EXPO +

School of Computing

CA400 Year 4 Functional Spec:

Expo +

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1. Introduction

1.1 Purpose

This document outlines the technical description of our web-based application Expo+. It will explain further why the application is needed and what functions it has. It will be the document of reference for our CA400 Project.

1.2 Scope

Expo+ is a event web application that is based on Dublin City Universities (DCU) Exposition which is where students from the computing and engineering faculty showcase their final year projects to attendees. We saw that there was a need for this application as we have spoken to the people in charge of organising this event. They mentioned that they only use a booklet to help attendees and that an application would greatly help the event. This application will help aid attendees with easy navigation and make it easier for attendees to find projects that they are interested in. They also have the opportunity to communicate with students and give feedback to them.

This will provide a more **interactive** and modern feel to the event making life much easier than flicking through pages to find project demos which users would be interested in. It will also help the event be more **efficient.**

It will be available on all devices with browsers. Users can register an account and answer our built in questionnaire which will then recommend them projects to visit.

Expo+ will have a unique recommendation system which will show projects that would be suitable for the attendees to visit. Part of the algorithm will have collaborative filtering which will recommend projects that similar users have liked and interacted with. This will produce a more personalised and accurate prediction. The project makes use of a Python library called sklearn.

The attendees will be able to like projects and comment under projects. These features would be stored in our database which will be used in our recommender system to show popular projects and for personal recommendations.

Users will be able to use an interactive map for easy navigation. This map will have the layout of the classrooms where the projects will be held and it will also show each location of the students. The users will be able to star/favourite each project they wish to visit and it will then be highlighted on the map. When users hover over the highlighted parts it will show the students project name and table number. The map section will have a video walkthrough to each lab room this will help people who prefer to see visuals.

Attendees can search for a particular keyword or user and projects will be listed. Users will be able to update their profile and enter which company they're coming from. They will have a section to enter in their linked in user.

1.3 Glossary

API - Application programming interface

Pymongo - Is our no SQL database

Recommendation system- used to recommend projects to users

Attendees - we are referring to people using the application

SVG - Scalable vector graphics that will be used to create our map.

DCU - Dublin City University

1.4 Business Context

Educational institutions can use this application to efficiently organise and manage academic or project showcase events like expos. It streamlines the process of presenting student projects to attendees.

Event management companies can offer customised versions of the application to universities or other clients organising expos, showcasing their ability to provide innovative and technology-driven event solutions.

The aim is to make this application a real life solution to the DCU's expo and would like them to use it in the future. With more time there is potential to further develop the project.

1.6 Overview

Section 2 is a general description of the product and its functionality. User characteristics and how the users are expected to react to the product which is shown by different use cases. The constraints of the system and operational scenarios will be discussed in this section also.

Section 3 will include all requirements of the system. All these requirements will be ranked from most important to least important, any technical issues will be discussed in this section.

Section 4 is the system architecture that will display the system overview and the organisation of the different components of the system.

Section 5 is the high-level design where all design components will be expressed from the software design, UI, logic design and their associated diagrams.

Section 6 is the preliminary schedule which will be the plan for the project from the start date to the end of the project, including tasks that need to be completed. All important deadlines and information will be recorded here.

Section 7 is the change request management, assessing and examining suggested changes for the application.

Section 8 are the risks and assumptions where things that could hinder the development of Expo + will be examined.

Section 9 is the operational attributes which are the important qualities the application will have and how to obtain those qualities.

Section 10 is the references

Section 11 is the appendix

2. General Description
2.1. Product/ System Functions

User sign-in - When the user has signed into the application through Vercel on their local browser, they will be prompted to enter with their DCU Google email/ any google account or use the option to create a new user when signing up after this their name, profile image and a user id token will be created for each user.

Projects Tab - This tab will display all of the projects that are being displayed at the expo in a simply formatted webpage in which projects will be split into subsections depending on the similarities between them.

Favourite - Users will be able to favourite projects that they would like to see, the starring would be similar to how one can star an email that they would like to look back on at a different point in time.

Map - All project locations will be displayed on a virtual SVG map in which projects of each student will be numbered with their names highlighted once the user hovers over the project, projects which have been previously favorited will be highlighted in a different colour on the map to the unselected projects to help provide the user easy access to the locations of the project in which they are looking for.

Recommendation System – If a project is favorited by a user then the user will then be recommended similar projects to view based on the fact that other users who have favorited certain projects had also expressed interest in another project similar to that type.

Feedback – Users will be able to leave comments on projects in which they have visited and express their thoughts about each project.

Reactions – If a user was impressed by a project which they have visited then they will have the option to heart/thumbs up the project.

2.2 User Characteristics and Objectives

Users will be able to use this web application when attending the DCU Expo that displays the projects of final year students. This application will make it easier for attendees to navigate their way around the expo, to attend projects in which they express a personal interest in, to discover new projects that would be recommended to them in which they may not have known before. Alongside all of this an aim would be for users to be able to leave a comment on projects in hopes of providing positive feedback so that the creators of the projects will have positive feedback on how they could potentially improve their projects in the future.

2.3 Operational Scenarios

The system is expected to produce results for enquiries which the user may have when looking to make full use of the app functionality and to assist users in regards to the DCU project expo. Posted below are a number of Use case examples

2.4.0 Use Case Diagram
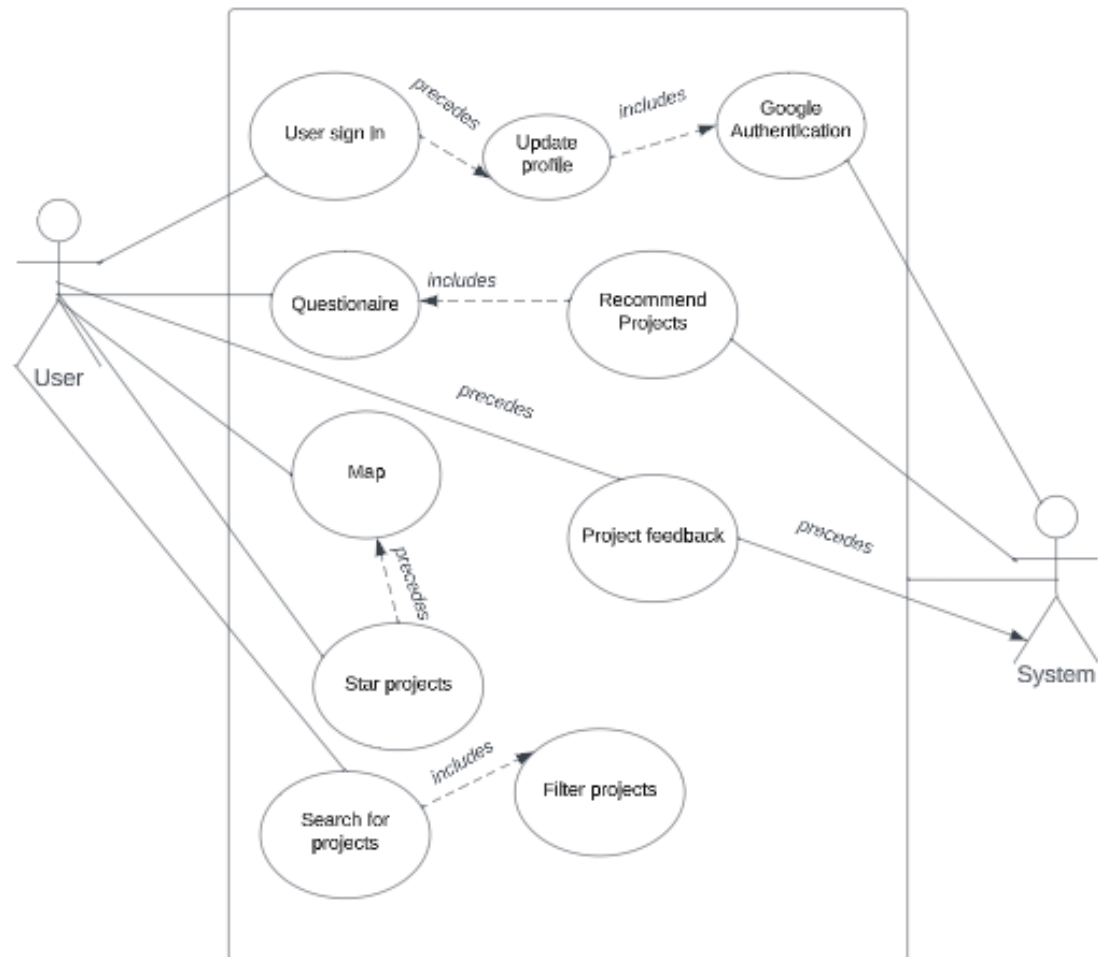
2.4.1

Use Case 1	The user is looking for the location of project X on the map
Goal	To be able to see the desired location highlighted on the virtual map
Preconditions	Desired location must already be starred/favorited by the user for it to be highlighted User must have the virtual map open
Description	The user selects the the topics in which they have an interest in and the location of those projects which have been starred are highlighted in the virtual map for the user to see
Post condition	The location the user wishes to go to has been highlighted and the user now knows how to get there

2.4.2

Use Case 2	Similar projects
Goal	To be able to find similar projects to the ones which they have selected to view
Preconditions	User must make use of our questionnaire recommender system or make use of our filtering system
Description	The user selects the the topics in which they have an interest in and the location of those projects that have been starred are highlighted in the virtual map for the user to see

Post condition	The location the user wishes to go to has been highlighted and the user now knows how to get there

2.4.3

Use Case 3	Account creation
Goal	For the user to be able to create an account for the expo+ application
Preconditions	User must have access to a mobile or a laptop and must be connected to wifi or mobile data Must also be on the expo+ website User can use google to sign in
Description	Account can be used for navigating their way around the expo+ web application
Post condition	The user will now have an account registered on the expo+ website which can be used for future sign ins

2.4.4

Use Case 4	Sign in
Goal	For the user to be able to sign into their expo+ account
Preconditions	User must have an account created Must enter valid login credentials to the previously created account
Description	The user inputs their previously created account into the sign in box with their correct details
Post condition	The user will have an account in the expo+ and will be able to navigate around freely in the application

2.4.5

Use Case 5	Project feedback
Goal	For the user to leave a comment on projects in which they've visited
Preconditions	User must have an account created User must be clicked into the specific project which they intend to give feedback on
Description	The user gives constructive criticism in the comment box of projects in which they have visited
Post condition	Students that created the project will be able to see the feedback and potentially be able to build on it in the future

2.4.6

Use Case 6	Project filtering
Goal	For the user to be able to find the ideal projects to look for in relation to their interests
Preconditions	User must be signed in User must be viewing all projects
Description	The ability to filter though projects will help the user to find projects that fall under their line of interests
Post condition	Projects have been filtered out and users can now see projects that have been specifically tailored to their interests

2.4.7

Use Case 7	Use of the search bar
Goal	To be able to search for certain keywords or certain projects
Preconditions	Availability of searchable content Users must be signed in User must have knowledge of what it is that they're looking for
Description	User enters keywords or project name into the search bar and selected resulted is returned back to them
Post condition	User finds the project that they were looking for

2.5 Constraints

Time

Development of the core functionality of the application would need to be completed by March 2024, this would mean that any additional features would not be treated as a priority and would only be added if the main components of the application were to be completed first.

User Interaction

The design of the application means that it can be accessed via smartphone and desktop. Consistency between web pages needs to be insured and usability regardless of device needs to be a priority.

Deployment

This application will be deployed on Vercel to accommodate users of all types of operating systems, this poses a list of potential problems for the application such as Configuration Complexity and how to ensure that our application would work in a serverless environment. Another constraint

that would be had upon deployment would be that compatibility issues would occur in relation to ensuring consistency within servers.

3. Functional Requirements

3.1 Recommendation system

Description

The recommendation system will be noticeable after the user has chosen what projects that they seek to look for as once they have selected the projects in which they have expressed an interest in, then they will now be shown projects which are similar to that in which they have chosen or projects in which people who have chosen the same project as them have also expressed an interest in.

Criticality

This recommender system is a crucial part of the project as it poses a unique level of difficulty while also being a technically challenging aspect of our project, it is vital because it is a primary way for users of the application to discover more projects that fall within their category of interest.

Technical Issues

The main technical issues with the recommendation system is addressing the cold start problem and figuring out the solution on how to populate data within the system in order to make it effective. Although there are ways in which to address this issue not every solution will be applicable to this project.

3.2 Virtual map

Description

A map of the locations of each project that will display details such as the names of the students who created the project and the project name itself. Upon selection projects which have been starred/favourited will have their location highlighted on the virtual map making the selected projects easier to get to. The map of course will display the location of all projects whether they've been selected or not but starred projects will stand out more than non starred projects.

Criticality

This function is of major importance in our project as its general aim is to make the location of the projects easier to find for users seeing as this is the main issue that the expo has each year so to be able to help the users achieve this task while also cutting down the time it will take to find the location of the places that they are looking for via highlights would be the primary goal.

Technical Issues

Main technical issues with this task is to find a map software that would be applicable for designated areas such as classrooms, the majority of map software accessible on the internet are not made for such confined spaces such as classrooms or labs and are normally made for larger scale areas such towns and neighbourhoods.

3.3 Search function

Description

The search function will be used as a method of filtering in which users will be able to look up names of the projects in which they are looking for, this is an instance in which keywords will be a major contributor to the search results.

Criticality

This feature holds a high level of importance to the project as it will assist users in finding out information about the projects they have an interest in and will help them to find the locations of the projects quicker.

Technical Issues

The main issues that will come from the search function is to do with the keywords and how relevant they will be to what the user is actually searching for, when a user searches for a project name or details about the project it is important that they are actually supplied with the right information and not something that is the complete opposite of what it is that they are looking for.

3.4 User Feedback

Description

There will be a designated section for users to be able to give constructive criticism or general feedback to students about their project, this will not be an anonymous function. The reason for anonymity is to prevent any toxic behaviour from users with the aim of discouraging students with negativity.

Criticality

The level of criticality for this feature is not as high as the rest as it is not amongst the top features of the project, that being said it still holds weight as a feature that may be useful especially for students who wish to further develop their project idea once the expo is finished.

Technical Issues

This feature should not pose a high level of difficulty in terms of technicality, however an issue that may arise is that students may not receive all the feedback or that errors may occur on the user end in terms of communications.

3.5 Vercel Deployment

Description

The web application will be deployed on Vercel as a means of the application being available for all users despite what device they are using, by doing this it makes the application more accessible than if we were to create a web application which would limit users and also gives the benefits of a mobile application without having to face the technical struggles which that poses.

Criticality

This is the most important part of the application as without the web app being deployed on Vercel then the project would not be viable, this is the single most key feature of the application.

Technical Issues

The issues that arise from Vercel is the deployment of the application on the platform as it is primarily used for hosting websites and web applications, problems which this may bring could be to do with cold starts which could bring about a delay in response times that could potentially cause the application to crash. Another problem that could occur is that there may be security issues in regards to who does and doesn't have access to the server.

4. System architecture diagram

In the system architecture diagram below, the structure of the application is shown. Attendees will be connected to the host link which they can then interact with the application that extends into the frontend and backend.
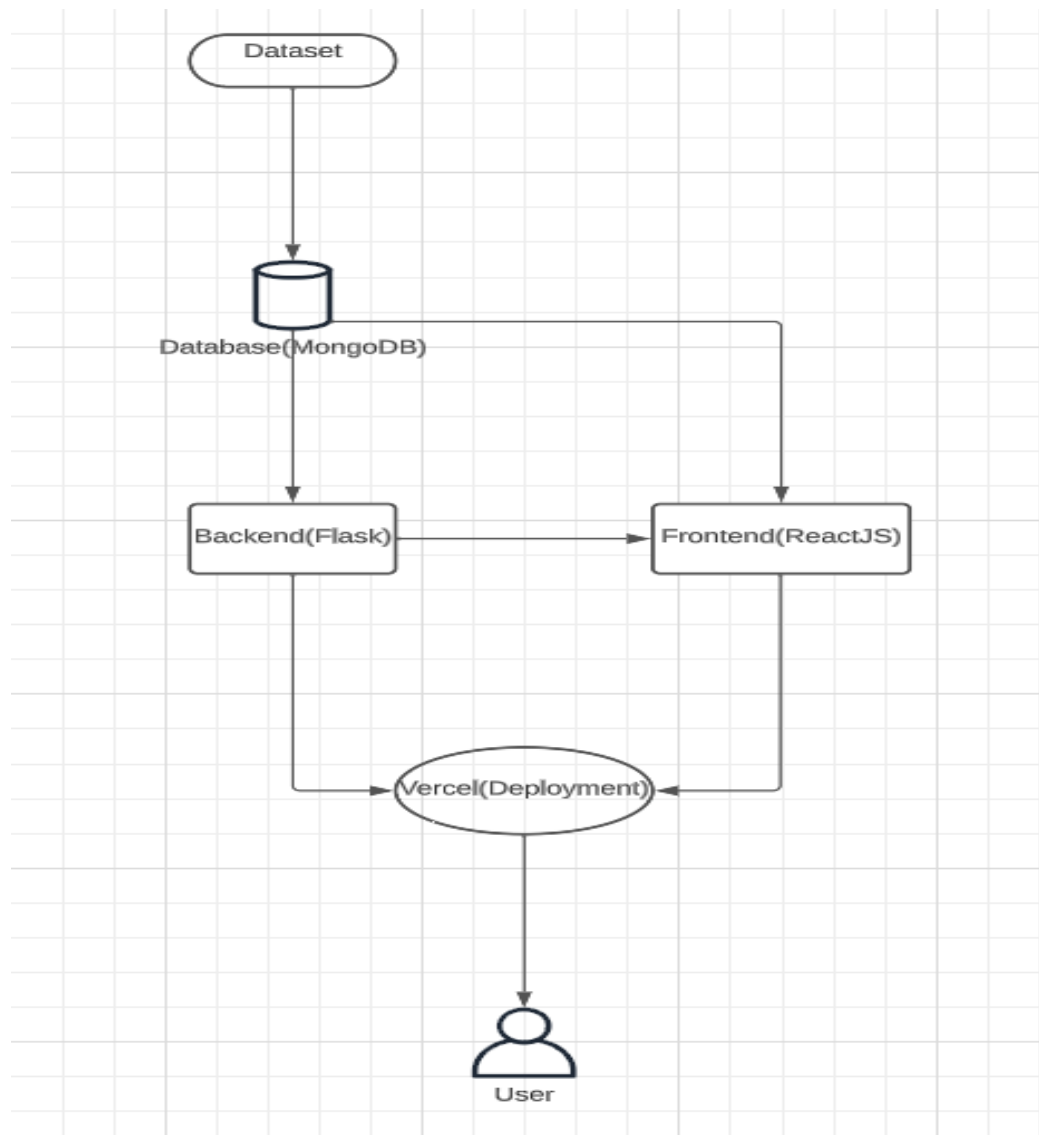
5. High-Level Design

5.1 Context Diagram

This diagram shows how the system interacts with its external entities to the system. It helps to give a general display of the scope of the project while also showing how the users will interact with the system.
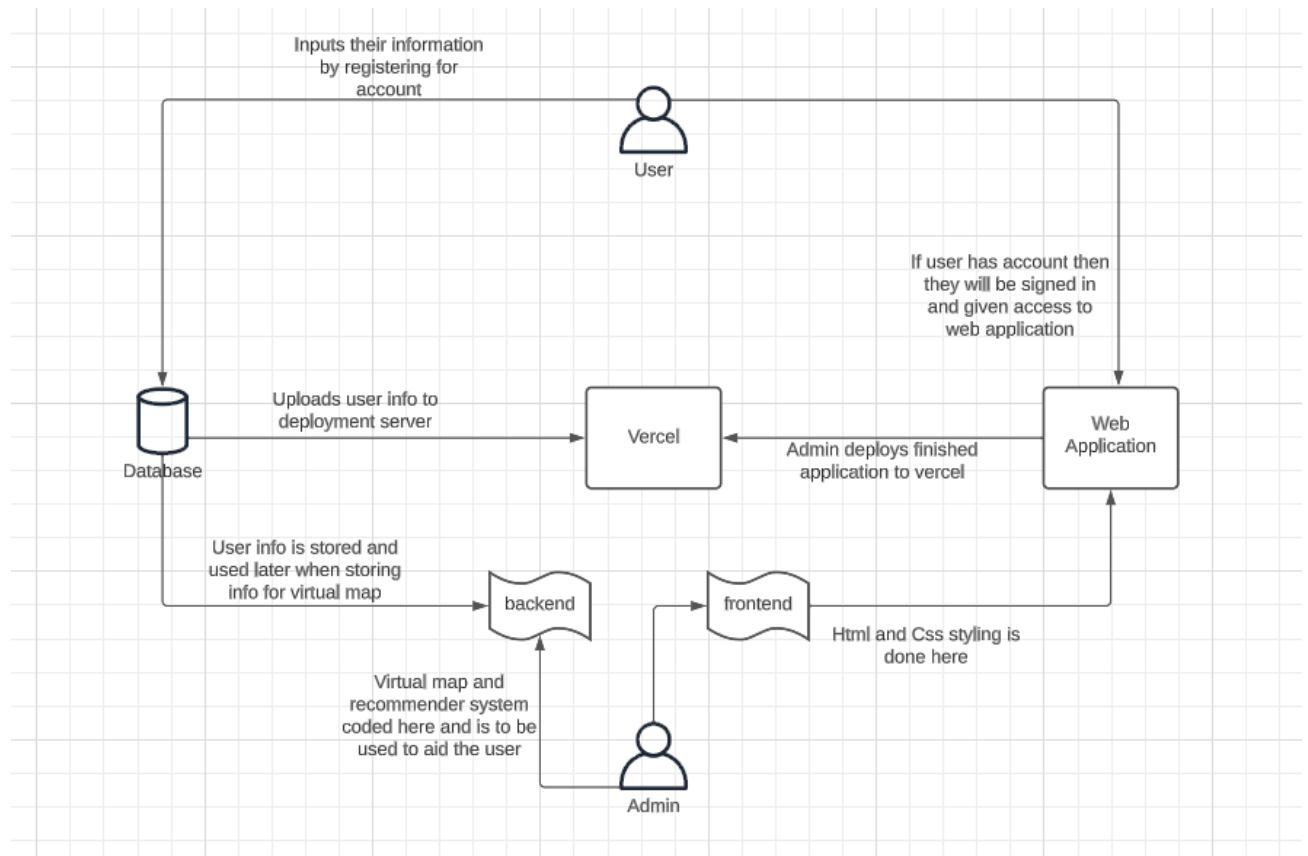
5.2 Logic Data Diagram

Logic data diagram for user selecting projects to view on virtual map
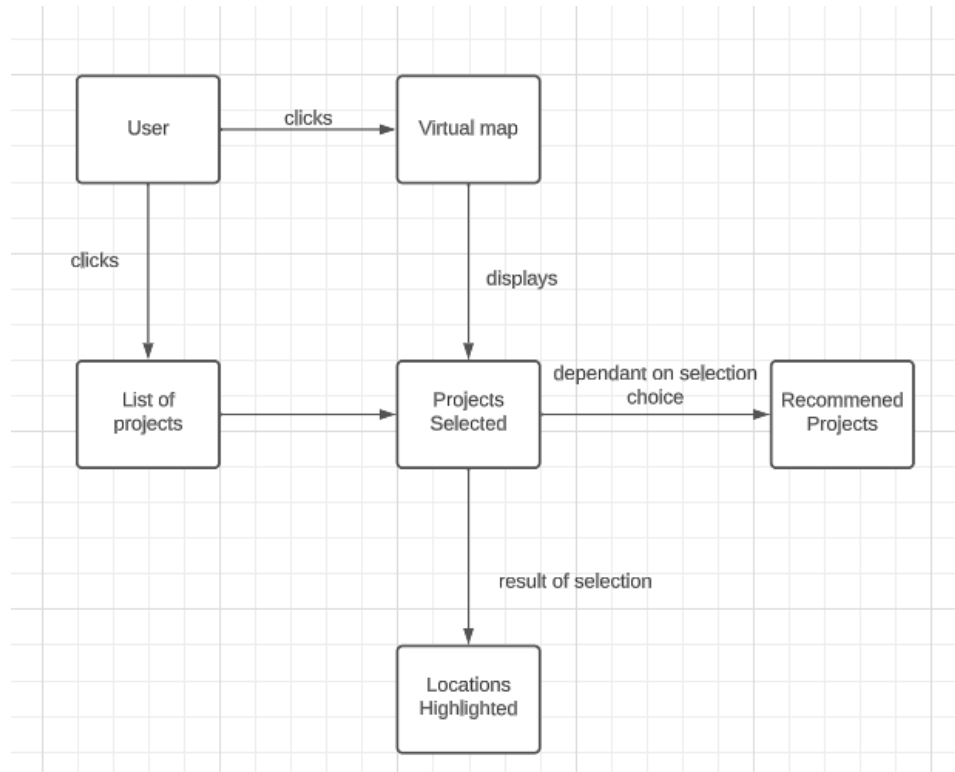
5.3 Data Flow Diagram

Here, the aim is to present the system's data transit patterns and demonstrate its usability. One can see the system's internal workings, its external entities, the data flow between these workings and its data stores.
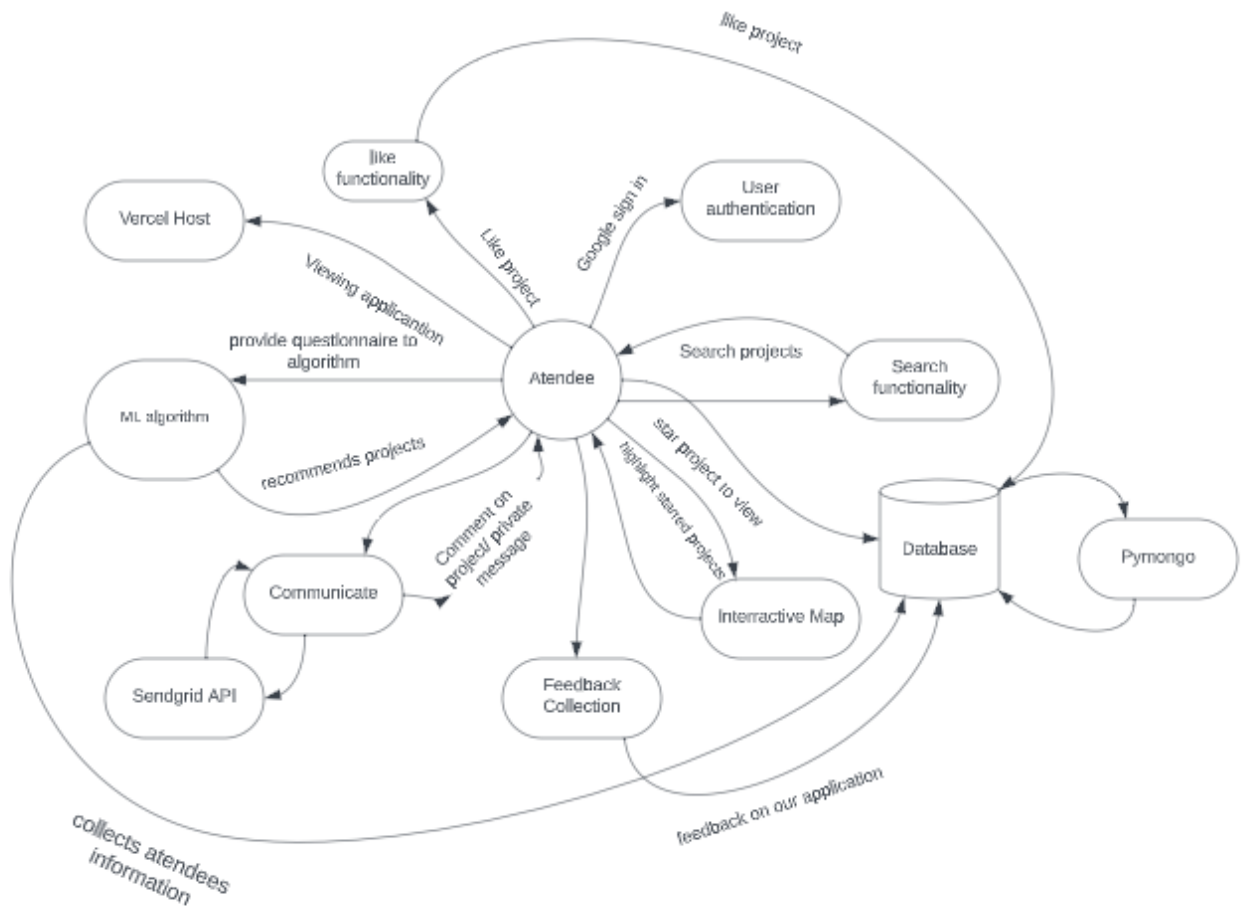
5.4 State Diagram

Here is our state diagram; it shows the different states that our system can be in and the transitions between those states.
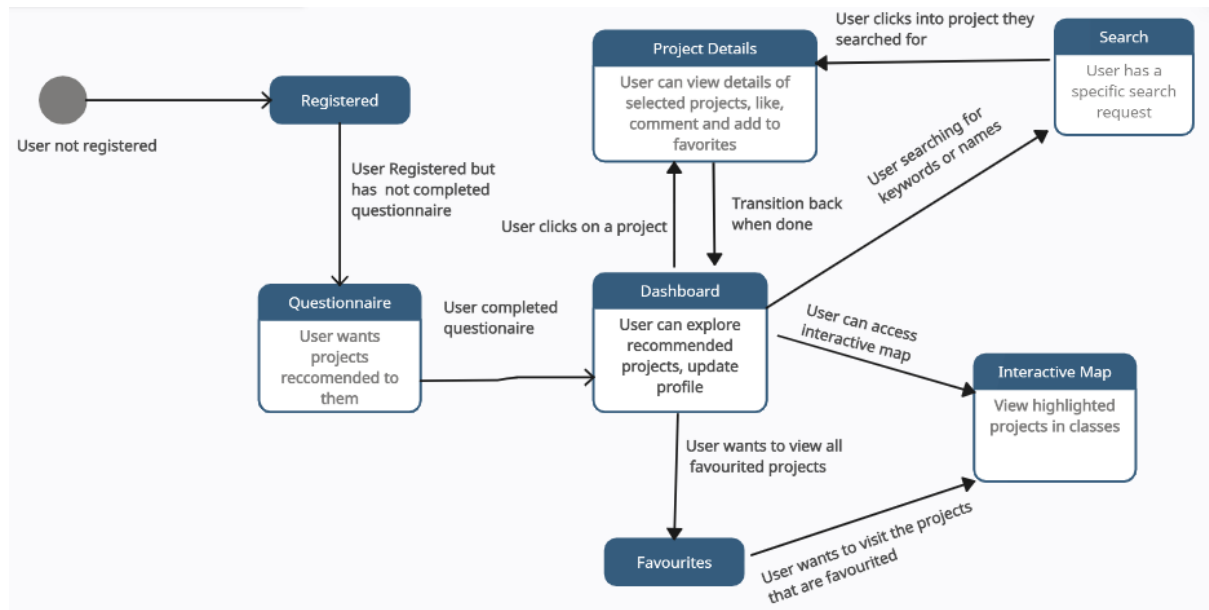
5.5 Map diagram

Here are two images of the entrance to the ground floor labs and an in depth image of one of the labs. The images that are on the expo booklet will be taken and converted to an SVG image so that they can be manipulated with.

Lab location
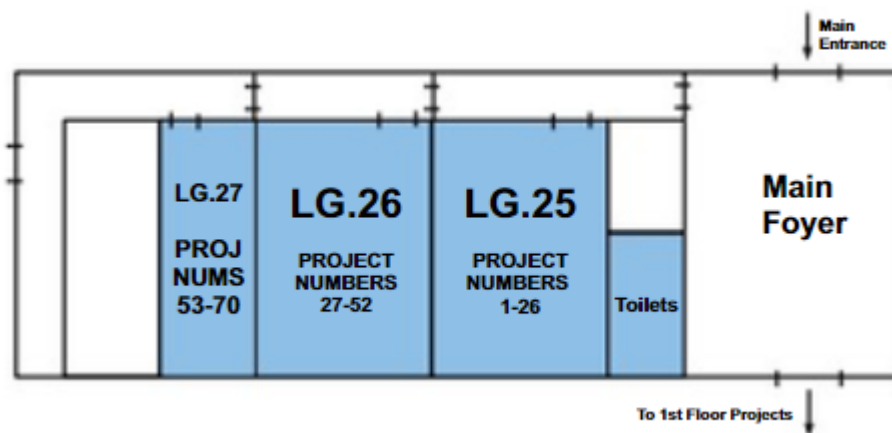
Detailed lab map
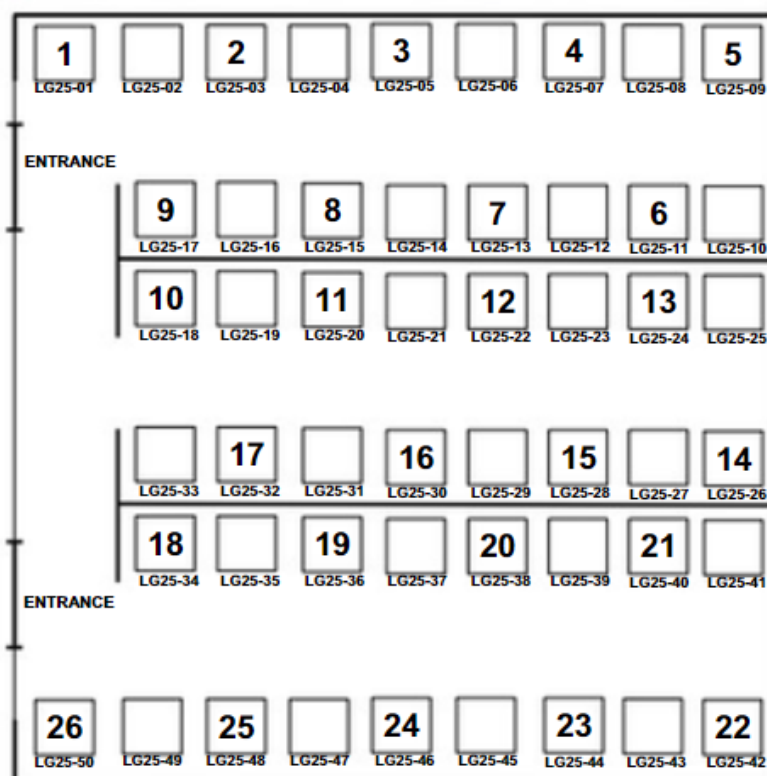
This is the first draft of the plan and schedule for the application. Below is a GANTT chart which shows the major tasks and timeline for the project. The main technologies needed are that of the front and back end which will be worked on simultaneously by both participants of this project.**[Fig 1]**

7. Change Request Management

This figure shows how modifications to the design will be handled. Design modifications will often be created, tested and debugged. Every design modification will undergo an evaluation and analysis process before it is determined whether or not it will improve the system. After that, approval may be given and there will be an attempt to try integrating it into the application. If the design modification is unsuccessful, then it will be rejected or postponed.
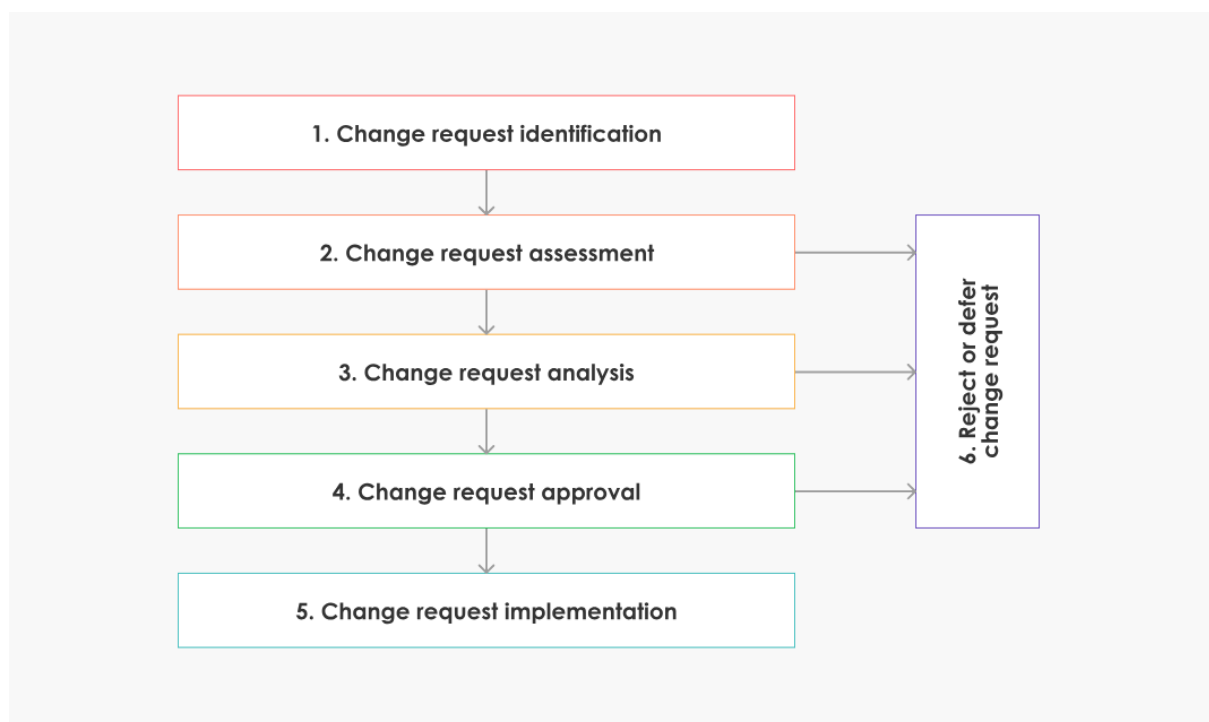
8. Risks and Assumptions

8.1 Assumptions

Google sign in - The assumption is that users have access to google a google account and can use it to sign in.

Validation - Provide another way for users to create an account and sign in

Knowledge of tech area - The assumption is that the attendees know which type of projects that they are into so that they can help the algorithm provide the best recommendation for them.

Validation - Have all the different types of technologies shown as well as each module so the user can view all that is available.

Compatibility - The application will work seamlessly across different devices

Validation - Perform compatibility testing on different browsers and devices to ensure a consistent user experience.

Data Training - Sufficient and relevant data for training the machine learning algorithm will be available as it will be source by using Kaggle.

Validation: Explore Kaggle datasets before and and adjust the algorithm if necessary.

8.2 Risks
New Technologies - Challenges may arise in implementing new technologies, such as the recommending system algorithm, Leaflet.js, and integrating various APIs.

Mitigation - Conduct thorough research, allocate sufficient time for learning and troubleshooting, and have backup plans in case certain technologies pose unexpected challenges.

Engaging with features - Users might not actively engage with features like liking projects or providing feedback.

Mitigation - Provide clear incentives, and encourage user engagement through intuitive design.

9. Operational Attributes

9.1 Speed

The main idea for this application is to make the most of your time so speed goes well with our application. Not only is it quicker to locate projects compared to a catalogue, it provides extra advanced features to keep the user engaged, it also helps the user schedule which project they would like to go to next.

9.2 Maintainability

The plan is to make the application maintainable by breaking down the code into smaller subsections in different branches that will allow for the code to be updated when needed. Any errors and upcoming issues will be identified and managed quickly. The plan is to make this application available for the upcoming expo events.

9.3 Multi-Device usage

As the plan is to host the application on Vercel this will provide easy access for all devices with browsers to run it.

The plan is to implement a responsive design using technologies like Bootstrap or CSS Grid to ensure that our web application adapts to different screen sizes and resolutions.

To guarantee consistent performance across several browser environments, the online application will be tested and optimised for different web browsers (such as Chrome, Firefox, and Safari).

10. References

Vercel - https://react-8ha4botqu-destinys-projects-a3dc80e8.vercel.app/
Sklearn - https://scikit-learn.org/stable/

11. Appendix

Fig 1

Task	Hours	%	Timeline / Assignee
Expo+	0h	0%	
Proposal + Supervisor	0h	0%	
Find Supervisor	0	0%	Genesis Jeames, Gideon
Finish proposal	0	0%	Genesis Jeames, Gideon
Proposal presentation/ Approval	0	0%	
Funk Spec	0h	0%	
Write up	0	0%	Genesis Jeames, Gideon
Supervisor approval	0	0%	Genesis Jeames, Gideon
Submit document	0	0%	Genesis Jeames
Ethical Approval	0h	0%	
Write up	0	0%	Gideon
Supervisor approval	0	0%	
Submit document	0	0%	Gideon
Set up Environment	0h	0%	
link frontend/backend set up server …	0	0%	Genesis Jeames
Exam Season	0h	0%	
Exams	0	0%	
Backend	0h	0%	
User login / Logout	0	0%	Gideon
User profile	0	0%	Gideon
Database creation	0	0%	Genesis Jeames
Questionnaire section	0	0%	Gideon
Interactive maps	0	0%	Genesis Jeames
Search section	0	0%	Genesis Jeames
Attendee comment under project	0	0%	Genesis Jeames
Recommender system	0	0%	Genesis Jeames
Supervisor approval	0	0%	
Frontend	0h	0%	
Designing frontend interface	0	0%	Genesis Jeames, Gideon
Testing	0	0%	Genesis Jeames
Supervisor approval	0	0%	Gideon
Testing	0h	0%	
Testing phase	0	0%	Genesis Jeames, Gideon
Final project design	0	0%	Genesis Jeames
Supervisor approval	0	0%	Gideon
Documentation	0h	0%	
User guide	0	0%	Gideon
Technical Spec	0	0%	Genesis Jeames, Gideon
Video Walkthrough	0	0%	Genesis Jeames
Supervisor approval	0	0%	Gideon
Submission	0	0%	Genesis Jeames

Timeline columns: 9/23, 10/23, 11/23, 12/23, 1/24, 2/24, 3/24