the worst case, a hazard reduction burn can end up going out of control, leading to a dangerous bushfire. From our research and discussions with the client and stakeholders, we have identified that the specific focus of the problem is poor communication and conflict between authorities and the Aboriginal community regarding how to best organise and conduct planned burning activities. Currently, groups in charge of controlled burning rely on outdated, non-computerised registers to decide where to conduct burns, and use different methods for planning them.

On the one hand, local fire authorities base their decisions on estimates of fuel load in each area. Yet Aboriginal communities tend to prefer relying on their own traditional methods of conducting cool burns. Community organisations like the ILALC are usually poorly funded and therefore unable to maintain a detailed record of their controlled burning activities. Due to this inefficiency in the system, the end result is that areas much in need of bushfire risk management can go unnoticed.

A further focus which we have identified is the problem of Aboriginal people having reduced access to their traditional lands since colonisation. With the extinguishment of native title across wide areas of Australia, many traditional lands have become private or Crown property, to which the Aboriginal people can no longer freely observe and care for. This means they can no longer use their traditional observations of Country to a sufficient extent to inform their bushfire risk management. Thus, our solution not only needs to address the inefficiency and inadequacy of data that goes into planning controlled burning activities, but

we also must consider how we can involve local community members to provide data on their land conditions, enabling the large scale collection of such data through a mobile app interface.

Flames Illawarra differs from existing bushfire-related apps because current apps focus almost entirely on warning users of nearby bushfire events, instead of preventing bushfires before they occur. A prime example of an Australian bushfire-related app is the NSW Rural Fire Service (RFS)'s 'Fires Near Me' mobile app for both Android and iOS, which displays the location and severity of nearby fires on a map-based interface. While this might be very useful for local residents to plan evacuation or escapes during fire season, it does not inform local authorities on how they can better manage fire risk.

While apps like ours which allow user reporting of local conditions do exist, they do not seem to be available in the Australian market. Some examples of such apps include 'Fire weather calculator' created for Android by the University of Montana, which allows users to submit data on conditions like local wind speed and humidity. The data is then used for "weather prediction, analysis, and content display". However, even when compared to this app, our solution provides a more innovative approach because users will be able to submit various forms of data. This added functionality means that our app has the potential to be more useful to the unique situation faced in Australia by collecting more detailed and insightful data so that bushfire risk can be reduced more effectively.

3 Problem Definition

Controlled burns are currently managed using a simple register for backburning which is based on historical records. We need new records to replace this existing register—the register is not accurate because of the diverse Australian landscape and the changing climate/geographic conditions. The ILALC don't agree with relying on fuel load for burning and the register runs against our interests because we value the traditional, cultural burning done for generations. Our data gathering techniques are not technologically advanced and we have limited income to record the burns well.

To compound the problem, certain legislations prevent us from having access to Country due to the dispossession of traditional lands and the dehumanisation of Aboriginal Australians. As a result, we cannot freely engage in cultural practices and close walking of Country as was done prior to colonisation. We need new ways to continue monitoring the land and to conduct cultural burning. We need the help of communities and individuals to monitor the land collaboratively.

4 Objective

Objective 1 - Develop a system which users can submit and view geographical data, for community-based bushfire management

The system should include multiple functionalities, like a map which navigates ongoing bushfire risks, and uploading information about affected cultural heritage sites and wildlife. Users should be able to directly navigate places at risk of bushfire and current or past cool burns by viewing the map or a records system, and easily find the risk warning list which shows places with potential bushfire risks. Users can also search for results based on keywords like ‘location’, ‘recent burns', ‘restricted areas’ etc. They should be able to report a bushfire risk without needing an account or long verification process. Employees of stakeholder organisations such as Sydney Water can easily submit information on restricted areas that Aboriginal people cannot access.

Objective 2 - Design a user-friendly and simple interface

The mobile app would be free, for all users to access. It must be easy to use by Aboriginal people and the wider community, the elderly, people with disabilities, and minority groups. The app should not cause frustration for users or inconvenience them and should be aesthetically pleasing.

Objective 3 - Data security, data latency, data privacy; support resilient infrastructure

We will consider data security to prevent data breaches, and protect users’ privacy and anonymity. Additionally, we aim for the app to keep landmark data up-to-date, showing the latest bushfire situations in real time, and helping post-fire reconstruction. We also value data privacy. The app will only collect locational information when it is necessary to do so with user’s permission, through a Terms & Conditions statement.

This objective is not implemented in the prototype as we focus on the visual aspect of the user interface only (frontend) with no code implemented (backend). However, we have made recommendations for achieving this objective in sections 7 and 11 of this report.

5 Literature Review and Related Work

5.1 Current Bushfire Monitoring Method in the Illawarra Area (What has Already Been Done)

One of the most common methods for bushfire hazard management in Australia is to map the Annual Fuel Load (AFL) index for Bushfire Prone Areas (BPA). AFL and ABH mapping are gathered by a modelling mechanism in order to prepare bushfire mitigation plans and bushfire risk plans prepared by the local authorities and different bushfire management organisations. The records of the annual mapping data can also be used for community alerts, fire behaviour modelling, prioritising of planned burns (controlled burns), and allocating infrastructure projects (Newnham, 2017).

5.2 Challenges of Conducting Controlled Burns

Controlled burns can only be conducted under certain conditions. Prescribed burns mostly happen in spring and autumn seasons when there is enough moisture in the local landscape to make the fires of the controlled burn easier to control. The weather conditions on the day for burnings must be warm, dry and not windy to prevent uncontrollable flames (Department of Environment and Water, 2020). Also, the measurement of the build up of fuel loads is not always accurate to map the bushfire risk levels. It should be noted that under extreme conditions bushfires can burn across land with very low fuel loads. The diversity of forests, topography and climates may cause incorrect assumptions (Bill McCormick, 2002). Our client, ILALC, believes that a practical prescribed burning plan can only be developed from a sound understanding of Country and careful observation of changes to the environment, which is a challenging task for both the local communities and government bodies.

5.3 Why We Need a Community-based Solution and Why We Must Value the Traditional Knowledge of Aboriginal Australians

Indigenous people (specifically the Dharawal and Yuin nations) remain the Traditional Custodians of the Illawarra region. They understand the local landscape better than anyone else. The mitigation strategies for bushfire risk reduction (cultural burnings) conducted by the Aboriginal community has been a cultural heritage and an effective fire management practice to care for our Country. Since close and frequent walking for environment pattern recognition is crucial to eliminate inaccurate mapping of potential bushfire danger, the traditional knowledge of Aboriginal people must be valued. A statement from NSW National Parks and Wildlife Services (one of our stakeholders) has recognised that Aboriginal people's use of fire in history has promoted and protected natural and cultural values throughout history (NPWS, 2016).

Individuals, communities and various stakeholder bodies must work together for a better approach to bushfire management. However, the connection between our stakeholders and the community is relatively weak due to multiple obstacles. Neither the ILALC (representing the Aboriginal community) nor other bodies in charge of bushfire management (stakeholders) have the capacity and the full control to closely monitor the condition of the land. The documentation of conducting controlled burns relies on only a simple, out-dated register which is only based on historical patterns. The register is insufficient to carry out long-term prescribed burning plans. Thus, our client sees a huge potential to reform the data gathering process for the removal of barriers.

From the related background information, our group has proposed a technology-based solution. Since the key barrier exists within the data gathering stage, a mobile application which supports distributed statistics collection will be the answer to bring communities and administrative bodies together to map the bushfire hazard level.

6 Methodology

Chosen methodology: Agile

Agile is a flexible, iterative methodology. Different from the Waterfall methodology, the project team is able to go back and improve the project at different stages. This involves breaking down the project into major stages which we will complete step-by-step.

1. Data gathering stage (Define requirements)
2. Design stage
    a. Low-fidelity prototype
    b. Medium-fidelity prototype
    c. High-fidelity prototype
3. Testing stage

According to Dam and Siang (2021), different levels of prototype and design were classified as low, medium, and high-fidelity indicating completeness. The project team will focus on high visual fidelity and low-medium functional fidelity as the client does not require any coding nor back-end development from us.

During the data-gathering stage, the primary data collection will be from client consultation via Q&A, discussion forum, guest lectures, and weekly meetings. The project team is also expected to collect data from the team's own research as secondary data collection. The research includes social media, academic journals and articles, newspapers, and interviews.

The design was decided to be achieved using a prototyping tool hosted on a third-party website called "Figma". With reference to Nielsen's Usability Engineering (Nielsen, 1993), our prototype dimension will mainly be Horizontal because the Vertical dimension is beyond our scope.

During the testing stage, every team member is required to do user testing and unit testing manually. As we focus on UI/UX, automated tests will not be used. The following acceptance testing will be conducted by our client/project coordinator in order to get feedback for each design stage.

7 System Architecture

As our project is focused on creating a high-fidelity prototype, the development of a full system architecture in the traditional meaning is outside the scope of the project. Therefore, in this section we will report a proposed architecture based on our research into the feasible frameworks and approaches that can be used by ILALC to turn our prototype into a working smartphone application.

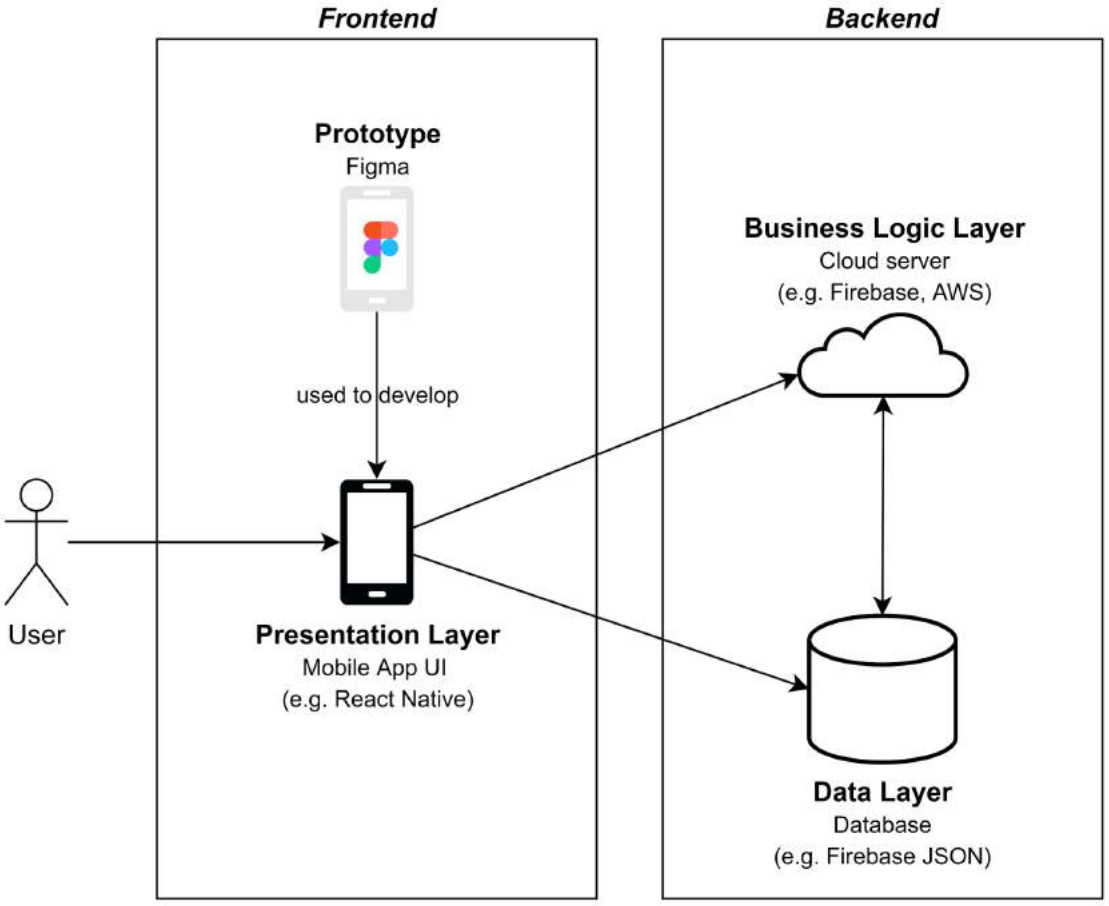


Figure 1. User Case Diagram of Flames Illawarra

7.1 Diagram

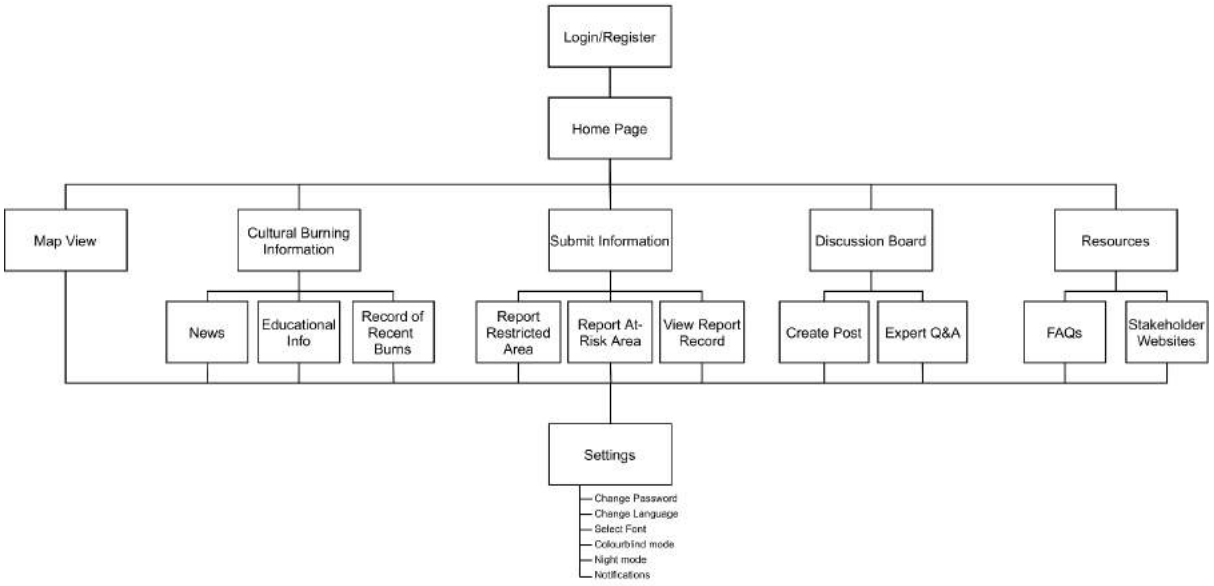


Figure 2. System Architecture of Flames Illawarra

7.2 Description

In the first diagram (see *Figure 1*) we show the connection between the different components of the proposed system architecture. A traditional mobile app follows a structure of three layers: presentation layer (the UI), business logic layer (rules and processes used by the app) and data layer (the database). We can also group the architecture into frontend and backend, the frontend contains the presentation layer while the backend includes business logic and data layers. The user interacts with the mobile app UI, which forms the presentation layer and is also the frontend. Here, the frontend will be based on our Figma prototype (the main deliverable of this project). The app connects to a backend consisting of a cloud server and database, or uses the local storage on the user's device if he or she is offline. This allows them to access all the functions including login, viewing and submitting burns and restricted area data.

We also show the hierarchical architecture of our prototype (see *Figure 2*) starting from the login/register and main page. From the main page all the remaining functions are accessible (map view, recent burns, discussion board etc.). Some of these pages then contain sub-pages, for example the Submit page contains links to the pages for submitting restricted and at-risk areas, also the viewing of a records page. Finally, the settings page can be accessed by the icon in the top right corner of every page, so it is connected to all other pages on our diagram.

7.3 App Frontend

There are several possible approaches to develop a mobile app frontend. These can range from coding the entire app from scratch as a 'native' app targeted to one specific mobile platform, to something as simple as using a container for a mobile-optimised web page. In deciding the best framework for our application, one of the main factors is that the app should be available on multiple platforms including iOS and Android. This means that native app frameworks which are for a specific platform (e.g. Swift for iOS, or Java for Android) would not be a good choice, because the client would need to spend extra resources on developers adapting the code for the other platform.

Instead, one better option for creating the frontend architecture of our app is React Native, which is a JavaScript-based framework with cross-platform support meaning that the frontend only needs to be coded once. As a 'hybrid' architecture that combines features of fully native and fully web-based apps, it also allows the integration with other components necessary for the requirements, including the Google Maps API and access to the mobile device's camera. Finally, there are some well-documented solutions that allow for a Figma prototype to be converted to React Native code. This could mean that the process of developing the frontend becomes much easier and can even be done directly from our completed high-fidelity UI prototype.

7.4 App Backend

Just like with developing the frontend, there are different options for creating the backend components for a mobile app, with popular alternatives like AWS, Firebase and Azure. From the high-fidelity prototype, we can see that a server is required not just for connecting the

individual app clients to the database, but also for the authentication function to let users login and post data that other users can then view. In terms of the database, it is important that the database will support each of the multiple data types required by the application. In particular we must consider how less conventional types of data like geographical data (e.g. location of cultural burns) and image data can be stored at a large scale. Furthermore, another important consideration is how the app will work when it is offline as the app needs to still keep some basic functions when offline (e.g. most recent logs of burning activity).

Therefore, for the Cultural Burning app, one possible implementation of backend which might be suitable is Firebase which covers both a cloud server and a JSON-based relational database. It supports both Android and iOS and user authentication functions, also it supports an offline cache of the data, so that there will still be some functionality when the user is not connected to a network. If React Native is chosen to create the frontend, then it can also be easily integrated using JavaScript modules to simplify the transition from the Figma prototype to a fully working mobile app.

8 Software Used For The System

Resource 1 - ENGG3112 Client Consultation Forum via Padlet

Padlet is an online discussion platform that offers a connection between us and the client. We shared this forum with other teams doing the same project from ENGG3112. Each team could raise the problems they encountered and when requiring clarification by the client, Jade Kennedy of the ILALC. The response from stakeholders was in real-time and publicly accessible. Project teams received insights and inspiration from the discussions, and it was a crucial resource for primary data collection.

Resource 2 - ENGG3112 Guest Lectures by Jade Kennedy (ILALC) and Stakeholders

The ILALC and stakeholder representatives, including Jade Kennedy, were invited to present as guest lecturers for the project. The clients delivered valuable information related to the projects that were not provided in the forum. It was an interactive and direct way to collect clients' requirements and obtain information through consultation via Zoom.

Resource 3 - Figma Prototyping Tool

Figma is used for designing prototypes. This tool combines design, layout, prototyping, code inspection, and presentation all in one platform which made it easy for our team to not have to use many different apps. It also provides interactive prototyping and real-time collaboration for teams, and it is free for students compared to other popular prototyping tools. It should be noted that due to ISYS3888 being taught remotely, we used our own computers and no University equipment was used.

9 Prototype Development

9.1 Low-fidelity Stage

In the low-fidelity stage, our team used the information we gained in data gathering (including requirements gathering from the project supervisor/client and our literature review of bushfire management) to brainstorm the main features of our prototype. First, we developed some personas(see *Figure 3*) to better understand the user groups we were targeting and then created a Google doc (see *Figure 4*) for each team member to contribute their ideas for the app's features.

Figure 3. User Personas in Flames Illawarra

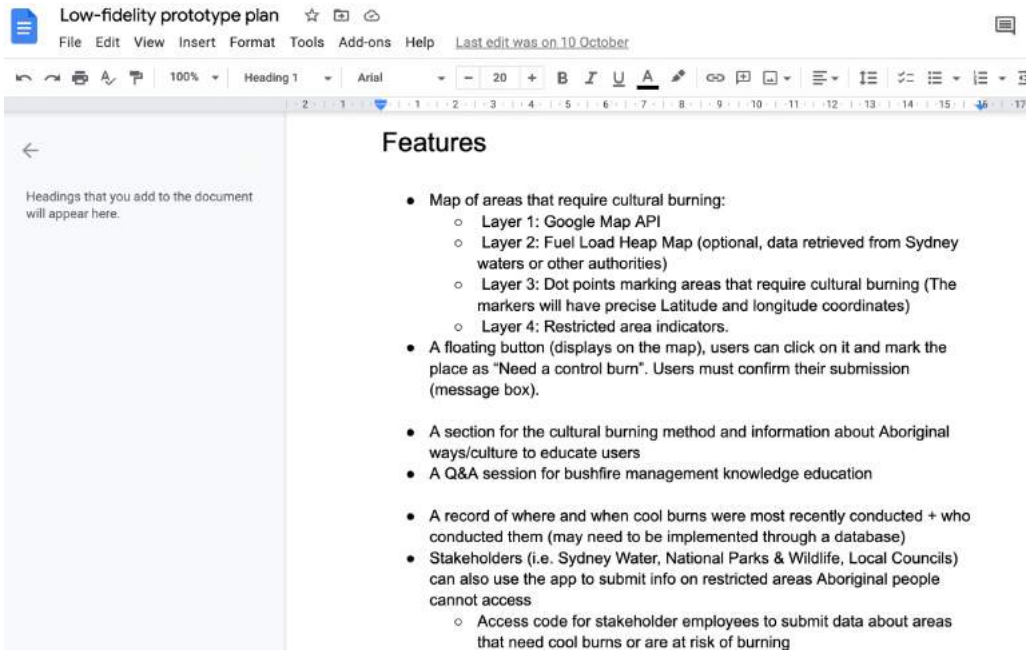


Figure 4. Low-fidelity prototype plan

We then showed this plan to Dr Rabiul for his feedback and approval.

The features planned were the main functionalities we wanted our app to have. However, we now needed to decide the contents of each individual screen for the prototype and made another Google doc(see *Figure 5*) for the team to share their ideas:

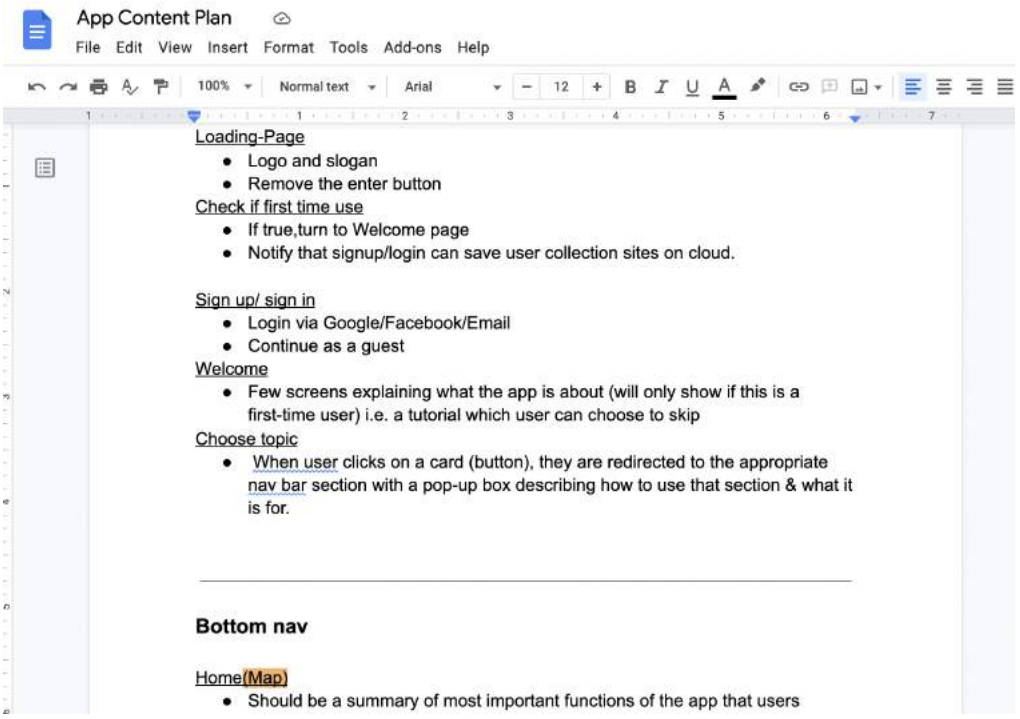


Figure 5. App Content Plan

The next step was to create wireframes and storyboards for the low-fidelity prototype based on our previous plans. This was done to get a visual idea of the structure of the mobile app. Adobe Photoshop was used for these wireframes because our team members were more familiar with this program than Figma which we had not used before. Therefore, we could save time drawing up simple wireframes (see *Figure 6*) and use Figma for the more complicated stages of medium to high-fidelity prototypes.

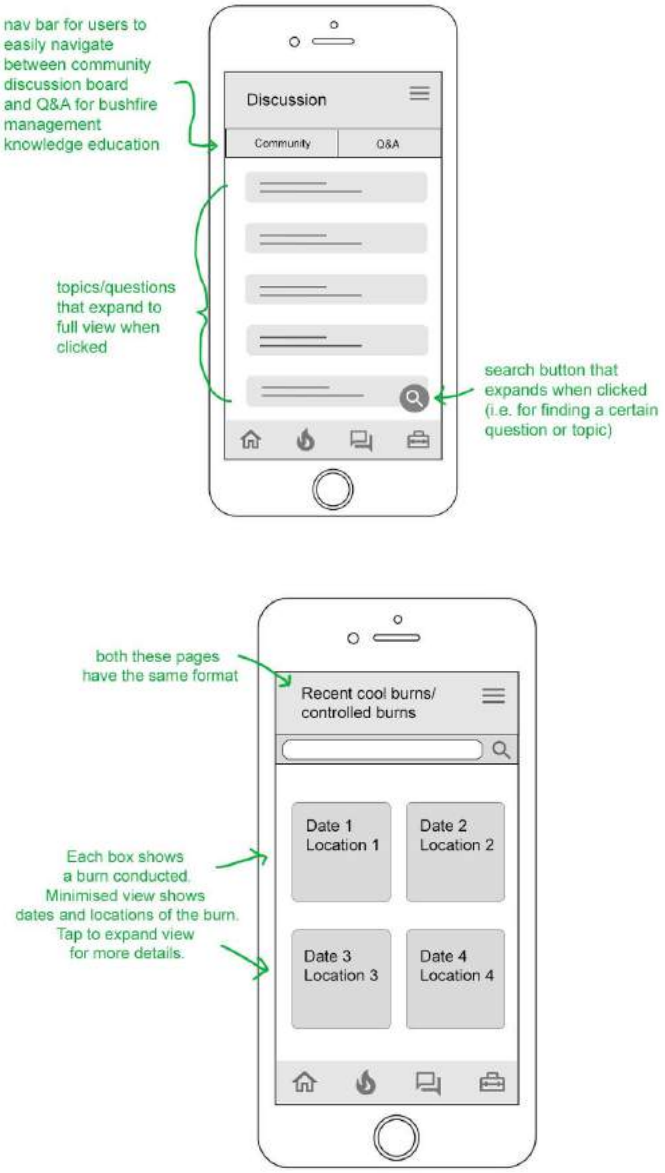


Figure 6. Wireframes of Flames Illawarra

9.2 Medium-fidelity Stage

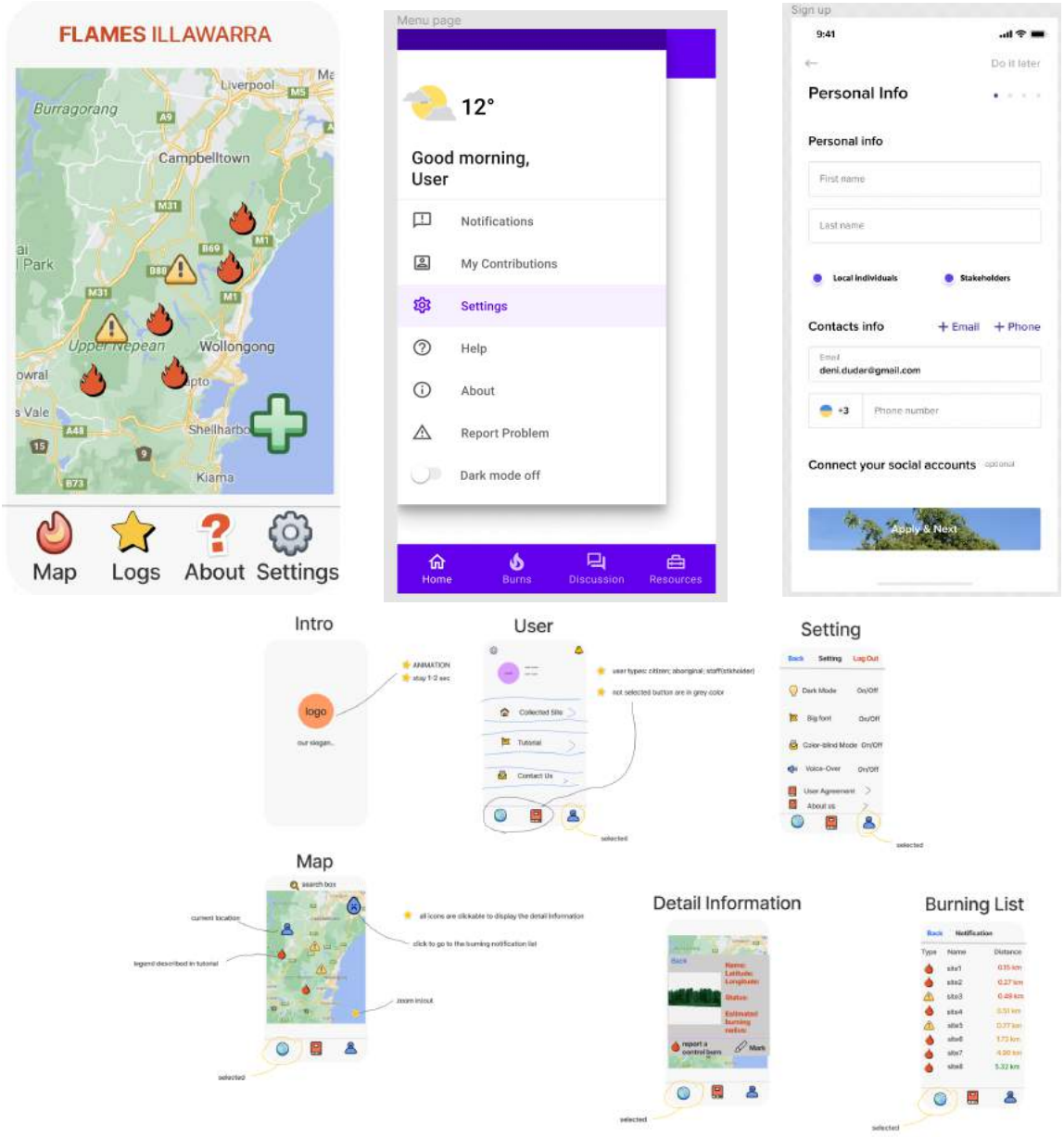
In the medium-fidelity stage of our prototype design, we started to use Figma for advanced versions of our low-fidelity prototype. However, as none of our teammates had used Figma before, we had to overcome this learning obstacle first and learn how to use the platform. Our team learned from free lessons offered by Figma such as "Learn Design" and Youtube tutorials such as "Introduction To Figma | FREE COURSE" offered by the verified channel, Envato Tuts+.

After becoming familiar with Figma, we began designing the colour scheme, typography, static elements and wrote the initial content of the app. For the medium-fidelity prototype, we decided that each team member would make their own version and compare afterwards so we could have more solutions to choose from, as well as show our solutions to Dr Rabiul and let him pick his favourite versions and provide feedback. Our design elements were

partly inspired by examples on Figma Template and existing bushfire apps like Fires Near Me NSW.

In each major stage of our prototype, we would present our current solutions to Rabiul before moving onto the next stage. This follows our Agile methodology where we work in iterations and constantly revise our solution (see *Figure 7*).

Figure 7. Different visual solutions made by team members



After presenting our solutions to Rabiul, we chose our official colour scheme (see *Figure 8*) and typography to use for the rest of the prototype. For the colour scheme, we used the Adobe Color software to choose the colours which are inspired by the Australian landscape, fire and oceans, and to see if they are aesthetically pleasing. Most of the app is made of warm colours which is user friendly because it reduces the strain on users' eyes, like the Night Shift function on phones.

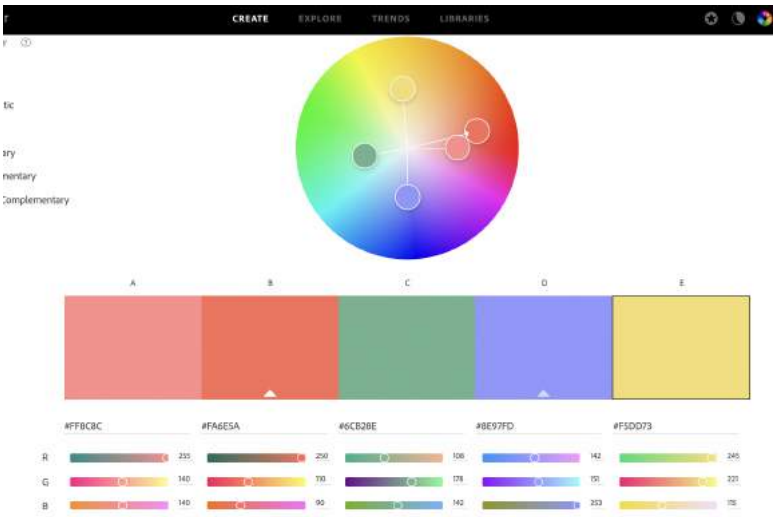


Figure 8. Colour Scheme

DM Sans was used as the main font because it is clean, minimalistic, and designed for use in small screens such as mobile interfaces.

9.3 High-fidelity Stage

For the high-fidelity prototype, we focused on interactivity and refining the user interface. We delegated work for each part of the app to the team members i.e. split by main functions such as Map, Cultural Burns, Discussion Board, Submit, Main Menu etc. After each section was developed, we merged them together by importing the separate screens into the main file and then linked them together using Smart Animations on Figma. (Please refer to section 9.4.)

To make the prototype interactive, we used Figma's Smart Animations to implement transitions between screens in order to simulate a real mobile app. This was done via the "Prototype" tab in Figma. Smart Animations allowed moving between different screens when a button was clicked, scrolling left/right or up/down, fading in/out, fixing navigation bars to the top or bottom of the screen etc. As seen below, the arrows represent the transitions between screens (see *Figure 9*):

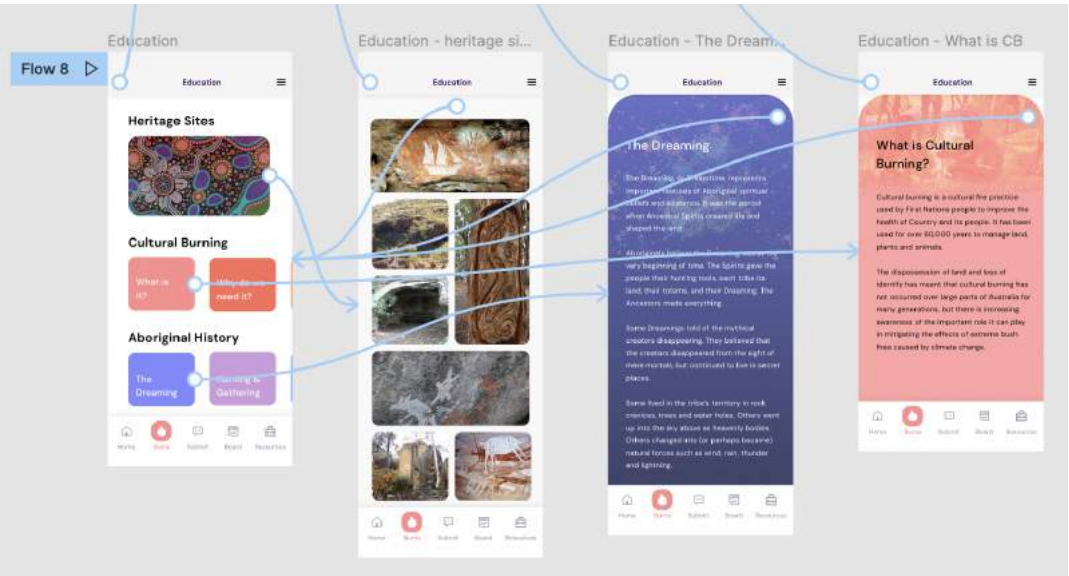


Figure 9. Transition example in Figma

To refine the UI, we used better graphics and visuals for the prototype screens to make it more aesthetically pleasing. At this point in development, we also proofread our content to ensure there were no grammar or spelling mistakes such as in the titles, sample articles, posts, dummy data etc (see *Figure 10*).

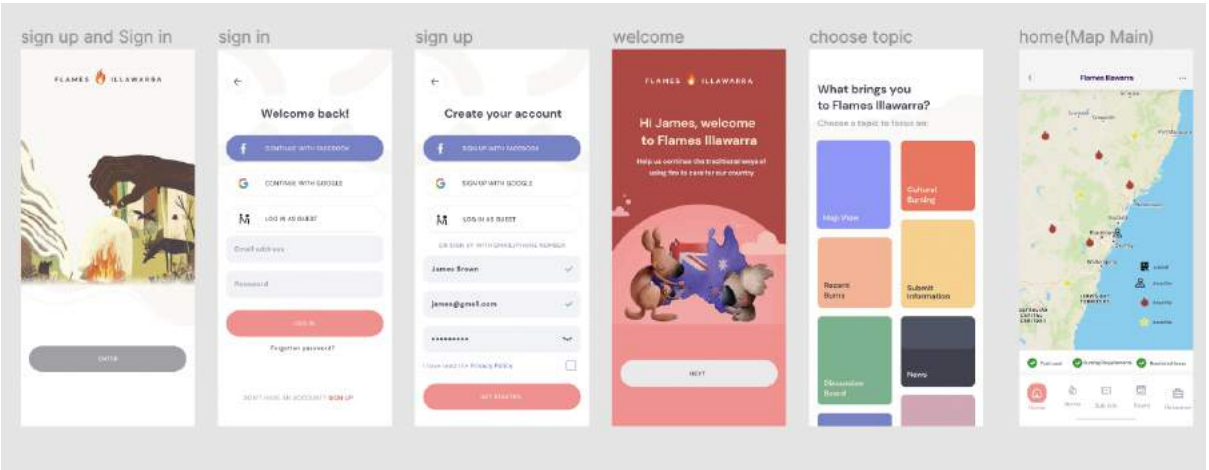


Figure 10. Refined UI

To ensure the prototype was indeed user-friendly, each of our team members conducted user testing. Specifically, we did the clickable prototype test to ensure transitions were not missing, navigation of pages was clear and easy for the user, and to check for bugs in the Smart Animations. If issues were found, our team fixed the problems rapidly which is part of the Agile design process. (More information can be found in section 10 of this report.)

9.4 Version Control

There were several issues with version control when we first started using Figma. Firstly, Figma has limited support for version control. There is a “Show Version History” function for files, but this is only the saved states of the files at different points in time. There is no branching available in Figma unlike in Github or Bitbucket, so it is hard to track changes

especially as Figma does not highlight the exact changes made between versions. Our team had to find changes by comparing versions manually which was too time-consuming and inefficient. Additionally, Figma auto-saves work so it is difficult to redo major mistakes made on a file.

The solution we came up with was to clone or duplicate the main Figma file (“Flames Illawarra UI”) and work on our allocated sections that way. We used Trello as an issue-tracking system to record changes/updates made to our file and then merged our work after agreement on the changes in Zoom meetings or on Facebook Messenger (see *Figure 11*).

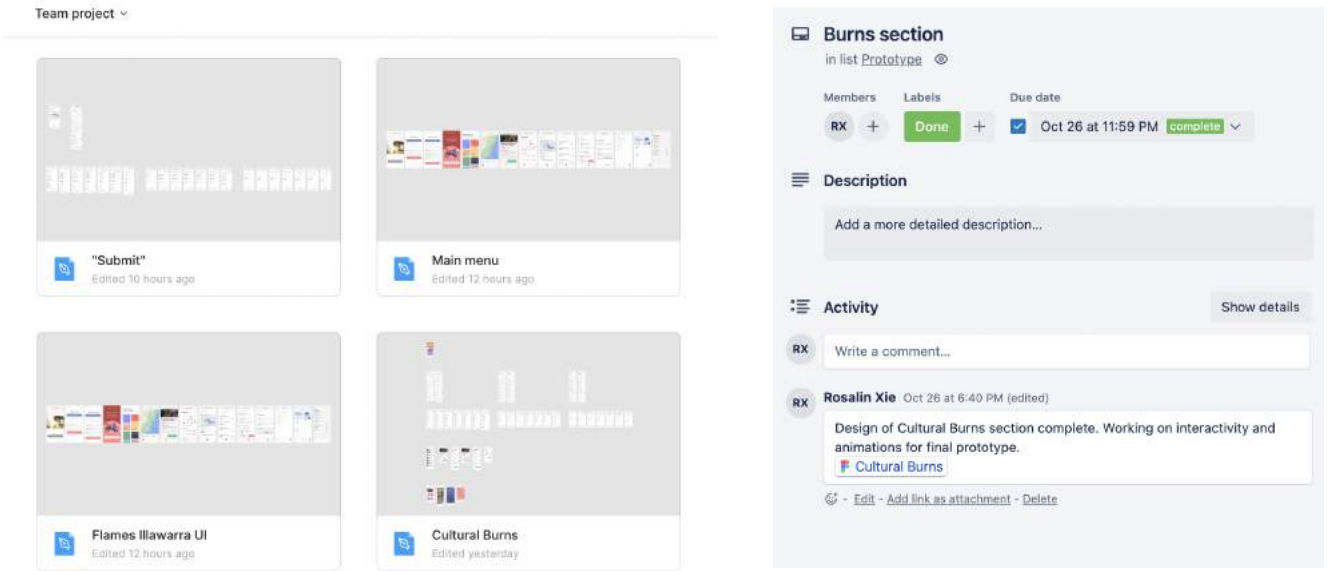


Figure 11. Figma File and Trello Board

9.5 Team Communication and Dynamics

Throughout this project, we used various mediums of communication to make progress towards project success:

We firstly used Zoom Meetings, facilitated to connect with our client Dr Rabiul Hasan for weekly updates, review and detailed advice regarding our project. Additionally, we presented our progress to Dr Farnaz Farid, our point of contact for our client, as well as our supervisor. From there, we received valuable feedback on our development and methodology in striving to achieve project success in our product.

We also used Facebook Messenger as an internal means of communication between group members. This allowed us to coordinate and delegate tasks via instant messaging without requiring group members to be there at the same time. Members could voice their opinions and thoughts on certain aspects of the project tasks or actions during development to the rest of the group to gain a better understanding of the requirements.

In terms of project progress, we utilised the Trello app to establish the status of project tasks via a Kanban board. Alongside a communication platform (e.g. Facebook Messenger), we were able to delegate tasks to team members and follow its status as tasks were completed, putting our project completion progress/status into the big picture.

Finally, to store all our files and records of project tasks, we used Google Drive which was shared between team members as a platform where shared tasks were delegated, and performed throughout the project.

9.6 Issues Encountered

Initially, our team omitted accounts for users because we didn't want it to discourage users from submitting data i.e. you must be logged in to an account to use the app like the Headspace app. Hence, we came up with a solution for users to submit an access code if they were providing information about a restricted area. The access codes were for employees of stakeholder organisations like Sydney Water to submit data about areas not available to the public. However, we decided to use accounts and make them optional for users, because accounts can better help the user track their submissions of data and help customise the app for the user.

Another issue that we encountered over our development of the high-fidelity prototype was gaining familiarity with the Figma software, and effectively understanding/linking connections between elements of our design. Most of the team members have not had extensive experience with Figma, and implementing features meant that the team had to share knowledge and research how to implement those features as they are required.

It was also harder to implement more Aboriginal-Australian related features into our prototype because of the increased priority with supplying the main features, and the lack of flexibility our prototype has in specifically identifying with Aboriginal culture.

10 Test Management

10.1 Iterative Testing

Our group has conducted multiple rounds of testing during different stages of prototype development. The tests take the form of iteration and make gradual modifications to our application based on insights regarding usability, accessibility and reliability of each particular UI component.

For each iterative testing cycle, we applied the Guerrilla testing methodology to examine the user experience issues collaboratively. During each session, some team members (about 5 people for each round) acted as Guerrilla participants to navigate through the UI/UX modules listed in the scenario-based testing plan and their behaviours and responses were recorded to generate insights. The findings were documented for further investigation on potential refinement.

About seven Guerrilla testing events were performed throughout the prototype development headway. The testing cycles had driven us to rethink some design decisions including transition animations, colour options, page controls and accessibility features. It also pushed us to brainstorm new approaches to help users contribute to our bushfire project more simply as the tests found some unnecessary and duplicate operations for common tasks.

10.2 Documentation of Testings - Cognitive Walkthroughs

Our testing plans are documented in the structure of cognitive walkthroughs, to test UI components under a certain user scenario. They helped us to track testing events in a user-centric scheme.

- Scenario 1 - User type: Illawarra local
  Tasks:

1. Download & open the application on his/her phone
2. Sign up by email and log in with the newly created account
3. Edit personal profile
4. Check privacy settings
5. View records of recent burns
6. Check out the map to view the circumstance of the local area
7. Submitting geographical information of places threatened by bushfires.
8. Go to the discussion board to ask a question about restricted areas

- Scenario 2 - User type: Community leader of ILALC
  Tasks:

1. Download & open the application on his/her phone
2. Sign up by email and log in with the newly created account
3. Read through the education article about aboriginal cultural burnings
4. Zoom in the map to view recent burning events
5. Zoom in the map to view fuel load information
6. Go to the discussion board to answer a question about aboriginal heritage
7. Have a look at restricted area information

- Scenario 3 - User type: NSW resident who wants to know more about cultural burnings

1. Download & open the application on his/her phone
2. Sign up by email and log in with the newly created account
3. Read the article on cultural burnings and click view more
4. Go to “Resources” and try to find more information about ILALC
5. Find more information about bushfire management methods
6. Check out Q&A session

10.3 System testing

After the completion of the high-fidelity prototype, our team performed system testing to examine if different UI components integrated well with each other from an inclusive

architecture perspective. The test was also regarded as a user acceptance assessment to check whether the final product passed the success criteria or not.

System testing was performed in the form of a comprehensive walkthrough. All UI/UX behaviours including corner cases of user interactions are carefully inspected as it is the final round of examination. The team recorded several performance indices to evaluate the outcomes, including user error rate, task completion time, behaviour consistency and feature availability. The results were compared with the acceptance scale to verify that our product works as a unified whole.

Two rounds of system testing were conducted before we handed off the final prototype to our client. The testing found integration problems such as incorrect overlays and navigations. We also optimised some operational architecture to simplify the process for tasks such as discussion post creation and submission of burning information. Currently, we await the client's feedback and another round of system testing is scheduled after responses are received.

11 Recommendation

11.1 Limitations

There were some functionalities and features that could not be implemented because of the limitation of resources. These included limited content, optimisation of map API, website design and multi-platform adaptations.

Due to the realistic limitations of interviewing and real-time discussion, Flames Illawarra could not come up with a fully functioning application. The actual coding and implementation of the app is out of project scope. One of our initial objectives which is to ensure data security, data latency, data privacy cannot be achieved in a visual prototype.

It was found that currently the Google Map API is not fully adapted on Figma causing the low loading speed and limiting functionalities on modification of map, the improvement could be done from further adaptation or reassembling the pages.

11.2 Future Development

About data security, data latency and data privacy, Flames Illawarra team recommends theories and approaches in future development. Flames Illawarra could provide extra verification (SMS or email verification code) when a user logs in on a new device or logs into a different location. Users can enter a long password that has a minimum of 8 characters with upper case and symbols and a maximum of 25 characters. All passwords could be encrypted using a hash function with salt before storage to avoid information leakage. Flames Illawarra could sign with the government to ensure no use of private user data, notify the user and ask for consent before accessing personal data. Real-time business intelligence can be used to ensure the real-time update of burns.

The team mainly focused on mobile prototype design. Flames Illawarra as an application available to the general public needs to be adapted for multiple platforms (e.g. iOS/Android) and being hosted on a website can lead to greater convenience for users. There will be various improvements on layout, compatibility and the most importantly, the front-end coding. We believe that with a clear scope, objective and communication with the client, the web version of Flames Illawarra will be successfully completed with further development. However, with the limitation of capacity and time constraints, this cannot be accomplished by our team at the present time. The Flames Illawarra team is looking forward to the future development and launch of the project.

12 Individual Contribution

Jeremy: Team Leader. Responsible for facilitating contact between clients and arranging times, Week 3 presentation and developing the Submit page, as well as “Team Communication and Dynamics” and “Issues Encountered” sections in the report.

Ryan: Deputy Team Leader. Responsibilities included facilitating Zoom Meetings & client communication, week 6 & 10 presentations, developing ‘SUBMIT’ functions for the prototype and ‘Limitation’, ‘Objectives’ and ‘Methodology’ for the report, finally merging the prototype.

Rosalin: Developed “Cultural Burns” part of app, manager of the team’s Trello board, weeks 2 and 9 presentations, “Prototype Development”, “Methodology”, “Problem Definition” sections of final report, finally merging the prototype.

Xiaoqing: Responsibilities included developing the initial prototype which the group used, week 5 presentation, developing ‘Main Page’ and ‘Settings’ functions for the prototype and system architecture for the report.

Hao: Responsibilities included establishing the personas and test management plan for the project, week 5 presentation, developing “Discussion Board” and “Resources” pages for the prototype.

Junrou: Responsibilities included developing ‘MAP’ functions and creating animations for the prototype, creating medium-fidelity prototypes, helping confirm styles for pages, week 7 & week 8 presentation, recording weekly meeting minutes, finally merging the prototype.

13 Summary

In conclusion, we are able to use the ILALC bushfire management project to tackle existing problems from various angles. This includes how controlled burns management needs new records to replace the existing registers due to changing geographic conditions, as well as address issues prevalent in cultural burning and managing bushfire risk like poor data gathering techniques, limited funding, and prevention of Aboriginal Australians to enter their own land. Our bushfire management project is thus able to provide a solution via a platform

where individuals can help monitor the land and assist in cultural burning by submitting geographical information of places threatened by potential bushfires.

Looking at our objectives to achieve project success, we are able to submit and view geographical data related to bushfire risks/events. Through testing and employing usability methods, we can establish a friendly and satisfying user experience when the users are viewing or submitting data. This data can be authenticated and verified to ensure the correctness of the data in our system, and is protected against malicious activity (to a degree, as we looked to balance simplicity for the user and robust security) to uphold data security and privacy in our system.

Through our use of the Agile methodology in the project, we are able to take advantage of its flexibility and interactivity, allowing us to go back, modify, and improve our plans at any stage. We can also react to unexpected situations and respond with a plan to effectively and efficiently solve problems that arose whilst developing our project.

Throughout the development process, we struggled with gaining familiarity with the new software (Figma) and effectively understanding/linking connections between elements of our design. We also experienced difficulties differentiating our app to identify more with Aboriginal culture.

Overall, we deliver a high-fidelity prototype that allows users to report real-time data of bushfire risks by submitting geographic information. We can thus support communities in providing data of potential and ongoing bushfire locations, helping Aboriginal Australians monitor the land they are unable to access, facilitating reconstruction after a bushfire, and help ILALC conduct cultural burning.

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Client Feedback

The team already asked the main client Dr. Rabiul to send the client feedback directly to Dr. Farnaz Farid.

Appendix

Working Prototype

The link for the latest version of Flames Illawarra on 7th November 2021:
https://www.figma.com/file/4VFqVfSMoy3PSQjmH2jJbj/Flames-Illawarra-Report-Submission

When opening the link, click the **Play** button on the top-right of the screen to view the prototype. Click any **blank space** to see all clickable objects during the view.

The team may update Flames Illawarra during 7th November to 14th November and will provide the final link on the final submission.