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Introduction:

The McGregor Institute of Botanical Training is an educational institute which is in Ireland. It has extended its reach to Nepal by offering advanced programs in agriculture and horticulture specialty for undergraduates and postgraduates. With the growing public interest in agriculture, the organization has secured the introduction of short-term certification courses focusing on horticulture. Additionally, the McGregor Foundation aims to establish a platform where individuals can receive expert advice, discuss, and participate in the development of plans to create plants and forests to protect their rarity. Also, where individualities can be engaged in exchanges, and organize enterprise to guard rare shops.

This project comes with an online program which is design to support the efforts of the McGregor Institute. The proposed system allows users to register and enrol in various programs such as: participate in certification tests, get recommendations from experts, purchase plants, and make financial transactions in security, and communicating through dedicated platforms. To conceive and build the online system effectively, the specifications will be created, and a detailed description of system functionality will be provided, and a well-structured plan will be provided that will cover the planning and design stages. Also, different methodologies will be selected to make sure that the project's implementation coordinate with the aims and operational structure of McGregor institute. The McGregor Institute's mission to enhance botanical education and community engagement through comprehensive programming and strategic management and perfect integration of the proposed online program.

Work Breakdown Structure (WBS):

Work Breakdown Structure (WBS) is like a blueprint of the project. It breaks down a big project into the smaller and manageable part. Each part of the project gets more detailed as it goes down for the list by breaking down huge tasks. The Work Breakdown Structure covers every part of the project and shows that who is responsible for what. The WBS helps the project manager to manage the project by providing clear plan, coordinating team members, and marking the milestones. WBS is created by defining the project, setting limits, listing the requirements to run project and break down the task for individuals (Christine Organ, Cassie Bottorff, 2022).

For the development of system for the McGregor Institute of Botanical Garden. The system is broken down into the smaller and manageable part by using the prototype methodology. The Work Breakdown Structure (WBS) for the system follows the prototype methodology by prioritizing repetitive development and user feedback. It is the approach where the project is divided into different stages that focuses on creating the prototype of the final project.

The WBS is developed by gathering the requirement through the stakeholder's interview and documenting the user feedback. The design phase involves creating the wireframes and while prototyping focuses on the prototype for the various system functions. After the prototype is completed, it is reviewed by the customer and feedback is gathered and refined the prototype as per the feedback. After the satisfaction of the customer the project is developed and maintained by fixing the bug and implementing feedback along with future enhancements. The Work Break Down Structure (WBS) of the McGregor institute system is done bellowed:

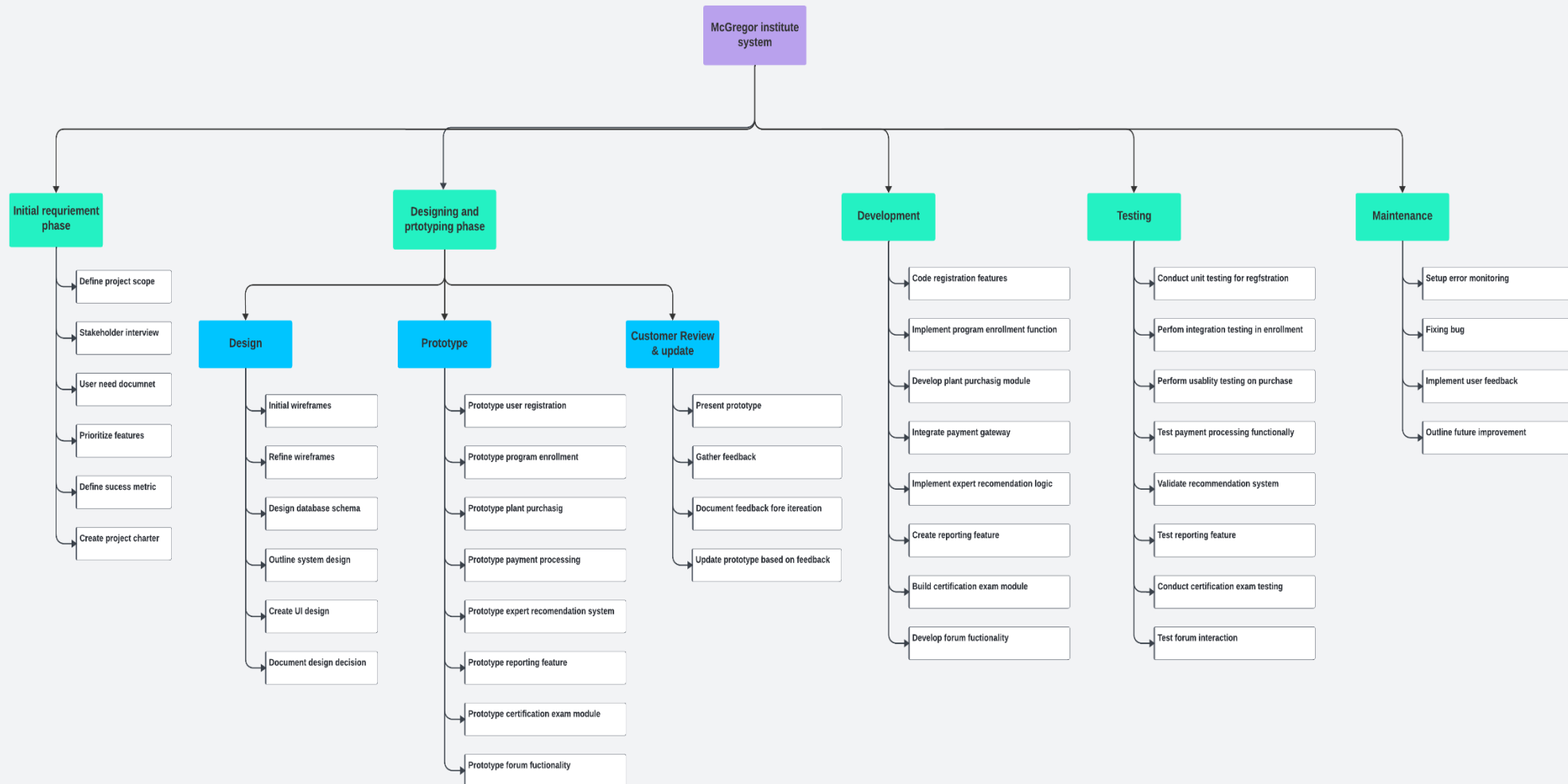


Figure 1: Work Breakdown Structure.

Gantt Chart:

Gantt Chart is a graphical or visual representation of the project timeline. It represents the project tasks like when the project starts and finish, and how they depend on each other. It is very useful to the project manager to make plan, manage, and monitor project tasks and resources. The Gantt chart consists of horizontal bars of different lengths and sizes that represent the timeline of the project along with the tasks listed in the vertical axis. These bars represent the task duration and completion status. It helps to facilitate communication among project stakeholders and helps to keep track and manage the project. Gantt charts are widely used in various industries, including construction, software development, and project management, to ensure that the projects stay on schedule and resources are allocated efficiently (Grant, 2023).

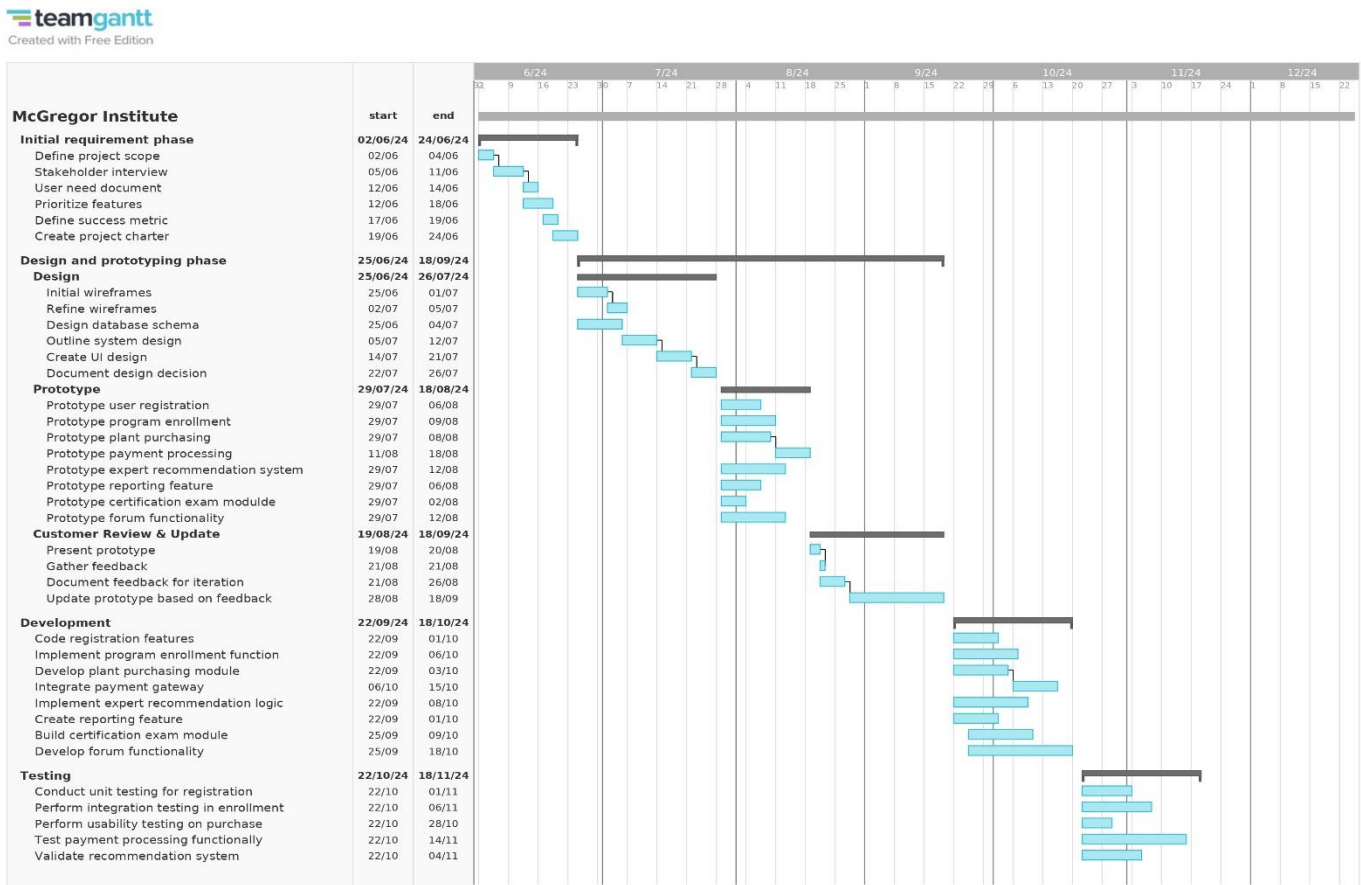


Figure 2: Gantt Chart.

teamgantt
Created with Free Edition



Figure 3: Gantt Chart.

Use case:

A use case is a methodology which is used in software engineering to define, clarify, and organize system requirements. It provides a detailed description of how the system interacts with its users or external entities to achieve a particular goal. The use case outlines the steps involved in executing a specific functionality or feature of the system from the perspective of actors. Additionally, the use cases are often represented visually using diagrams, such as use case diagrams. It provides a high-level overview of the system's functionalities and the actors involved in each use case. Actors are depicted as stick figures, and their relationships with use cases are represented by lines connecting them. Overall, use cases play a vital role in software development by providing a detailed understanding of how users interact with the system and the various scenarios that need to be considered during development and testing (Sanford Friedenthal, Rick Steiner, 2015). The component which are used to create the use case diagram are sorted below:

- **Actor:**

Actor is the component of the use case diagram. It embodies a distinct role fulfilled by the external entities that engages with the system being described which is known as use case.

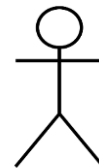


Figure 4: Actor.

- **Boundary:**

The boundary represents the scope of the system being modelled. It encloses all the use cases within the system boundary, representing what is included in the system and what lies outside of it. This helps to define the entire system and provides clarity on its functionalities and responsibilities.

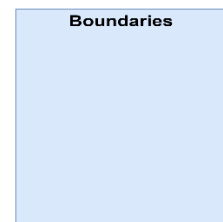


Figure 5: Boundaries.

- **Use cases:**

Use cases are the components of the use case diagram. It represents the specific functionalities or action of the system. Each use case describes the function or the specific task that system can perform



Figure 6: Use case.

- **Communication link:**

The communication link is also known as an association or a relationship. It represents the interaction between an actor and a use case. It describes how an actor communicates with the system by participating in a particular use case. It connects actors to the specific use cases.

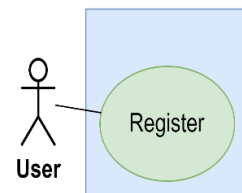


Figure 7: Link.

- **Relations:**

Relationships typically refer to associations between various elements of use case such as actors and use cases. These relationships describe how different elements interact with each other within the system. There are three types of relations they are: generalization, include and exclude.

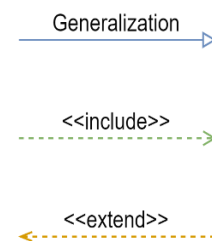


Figure 8: Relations.

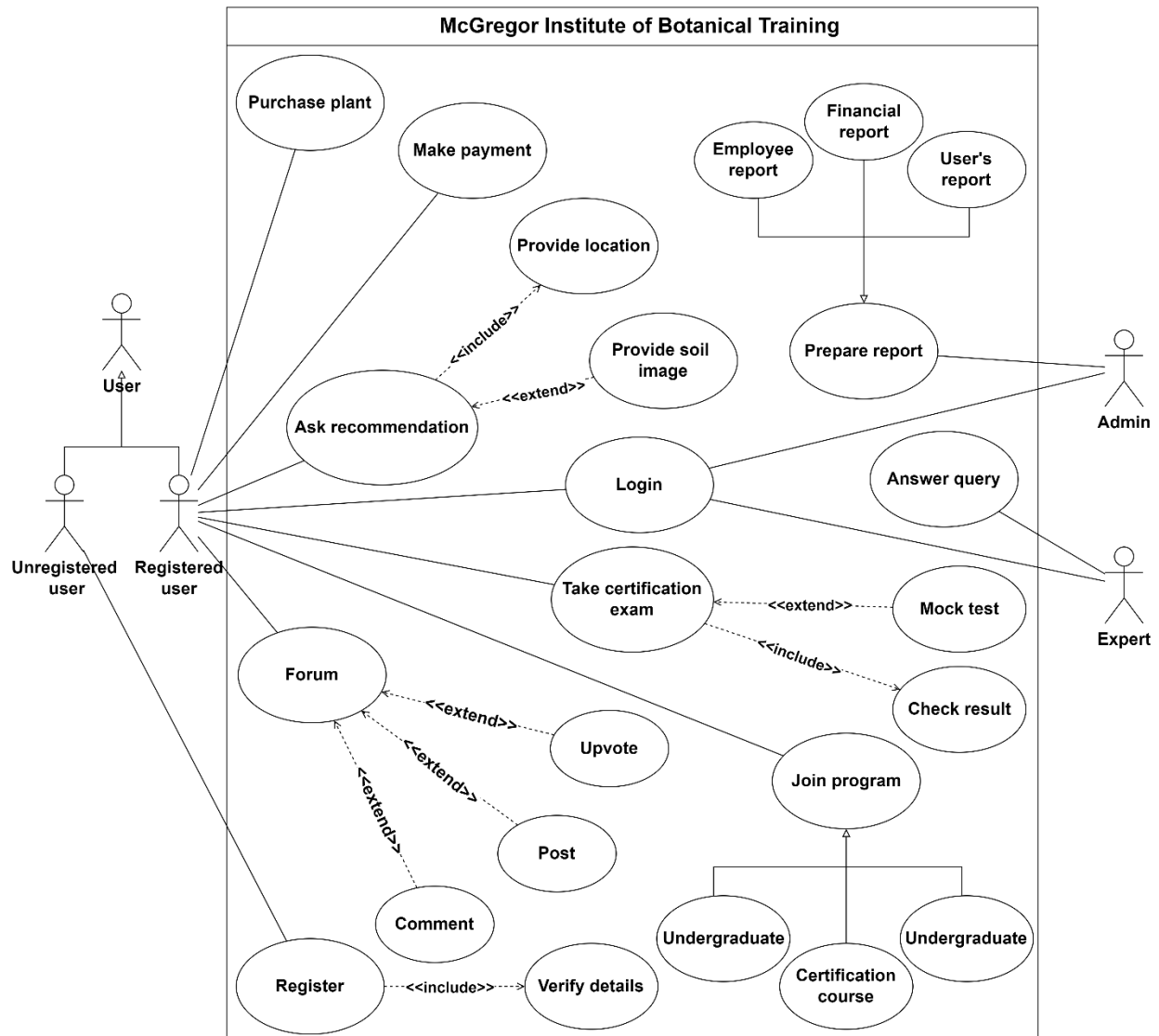


Figure 9: Use Case Diagram.

High Level Use Case:

A high-level use case is a brief description of a task or action that the system needs to perform. It gives an overview of what the system should do. It describes the main idea of what is needed to be done without getting into all the tiny details. The high-level use case helps us understand how big or complicated the task is and helps us to organize similar tasks together for later work (PennState, n.d.). Based on given specification, the following use cases can be identified as:

i) Register:

- **Use Case:** Register
- **Actor:** Unregistered user
- **Description:** The new or unregistered users can create an account to access the system's features by providing valid information in order to verify the users' detail.

ii) Login:

- **Use Case:** Login
- **Actor:** Admin, Registered user, and Expert
- **Description:** All the users can sign in using their username and password. The system verifies user's information and grants access based on their account type.

iii) Join program:

- **Use Case:** Join program
- **Actor:** Registered user
- **Description:** This lets the user to sign up for a specific program offered within the system. That includes postgraduate, undergraduate and certification course.

iv) Purchase plant:

- **Use Case:** Purchase plant
- **Actor:** Registered user
- **Description:** The registered user can purchase a plant through the system. They can browse plants and purchase it according to their preferences.

v) Make payment:

- **Use Case:** Make payment
- **Actor:** Registered user
- **Description:** The system lets registered users to pay for purchasing the plant and for the course they are enrolled according to their preference.

vi) Ask recommendation:

- **Use Case:** Ask recommendation
- **Actor:** Registered user
- **Description:** The users can ask for recommendations based on their needs. And they receive suggestions for their queries by providing the details to the experts.

vii) Prepare report:

- **Use Case:** Prepare report
- **Actor:** Admin This lets users to interact with each other. Moreover, they can browse existing conversations, ask questions, reply to others' posts, search for specific topics and upvote others post.
- **Description:** It led admins to generate reports about the system. They can prepare the report based on their needs.

viii) Take certification exam:

- **Use Case:** Take certification exam
- **Actor:** Registered user
- **Description:** This lets registered users to take exam offered by the system. They can take the mock exam optionally then view their results or feedback of the exam.

ix) Forum:

- **Use Case:** Forum
- **Actor:** Registered user
- **Description:** This lets users to interact with each other. Moreover, they can browse existing conversations, ask questions, reply to others' posts, search for specific topics and upvote others post.

x) Answer query:

- **Use Case:** Answer query
- **Actor:** Expert
- **Description:** Experts can answer user questions within the system. They can see the users query and provide suggestions for them as per their requirements.

Expanded Use Case:

Expanded use cases provide detailed descriptions of the interactions between actors and the system being developed. These descriptions focus on what the system should do from the user's perspective. They cover crucial information including variations and exceptions, to fully understand the functionality. Moreover, it helps to guide the transformation of textual use case descriptions into sequence diagrams, which visually represent the sequence of interactions between actors and the system (Wazlawick, 2007). The expanded use case of the system is below:

➤ **Take certification exam:**

- **Use Case:** Take certification exam
- **Actor:** Registered user
- **Description:** This lets registered users to take exam offered by the system. They can take the mock exam optionally then view their results or feedback of the exam.

Typical course of event:

Actor action	System response
1. Users navigate to the exam's dashboard.	
	2. The system displays certification exams.
3. The user selects the specific exam they want to take.	
	4. The system retrieves the exam questions
	5. The system presents the exams questions on the screen
6. User provides answer to the questions	
	7. The system records the answer
	8. The system provide result

*Table 1: Typical course of event of certification exam.***Alternative course of action:**

3. If the user does not find suitable exam. Use case ends.

➤ **Forum:**

- **Use Case:** Forum
- **Actor:** Registered user
- **Description:** This lets users to interact with each other. Moreover, they can browse existing conversations, ask questions, reply to others' posts, search for specific topics and upvote others post.

Typical course of event:

Actor action	System response
<ul style="list-style-type: none"> Users navigate to community forum. 	<ul style="list-style-type: none"> The system displays a list of existing conversations organized by relevance.
<ul style="list-style-type: none"> User may start a new topic by asking a question or posting a comment. 	<ul style="list-style-type: none"> The system provides a form or interface for them to enter their question or comment.
<ul style="list-style-type: none"> The users may upvote the opinion of other users. 	<ul style="list-style-type: none"> The system adds the number of upvote for the post or comment done by user
<ul style="list-style-type: none"> The users may search the topic according to their preference. 	<ul style="list-style-type: none"> The systems filters and display the topic according to the user choice.

*Table 2: Typical course of event of forum***Alternative course action:**

- If the relevant topic is not provided by the user, then system will display the error message stating result not found.
- If the user is not signed in the system than the users cannot create new posts, upvote to other people's posts, or leave comments in the post of other.

Collaboration Diagram:

The diagram shown below is a collaboration diagram of take certification. First the User access their exam TakeCertificationUI and requests ManageExam to see available exams. The ManageExam interact with the Exam to fetch a list of available exams. The list is then presented to the user. User selects the exam they want to take and the system confirms the selection and displays corresponding exam questions from the Exam. User then proceeds to answer the questions and submit their answer via TakecertificationUI. The ManageExam coordinated with Exam components to calculate and grade the exam. Finally, the result is sent back to the TakecertificationUI and is displayed on the dashboard.

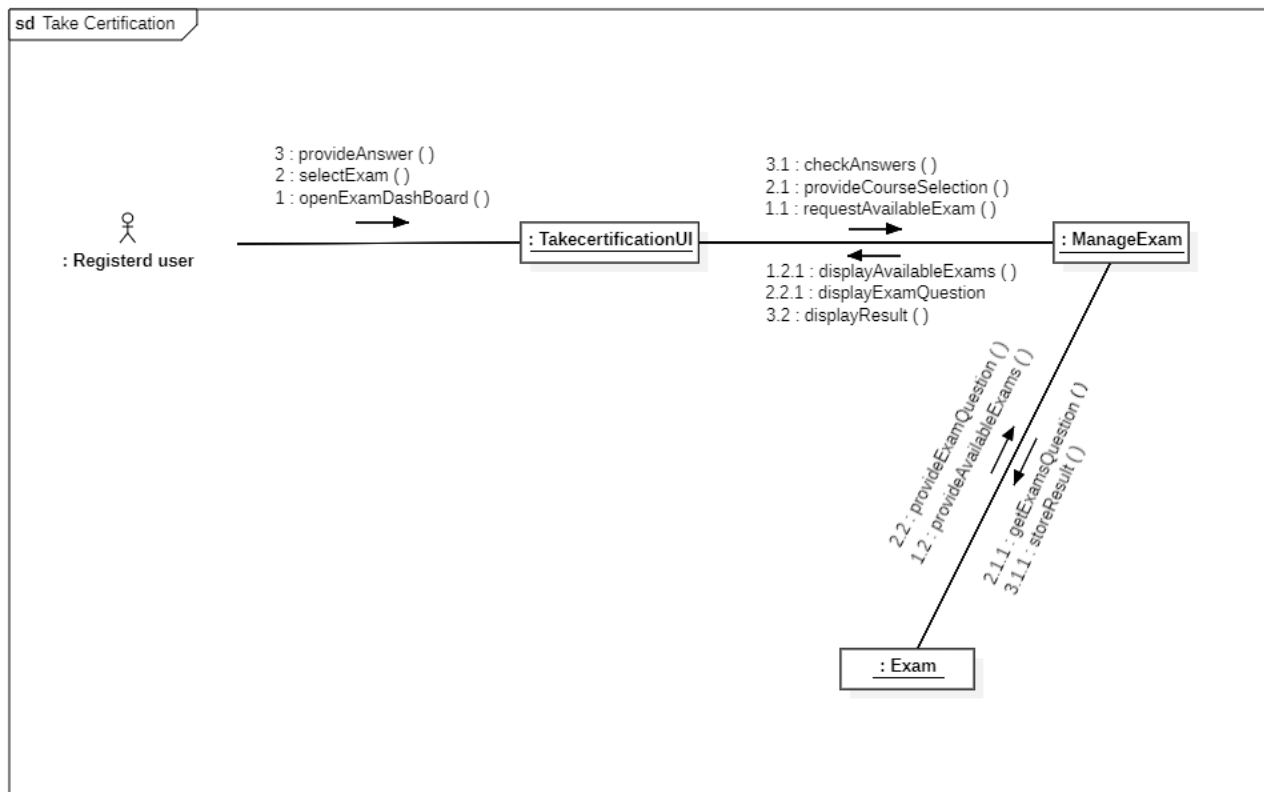


Figure 10: Collaboration diagram

Sequence Diagram:

A sequence diagram is a type of interaction diagram. It shows the order of the events and interactions between objects within a system. It provides a visual representation of the flow of messages, actions, and events between various elements of a system. They are commonly used during the design phase of software development to model the dynamic behaviour of systems and to visualize the interactions between different elements before implementation (lucidchart, n.d.)

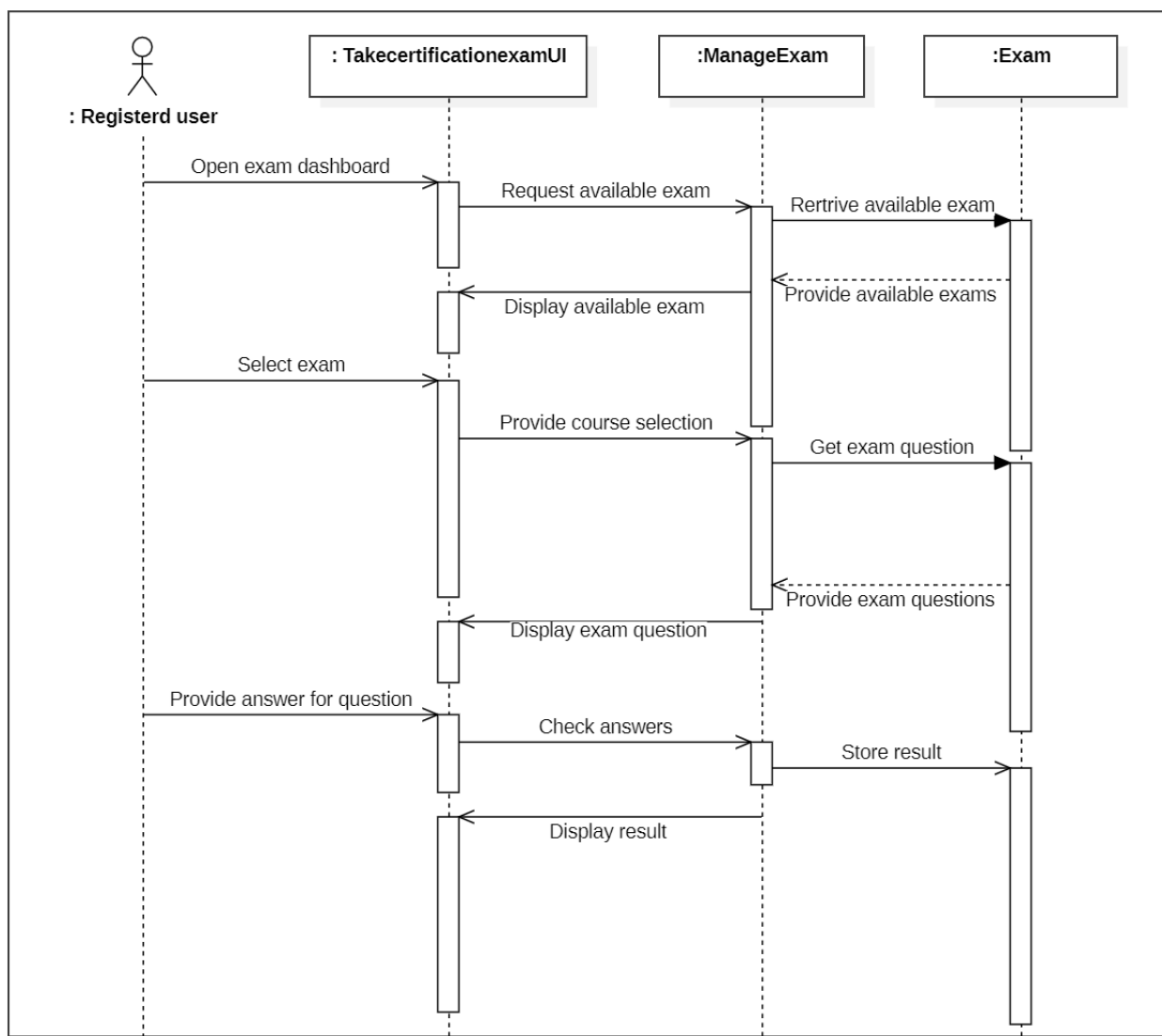


Figure 11: Sequence diagram

Further Development:

For the McGregor Institute of Botanical Training's online system, we will adopt the Prototype methodology because of its suitability for rapidly developing and testing system components. Here's how we plan to proceed:

Architectural choice:

The system will follow a layered structure, which includes four layers. The layers are sorted below:

- **Presentation layer:**

The presentation layer will deal with how the users interact with the system and how things look. This layer includes making web pages, getting what users' type, and showing information. To create presentation layers, we use the stuff like HTML, CSS, and JavaScript to make the interface easy to use and quick to respond.

- **Business logic layer:**

The Business Logic Layer have the main logic of the application. In the business logic layer, we perform different task like handling what users ask for, following the rules of the business, and making sure different parts work together efficiently. This layer will use the Model View Controller (MVC) pattern to keep things organized and easy to manage as the system grows.

- **Persistence layer:**

The Persistence Layer will handle storing and getting data. It talks to the database to do things like adding, reading, updating, and deleting data. In persistence layer we use tools like PHP to make this run smoothly and interact with the database.

- **Database layer:**

The Database Layer is where all the system's data is kept. It's like a big filing cabinet with tables, indexes, and connections that organize data and information neatly. For thee database layer use MySQL as the system's safe and efficient way of storing and handling data.

Design pattern:

The design pattern the Model View Controller (MVC):

- **Model:**

The Model is like the brain of the application. It handles all the data stuff, like checking if it is correct and changing it when it is required. In our system, the models will talk to the part that stores and gets data.

- **View:**

The view represents the user interface components. It is responsible for presenting data to the user. It receives input from the controller and depict the appropriate output for display. It will be implemented using HTML templates and CSS stylesheets in the system.

- **Controller:**

The Controller is like a mediator between the Model and the View. It handles user requests, manages input data, and updates the model accordingly. It essentially guides how the application operates. In the system we use the server-side scripting languages like PHP to create the Controllers.

Development plan:

In the development plan we use the different tools to develop the system. The tool includes the Apache web server, PHP scripting language, MySQL database and HTML/CSS for creating the site well. We will work on the different platforms like XAMPP that gives us which we need for PHP and MySQL in a single place. While creating the first version. We need to focus on the key thing like letting the users to sign up, enrol in the courses and buy the plant. As we go along we will add more different stuff based on what people needs and require

Testing plan:

- **Prototype testing:**

Each prototype that we make will be thoroughly tested. The testing is done to find any problems with how it works, if it's easy to use, and if it runs smoothly.

- **User feedback:**

People involved will give feedback on each prototype that we build. This helps us to decide what things to work on first and what improvements to refine the system.

- **Incremental testing:**

Testing will be conducted iteratively as new features are added in the system. To ensure that each iteration meets quality standards and user expectations.

Maintenance plan:

- **Prototype iteration:**

Regular iterations will be conducted to improve system based on feedback. According to feedback prototypes will be refined and add new features in it.

- **Bug fixing:**

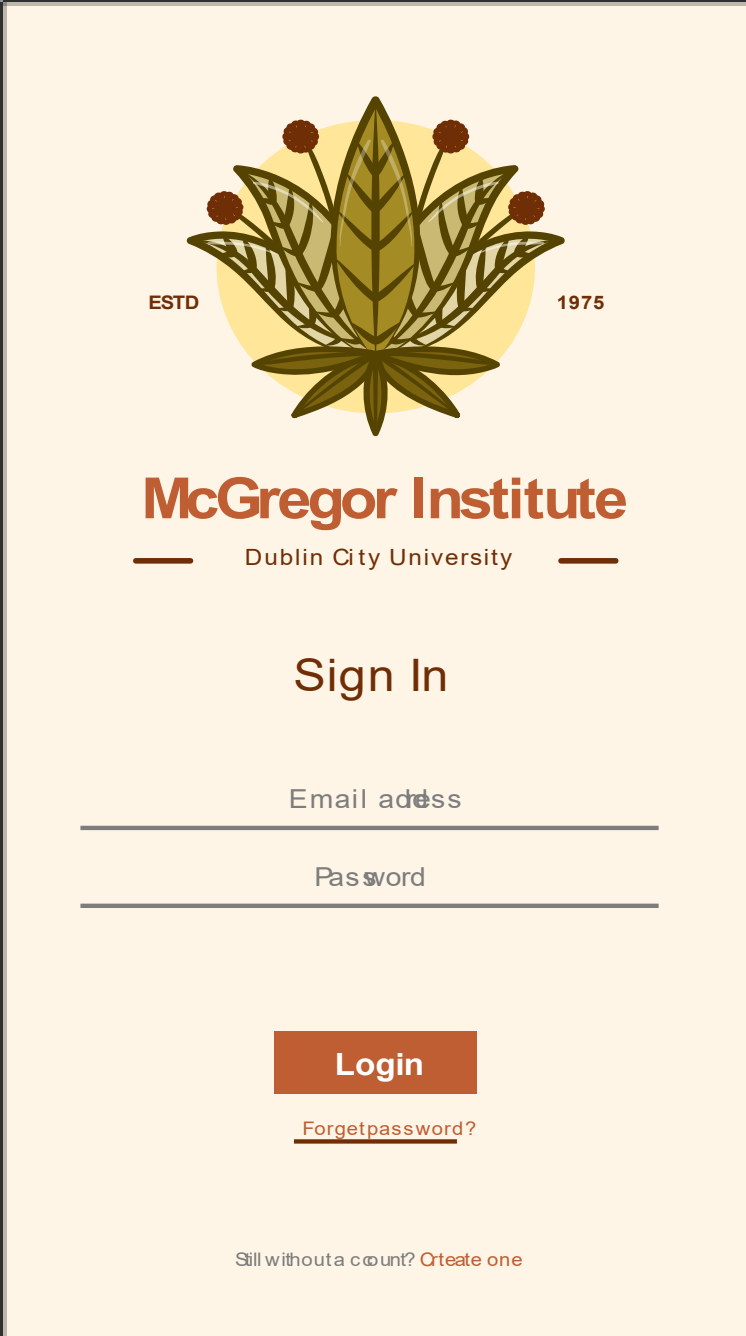
Reported issues will be addressed. To maintain integrity and functionality in the system in order to keep working the system well.

- **Documentation:**

Documentation will be updated step by step to reflect all the changes and enhancements. That is made during prototype iterations by ensuring the clarity and transparency in system development.


Prototype:

Prototypes are dummy model of the original conceptual model which can be either physical or digital and are made for small scale test environments. They are full feasible as they are not the original final product but can copy the functionality in low cost. The prototype of the McGregor system is listed below:



The image shows a login page prototype for the McGregor Institute. At the top, there is a logo featuring a stylized plant with green leaves and brown flowers, set against a yellow circular background. The text "ESTD" is on the left and "1975" is on the right of the logo. Below the logo, the text "McGregor Institute" is written in a large, bold, orange font. Underneath this, "Dublin City University" is written in a smaller, black font, flanked by two horizontal orange lines. The main heading "Sign In" is centered in a large, black font. Below this, there are two input fields: "Email address" and "Password", each with a horizontal line below it. A large orange button with the text "Login" is centered below the input fields. Below the button, there is a link "Forgot password?" in orange text. At the bottom, there is a link "Still without a cøunt? Crteate one" in orange text, where "cøunt" and "Crteate" are misspelled.

Figure 12: Login Page



McGregor Institute

Register

Name

Email address

Password

Login

Already have account? [Login](#)

Figure 13: Register page

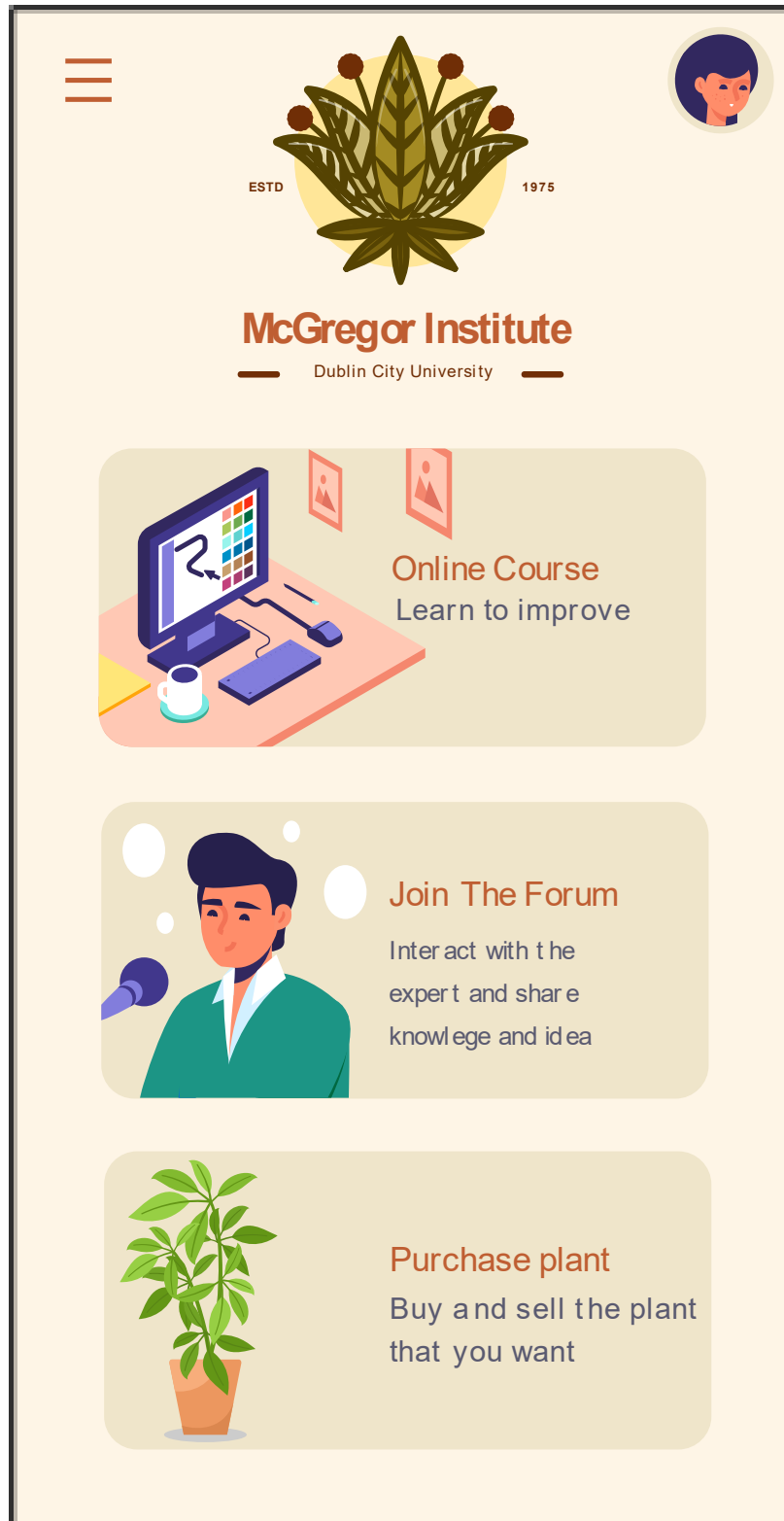


Figure 14: Home page

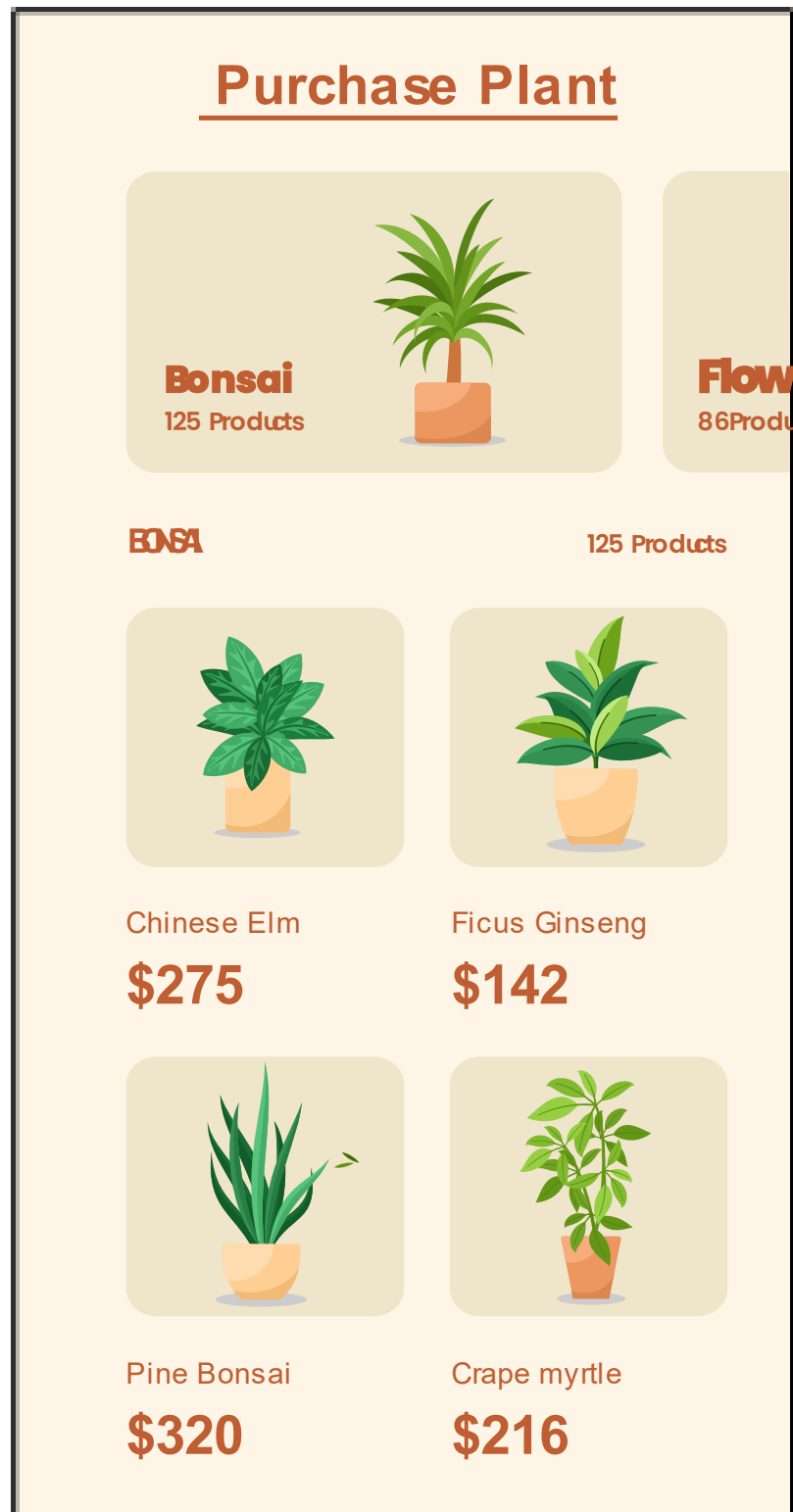


Figure 15: Purchase plant

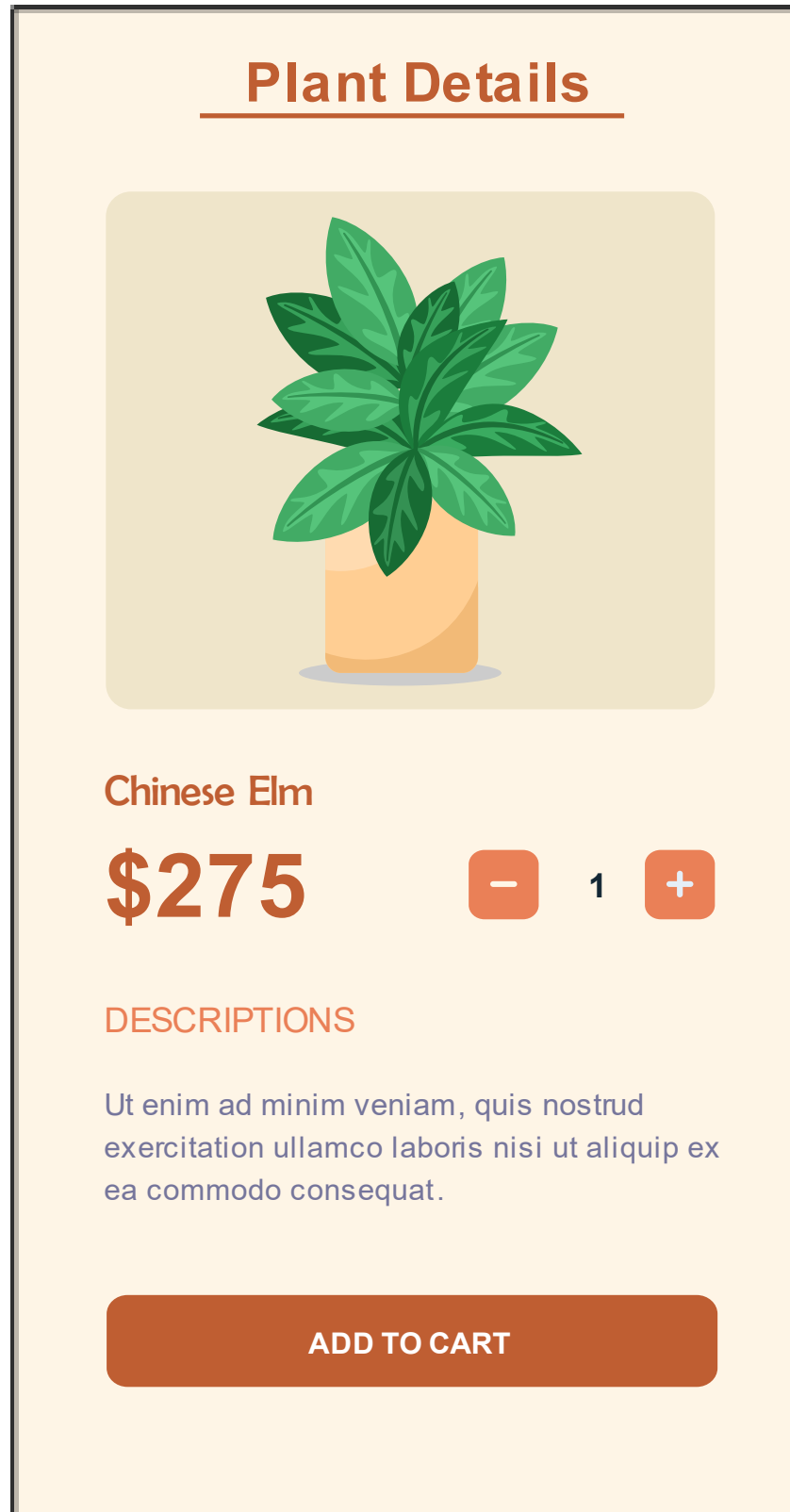


Figure 16: Plant details

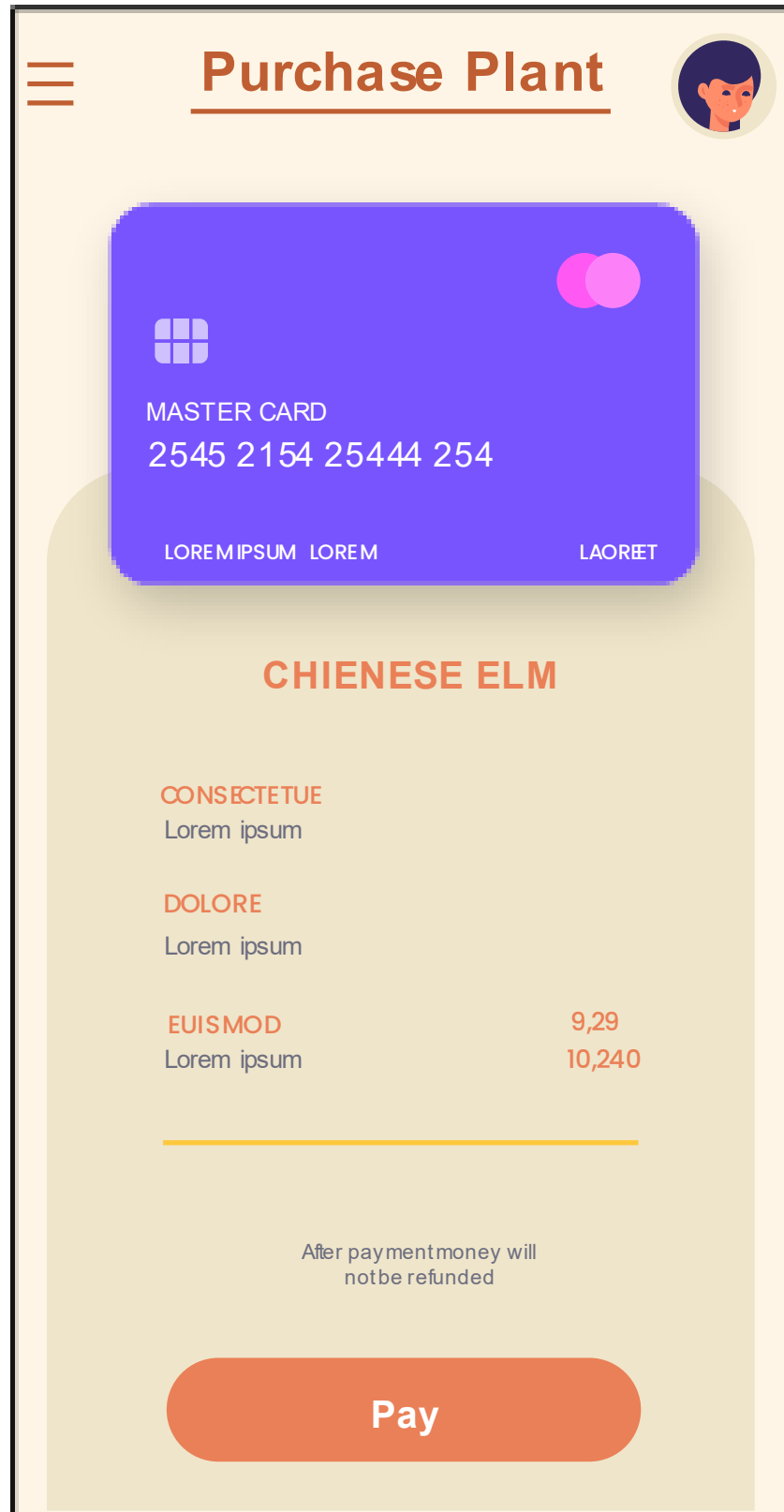




Figure 17: Purchase plant




Figure 18: Online course



Free Courses





No : 1
03:20

Introduction

A description about the horticulture and its practice.

No : 2
03:20

What is horticulture?

Brief definition about horticulture and its type

No : 3
03:20

Types of horticulture

Description about the various types of horticulture

No : 4
03:20

Overview

Engage with practical and theoretical knowledge

Start

Figure 19: Free course



Paid Courses



No: 1
03:20

Introduction

A description about the agriculture and its practice.

No: 2
03:20

What is agriculture?

Concept of performing the agriculture and its types.

No: 3
03:20

Soil detail description

Description about the soil and its types in full detail.

No: 4
03:20

Quality farming

How to perform quality farming using different methods.

Buy for 9.99

Figure 20: Paid course

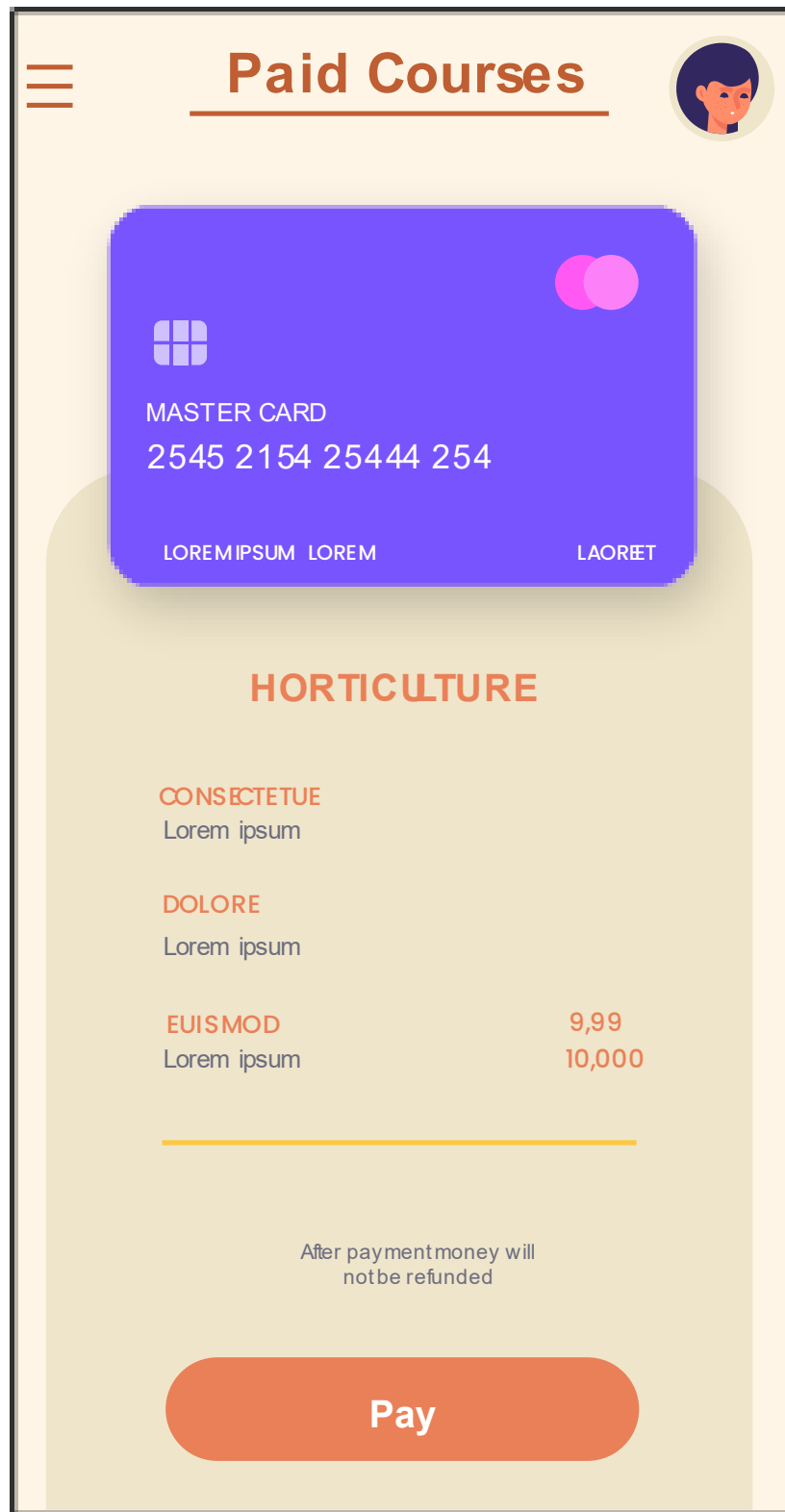


Figure 21: Paid course payment

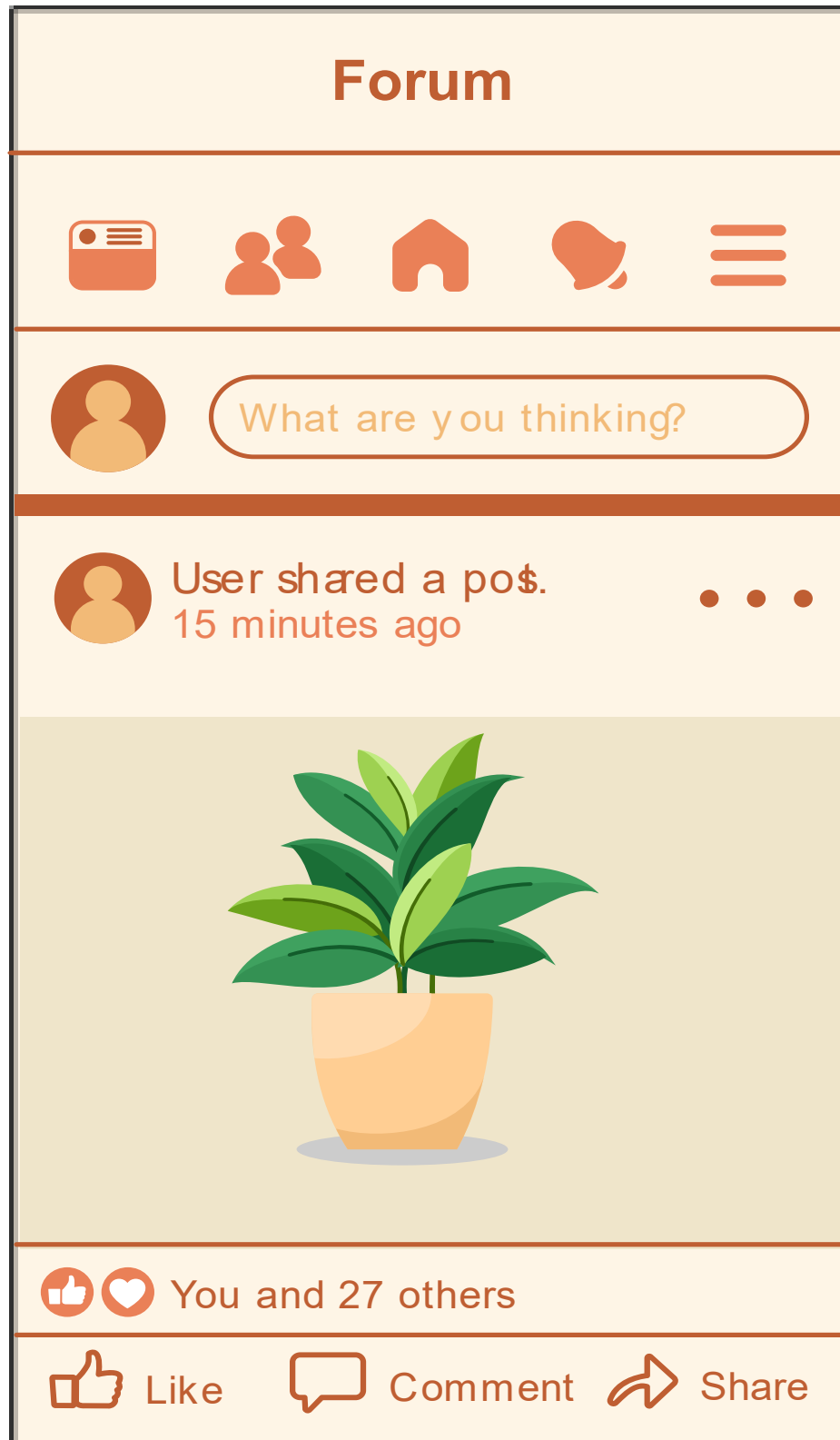


Figure 22: Forum

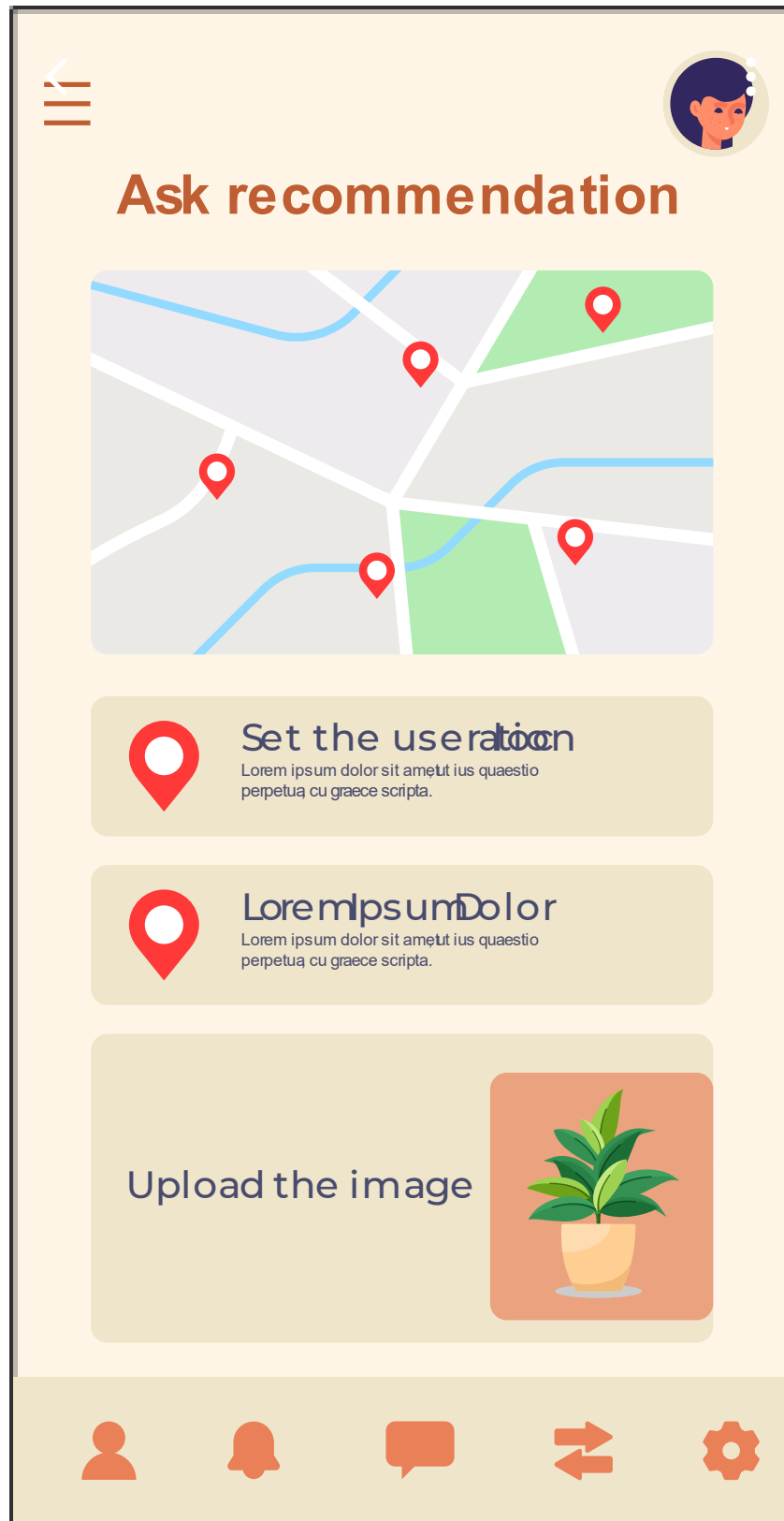


Figure 23: Recommendation



Figure 24: Admin page



Add the Plant

 Search plant



Ficus ginseng

lore m espm re d red
gge d insum pod fadne
jafd

 1 



Crape murtle

lore m espm re d red
gge d insum pod fadne
jafd

 1 



Chinese Elm

lore m espm re d red
gge d insum pod fadne
jafd

 1 

Figure 25: Add plant



The image shows a digital form for a certification exam. At the top left is a hamburger menu icon. At the top right is a circular profile picture of a person with dark hair. The title 'Certificatio exam' is centered at the top in a large, bold, orange font. Below the title are six identical question blocks, each containing the word 'Question' in a bold, dark blue font, followed by a paragraph of placeholder text: 'Lorem ipsum dolor sit amet, ut ius quaestio perpetua, cu graece scripta.' At the bottom of the form is a large, rounded orange button with the word 'Submit' in white text.



Certificatio exam

Question

Lorem ipsum dolor sit amet, ut ius quaestio perpetua, cu graece scripta.

Question

Lorem ipsum dolor sit amet, ut ius quaestio perpetua, cu graece scripta.

Question

Lorem ipsum dolor sit amet, ut ius quaestio perpetua, cu graece scripta.

Question

Lorem ipsum dolor sit amet, ut ius quaestio perpetua, cu graece scripta.

Question

Lorem ipsum dolor sit amet, ut ius quaestio perpetua, cu graece scripta.

Question

Lorem ipsum dolor sit amet, ut ius quaestio perpetua, cu graece scripta.

Submit

Figure 26: Certifaceion exam

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