Interim Project Report:Redland Museum

GitHubs used for the project:

https://github.com/ProPablo/Codebase2_GT

https://github.com/ProPablo/Codebase1

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1. Introduction

The Redland Museum is a museum situated in the south east area of Queensland specifically in the Cleveland suburb of Brisbane. The museum primarily exhibits artifacts from the Redland area while are also involved in the collection and recording of historical information of the Redland area. While the museum operations have worked consistently and effectively to show off the area's history, the museum decided to branch into the technology area. The client, Russell Dinte who is also the technology manager at Redland Museum, had the business goal of creating an interactive mobile application that would utilise bluetooth beacons to tour and guide visitors around the museum. This project requested by the client has been worked on in the previous two years with the project being an estimated total four year plan. The project's goal is to positively impact visitor's experience with a more modern and fun approach to exploring the museum. The end of the project would include the successful creation of the mobile application which is connected to a backend database that should allow admins to easily configure and edit information displayed. Along with this, the bluetooth beacons should be set up correctly so that the application can track an approximate location of where the visitor is in the museum and therefore display the relevant information or video when they are in a certain area.

2. Project Scope and Plans

To achieve the project's end goals, the work completed by the previous two teams was analysed to determine what steps should be taken to further progress the current project's state. The project was broken into multiple sections and was assigned to members according to their strengths. Particular sections, such as cleaning up the backend, were marked as a higher priority task due to it being necessary in progressing the current state of the project. Meanwhile, other tasks such as editing the user stories done by the prievous's teams to meet the client's new expectation were lower in priority as this was not crucial to the moving forward with the task set by the client. Meanwhile, there were multiple discussions between the client and the team about feasibility concerns of if the work done by the previous team was suitable enough to reach the end goal of the project. These discussions resulted in many changes that were decided to be crucial in allowing the project to progress smoothly and for the finished product to resemble the client's vision.

2.1 Project Plan

Discussing the state of the project with the client was essential in understanding both how to progress the project as well as what to prioritise. The client provided some design notes which served as the foundation for the project plan that was followed throughout the semester to define and prioritise tasks. The weekly sessions dedicated to tasks as well as client meetings contributed to the fast velocity with which the project was able to progress.

Outlined below is the high level sprint plan that was followed throughout the semester along with what will be followed in the next semester.

Semester 1:

Sprint 1 (Week 6)

1. Understanding previous teams' work
2. Refine backend / administration portal (codebase 1) according to client's needs
3. Updating user stories

Sprint 2 (Week 12)

1. Rework mobile application (codebase 2)
2. Establish connection between codebases
3. Choose appropriate supporting code libraries (for beacon navigation and map functionality) for easier progression next semester

Semester 2:

Sprint 3 (Week 6)

1. Restructure backend / administration portal (codebase 1)
2. Refine mobile application (codebase 2)
3. Finishing refinements to backend for smooth communication with the refined mobile application

Sprint 4 (Week 12)

1. Start implementation of tour functionality
2. Establish communication with beacons

Along with this, user stories provided by the previous teams were kept the same or modified to match the new priorities specified by the client. These user stories referred to can be seen in Appendix 4.1.

2.2 Feasibility Analysis

A feasibility analysis was conducted to decide if the current plan set in place by the client was sensible and best practice for the progression of the project. As the project was being worked on according to the sprint plan outlined for semester 1, the team faced a plethora of obstacles which either slowed down the progress or required a completely new approach to be made to certain sections of the project.

Firstly, a major challenge faced by the team initially was being able to understand the codebase files given by the previous teams. Picking up unknown work with little description given and being able to understand everything proved to be a challenging task. This was overcomed to a certain degree through a lot of time tinkering around with the codebases and seeing which parts influenced certain areas of the database or the mobile application.

In addition, the previous team had created the front-end mobile application by using xamarin forms but the current team was unable to get the mobile application to be built and running on any device besides the device which the previous team installed it on. Because of this, an executive decision with the input of both the client and every team member, it was decided that starting the front-end from scratch would allow the project to progress further in the future but would set back the starting point of the project by a significant amount.

Lastly, the final major challenge was the constant changing idea of the layout of the mobile application. The layout of the mobile application went through many changes throughout the course of the semester as the specifications of the client was constantly changing. In addition to this, the team would have to research and find the most suitable way to implement the changes asked by the client, many times the team would have decide that a different change would greatly benefit the finished product more than what was suggested by the client so close communication was needed to satisfy the client while proceeding with the approach which would benefit the end project more.

3. The Artefact

3.1. Structure

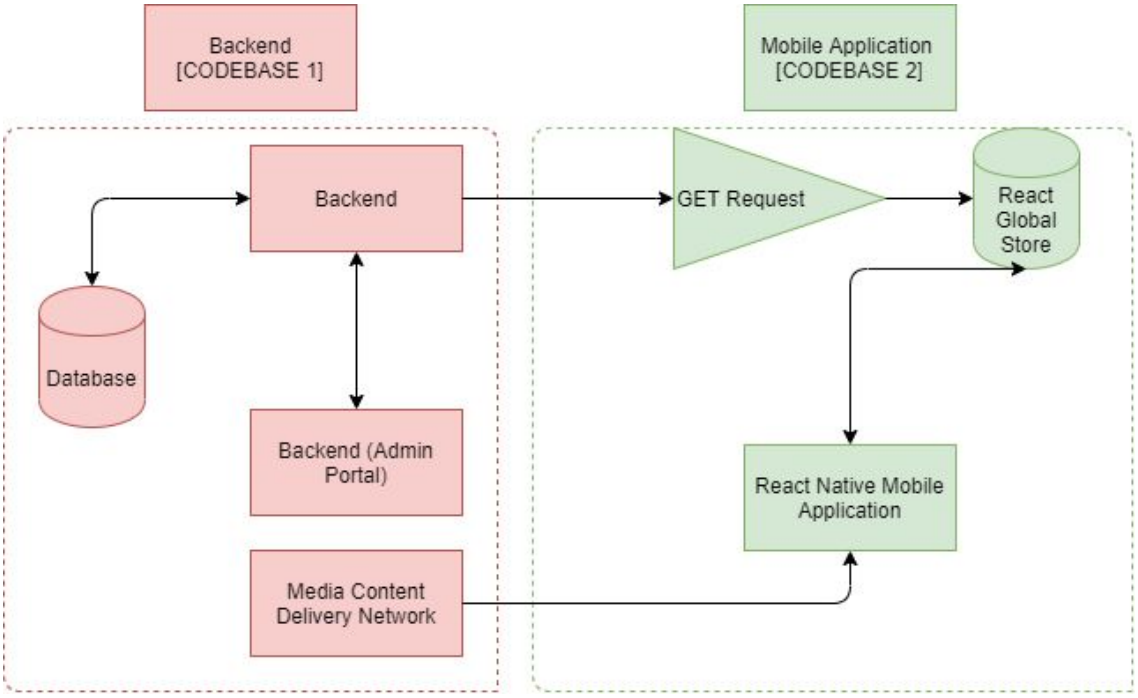


Figure 1 - Relationship Between Codebase 1 & 2

The museum's guidance and touring system has two aspects, codebase 1 (the backend) and codebase 2 (the frontend). Codebase 2 is a mobile application (written in React Native) that the user will be interacting with whilst codebase 1 (written with dotNET MVC in C#) is an administration portal that the client will be interacting with in order to change the stored data. Codebase 2 communicates with codebase 1 for appropriate image or text information pertaining to what is shown on screen.

3.2 Technical Description and Process

3.2.1 Description Evaluation

Codebase 1 was provided as a functioning backend with a web UI as an admin portal with working auth. Most of the alterations we made were by changing the Model and Data Transfer Objects (DTOs) as well as creating migrations (using the c# package manager API) for the database to fit the needs of the client. We also edited the admin UI to reflect these changes by editing the csHTML templating files. We also contributed to the usability of the UI by changing the dropdown menus to allow for a “none” choice.

Codebase 2 fundamentally works as a GUI for whatever information the backend has to offer. Therefore, on boot, get requests are made to retrieve all the data from the backend. This was done so as to not overload the client’s network by making a request for every page load. This data is placed in a global store accessed by react to display components of the relevant information.

```
 useEffect(() => {
    //Load information into global store on boot
    loadArtefacts();
    loadEvents();
    loadStore();
  }, []);

<NavigationContainer theme={NavigationTheme}>
      <ArtefactsContext.Provider value={artefactsProviderValue}>
        <EventContext.Provider value={events}>
          <StoreContext.Provider value={{ storeImages, storeItems }}>
            <Tabs />
          </StoreContext.Provider>
        </EventContext.Provider>
      </ArtefactsContext.Provider>
 </NavigationContainer>
```

Media is stored on a pseudo content delivery network (CDN) on the backend (to take advantage of media caching) instead of delivering the media as base64 via the opening payload. This media is then accessed by the mobile app from source URL.

```
<Video
  ref={(ref: Video) => { this.video = ref }}
source={{uri:"http://192.168.5.75:8181/videos/2020-10-08_dynamax.mp4" }}
```

3.2.2 Design Contentions & Challenges

We are the third team to be working on this project and as such most of the time spent initially was on development operations and set up. A reevaluation of the previous team's designs was also required in order to reach a decision as to whether they still reflected the needs of the client. Due to lack of familiarity using Xamarin.Forms and overall ambiguity of codebase 2, we decided to rewrite the entirety of codebase 2 using React Native, a language that the team was more comfortable with. Experimentation was done with Xamarin.Forms before this decision to see if it was sustainable to keep using already written code. We were able to reach feature parity with the previous team's second codebase sufficiently.

Working with codebase 1 also had its challenges mostly because of the ambiguity that comes with working with other teams' code as well as the lack of a GitHub repository to fork and follow. Large amounts of research had to be done in order to understand the nuances of the dotNET MVC architecture used by codebase 1 which occasionally bottlenecked codebase 1's progress. One particular consideration that was discussed heavily was the method of delivery for the associated artefact media and how it was structured. All media were encoded as base64 strings that were decoded in order to be consumed. This ends up being an issue because base64 is not a sustainable method to consume video on codebase 2's end. We instead proposed to the client the idea of the CDN mentioned However, it seemed that codebase 1 followed MVC convention and best linting practices so this challenge was something that our team managed to overcome eventually.

The client requires a usage of Kontakt bluetooth beacons which has a related library, although in our attempts to use it we found that it was obsolete with respect to the current Android SDK and hard to use as a result. We instead opted for a more general bluetooth library to use for communication between codebase 2 and the Kontakt beacons themselves.

There was a period of time where a third Codebase written in Xamarin.Forms as a Mobile app was considered. This was to serve as a maintenance application, with which the client could simulate the beacon triangulation technology and map out where beacons and artefacts would be located. This concept was determined as infeasible however, due to the low accuracy of the bluetooth positioning and a change in paradigms of how to approach user location tracking and artefact targeting.

3.3 Functionality

Codebase 1

This admin portal is intended for a user that will be involved in deciding what content should be displayed on the mobile application. This is done by creating an object, whether it be a zone, museum artefact or exhibition, filling out the appropriate information and saving it to the website. This allows the mobile application to retrieve appropriate information about museum artefacts so that the tour functionality works as intended.. At this stage, a lot of functionality was kept from the previous teams' work on this codebase because it still suited the client's needs, however more particular changes specified by the client needed to be completed by this semester (refer to Appendix 4.5). These changes required alterations to both the front end code of the administration portal website as well as the properties of objects used to represent the data being stored on the database. In terms of functionality itself, though changes were made, the administration portal was aimed to still behave similar to where the previous team had left off because it still satisfied the client. Although the core behaviour and functionality of codebase 1 will stay the same, the structure of the information presented will change over the course of the next semester because the more the mobile application was developed, the more it necessitated a refactoring of the administration portal to better support the mobile application's touring functionality.

Codebase 2

This mobile application is primarily to be used by the museum's customers. The bottom bar serves as an efficient and intuitive design for navigation to the most important parts of the app. The home screen displays points of interest such as events and the primary touring functionality of the app so that the entry point for the user of this app is very clearly signposted. The tour itself takes inspiration from the design cues of Google Maps where you can pan and zoom the map itself as well as show a pull up menu when the user goes near a point of interest. Appendix 4.3 showcases our major design features (with Appendix 4.2 showing the wireframes) and Appendix 4.4 shows the previous teams screens which we reworked. Only the Artefact bottom tab was fully implemented to act as a proof of concept with next semester's aim being to complete the remaining tab.

3.4 Quality and Metrics

Quality of the project's progression was measured by weekly meetings with our client where we would express our ideas and concerns as well as demonstrate any appropriate changes to the database or the mobile application. The project's goals were guided based on these meetings and our team utilised a Trello board to keep track of that (refer to Appendix 4.6). Alongside these weekly client meetings, we also consistently held our own team meetings 2 times a week for approximately 4 hours on the set days of Tuesday and Thursday to discuss how the development of the project would proceed. GitHub was also used extensively to track who was working on what as well as to split up commits and branches for each codebase. We found that enough progress was made each week to allow for a sufficient demonstration to our client who would then give their input. These meetings with the client proved to be very rewarding for both the team and the client as each week a plethora of ideas and discussion of possible changes that should be made were heavily discussed and ultimately painted the goal that should be met before the next client meeting the week after.

The client's suggestions and ideas were weighted more heavily than individual team members suggestions. If the majority of the team decided that a certain feature or change different from what the client had in mind was better, the team would propose the new idea to the client and receive confirmation if the idea was indeed the better way forward or if the client would still prefer his idea instead.

4. Appendix

4.1 Modified Previous Team User Stories MoSCoW Prioritisation

ID	Requirement / Story	Priority	Points
1	As a project leader, I want this app to have real-time location services, because it can provide “self-guidance” to visitors.	Should	8
2	As a project leader, I want the real time location aspect of the project to be accurate to a maximum of 2 metres, so that this app can eliminate any "overlapping" and help visitors better.	Should	8
3	As a product owner, I want to be able to input videos into the database for certain displays, so that there can be more interactive elements in my museum.	Must	5
4	As a product owner, I want to be able to see which displays are most visited and the least, so that I can plan my museum accordingly.	Should	4
5	As a project leader, I want to show the popular areas that visitors go to in the form of bar graphs, so that I can get information more easily.	Could	4
6	As a project leader, I want the app to guide the visitors to different areas of the museum as most	Should	4

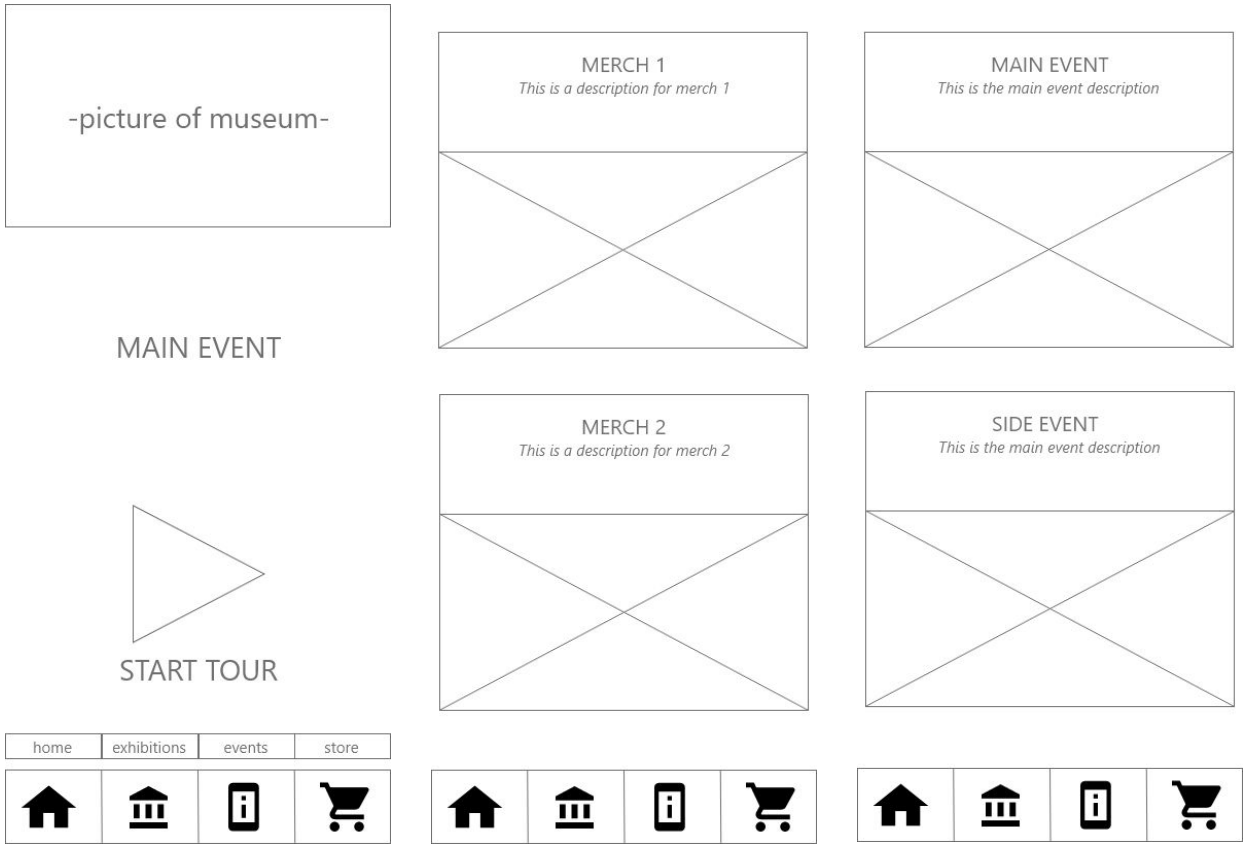
	visitors never go deep enough to discover the rest of the pieces.		
7	As a project leader, I want this app to connect to museum's bluetooth, so that the beacon is able to pinpoint the user and display photos and videos depending on where the user is.	Must	4
8	As a product owner, I want an admin account for the application, so that I can have access to sensitive information (e.g. most visited displays).	Must	3
9	As a product owner, I want the app to be visually appealing so that it grabs the attention of the user and also adds to the user experience.	Should	5
10	As a product owner, I want the visitors to have a tag which is linked to their device through the QR code so that it can help track the user.	Won't	3
11	As a product owner, I want the app to display the floor plan and the artefacts as a flashing dot, also having the visitors location display as a blue dot so that it can help guide the user	Must	8
12	As a product owner, I want the artefacts to stop flashing and display as a solid dot when the user is in the vicinity, so that the user knows what they have visited.	Should	5

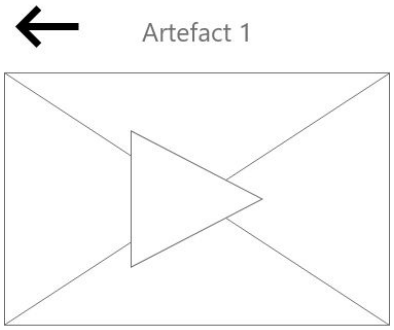
13	As a product owner, I want the app to be able to start the tour at a random location so that it is convenient for the user.	Could	5
14	As a visitor, I want a QR code, so that I can download the app on own smartphone.	Could	2
15	As a visitor, I want a “help” menu to list all functions provided by the app, so that this will guide me on what to do next.	Could	2
16	As a product owner, I want security features in the app that disables it out of premises of the museum, so that people who steal the tablet won’t be able to use it for anything.	Won’t	4
17	As a user I want the app to be simple to use so that I'm able to navigate through the app without any problems.	Should	3
18	As a visitor, I want a map that shows some places such as display areas, exits and toilets, so that I can find the direction quickly.	Could	1
19	As a visitor, I want to search for feature, so that I can know the exhibits’ name, category and year range.	Should	4
20	As a visitor, I want to know the current and future exhibitions, so that I can plan to visit the museum again.	Won’t	2

21	As a visitor, I want to know more information about displays, such as video, photos, and text about the item, so that I can have a comprehensive understanding of the display.	Should	3
22	app to be maroon and yellow, so that I can show to users our main colour scheme.	Could	1
23	As a visitor, I want to see most visited artefacts so that I can use this information to view items I find interesting.	Could	3
24	As a visitor, when i'm using the tour feature, I want the app to have a little icon next to active displays that have information on them, so that I can gain knowledge of the piece.	Should	3
25	As a product owner, I want to have an option to disable and enable artefacts on website, if they're disabled it won't show up on the floor plan, so that I can enable artefacts that have information on them.	Should	5
26	As a product owner, I want the app to display our logo mainly on the home page, so that it is recognisable as redland museum and make it more visually appealing.	Could	2
27	As a visitor, I want to see labels next to most visited and help buttons, so that I am able to recognise what the buttons do.	Could	1

28	As a product owner, I want the homepage of the app to have the text coloured black, so it’s visually appealing to the visitors.	Could	1
29	As a product owner, I want to have admin permissions so i’m able to edit, add and delete an artefact on website.	Must	4
30	As a visitor, when I'm viewing information on an artefact, I don’t want the navigation bar to appear, as I may accidentally click on it.	Should	3

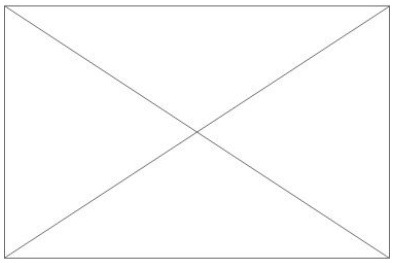
4.2 Codebase 2 Wireframes





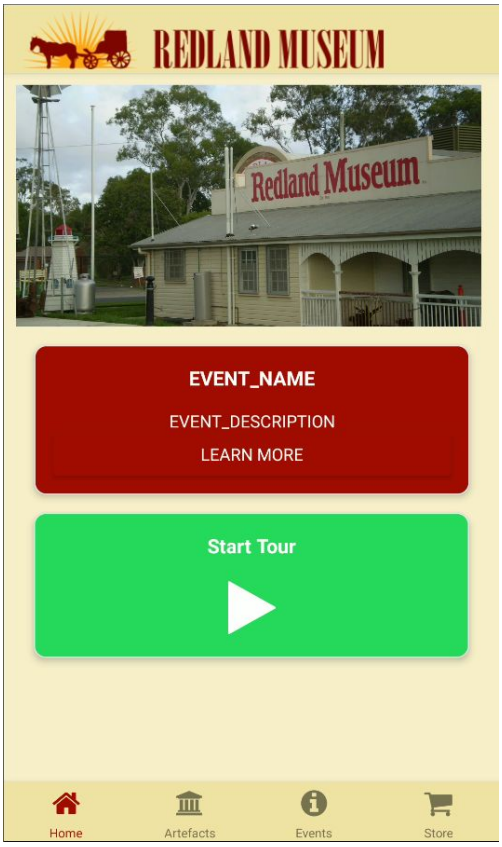
This is a description describing Artefact

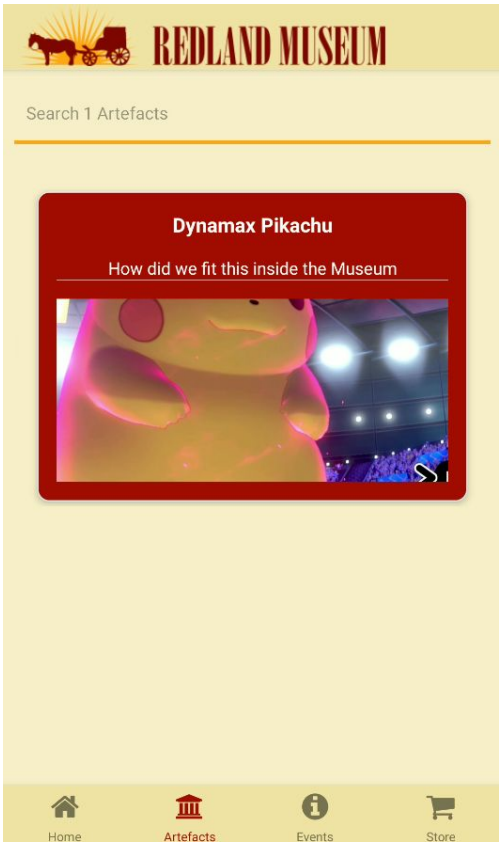
FLOOR PLAN

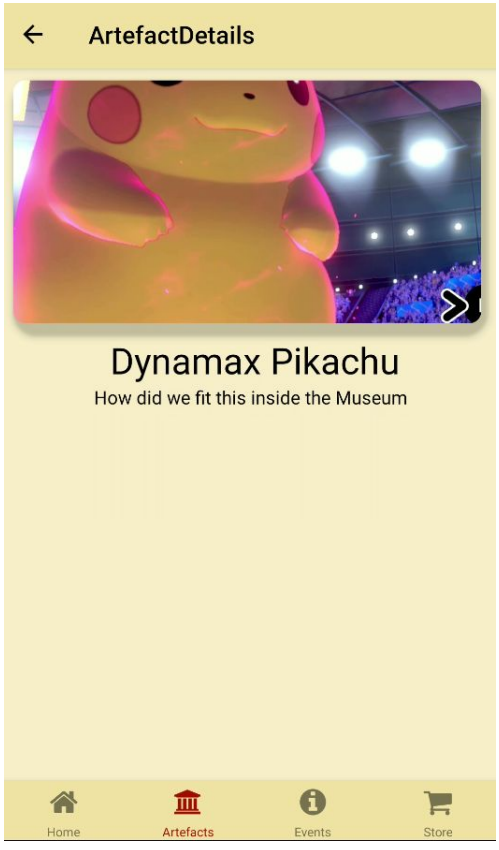


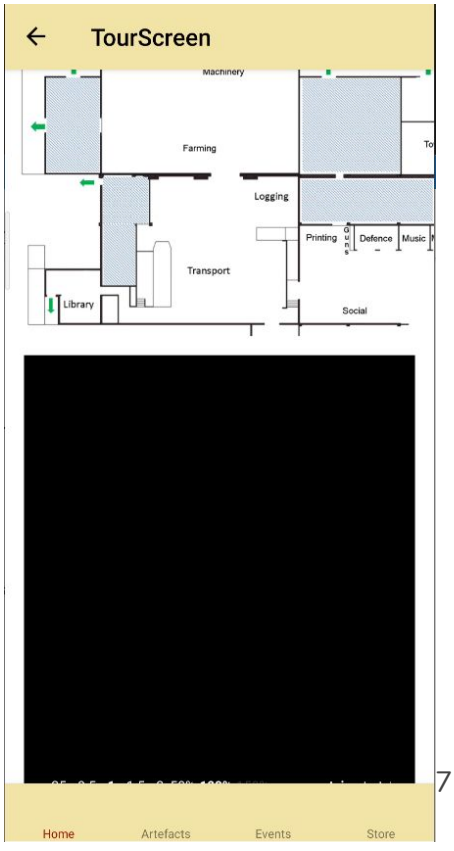
This is a description describing the MAIN EVENT.

4.3 Codebase 2 Screenshots

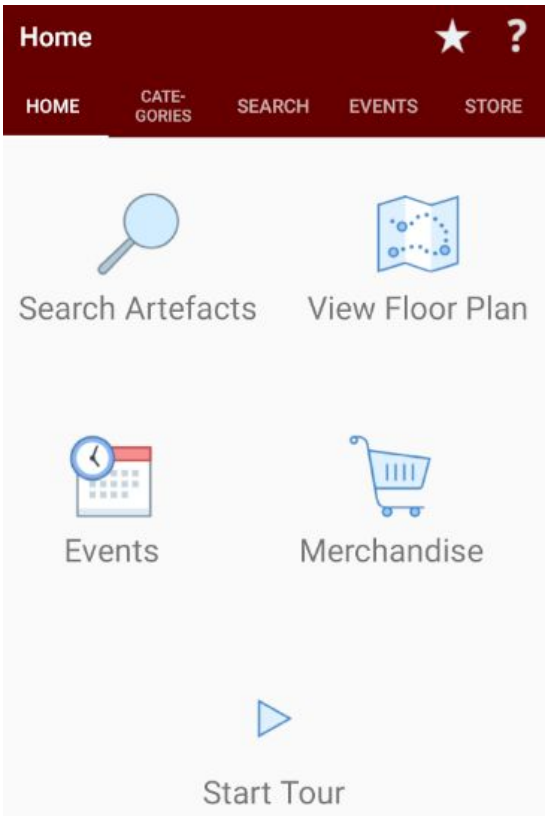


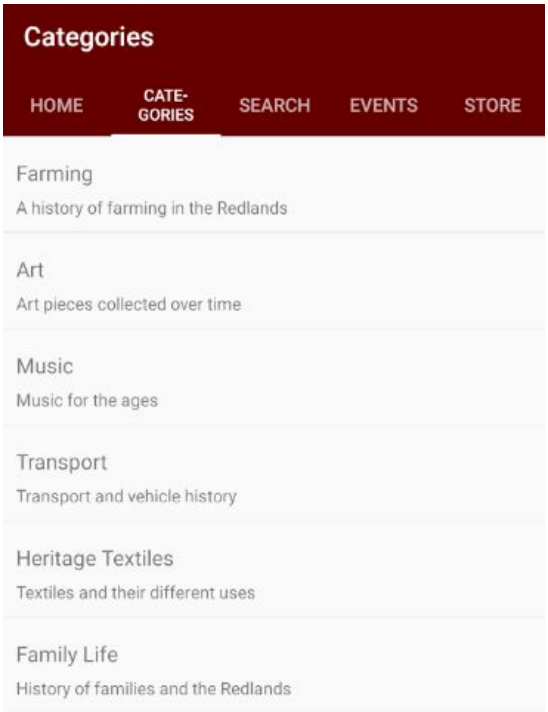


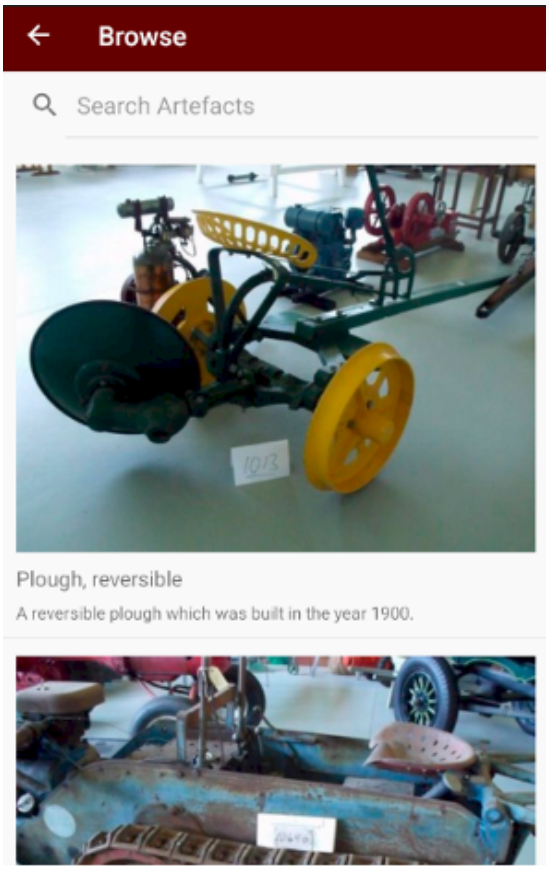


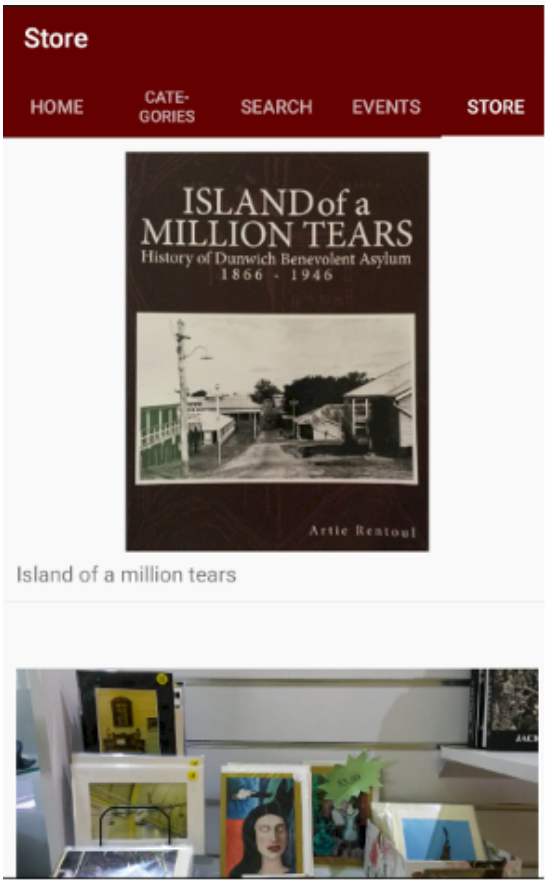


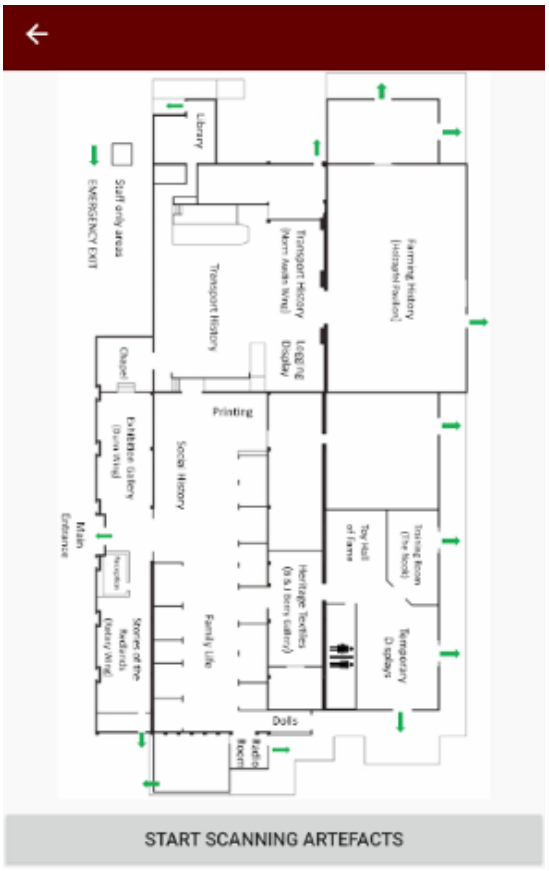
4.4 Codebase 2 (Previous Team)

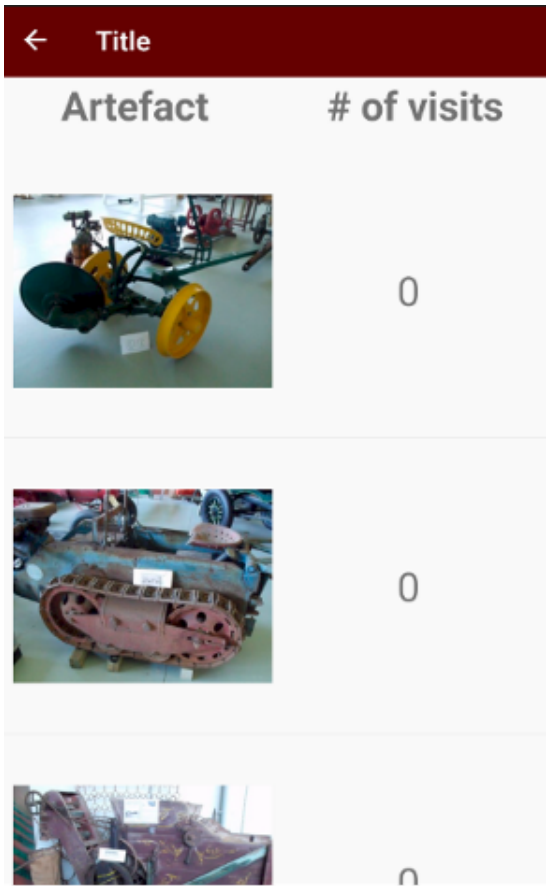


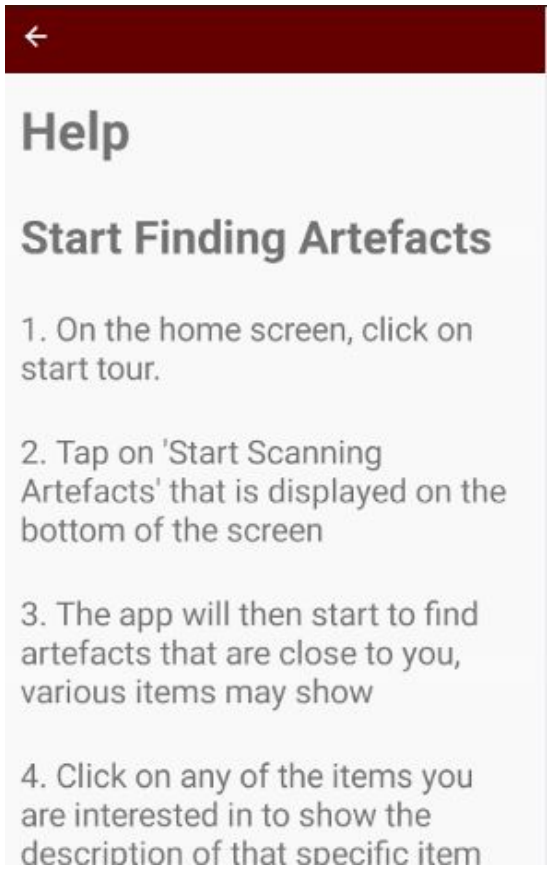






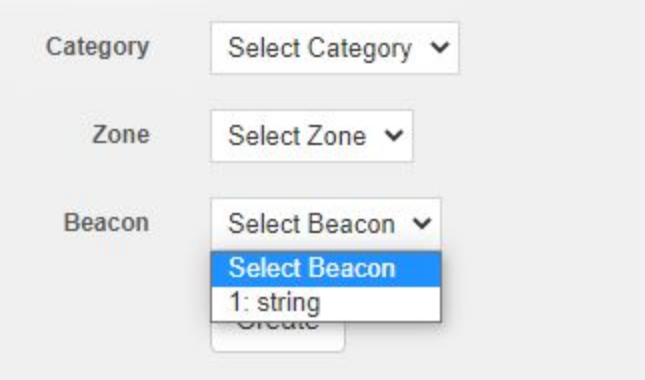

Library
Staff only areas
EMERGENCY EXIT
Transport History
Transport History (Norm Austin Wing)
Lego (R) Display
Farming History (Holroyd Pavilion)
Chapel
Printing
Social History
Toy Hall of Fame
Training Room (The Nook)
Temporary Displays
Heritage Textiles (B.S.I Items Gallery)
Family Life
Stories of the Redlands (Dairy Wing)
Dolls
Radio Room
Main Entrance
START SCANNING ARTEFACTS


Title
Artefact
# of visits
0
0
0

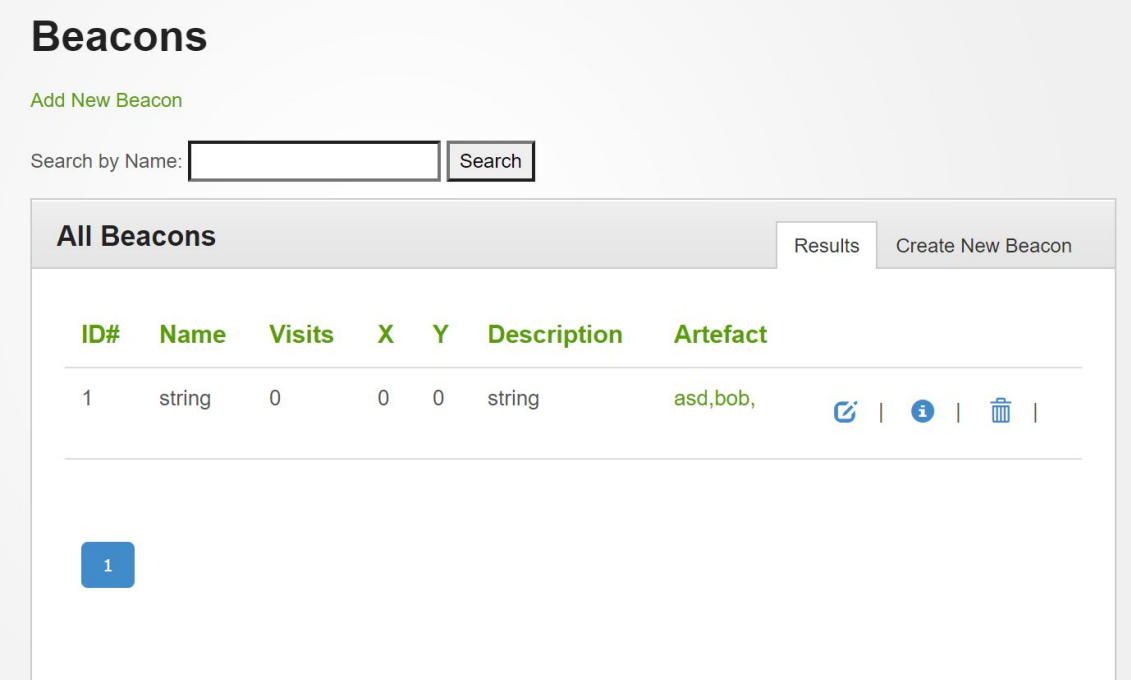

Help
Start Finding Artefacts
1. On the home screen, click on start tour.
2. Tap on 'Start Scanning Artefacts' that is displayed on the bottom of the screen
3. The app will then start to find artefacts that are close to you, various items may show
4. Click on any of the items you are interested in to show the description of that specific item

4.5 Codebase 1 Changes

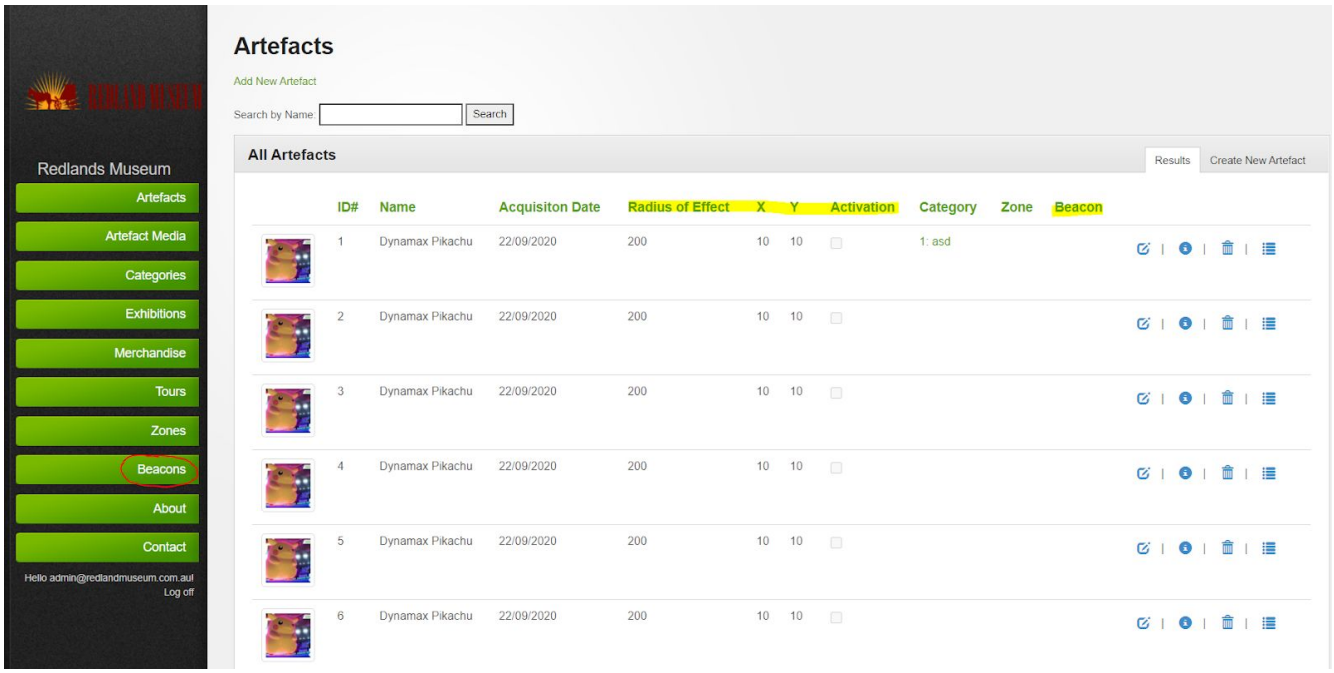
Added dropdown menu to artefact create / edit



Added beacons tab



Added new fields to Artefacts tab



4.6 Trello Board