



Interim Report

Proposed Project Title: Edifice

Project Group Details:

Group number: G42

Group members:

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Details of Project Supervisor, Co-supervisor

Proposed Project Supervisor (Academic Staff of UCSC)

Name of the supervisor: Dr. Thilina Halloluwa

Signature of the supervisor:

Date:

Proposed Project Co-Supervisor (Assigned by Course Coordinator)

Name of the co-supervisor: Mr. Pasindu Marasinghe

Signature of the co-supervisor:

Date:

The client of the Project

Name of the client: Dr. Thilina Halloluwa

Address of the client: University of Colombo School of Computing,
UCSC Building Complex,
35,
Reid Avenue,
Colombo 07.

Contact number of the client: 0777229245

E-mail address of the client: tch@ucsc.cmb.ac.lk

Project Details

Project Title

Edifice - Construction Project Management System

The Goal and Objectives

Main Goal

To develop a successful platform to manage every type of construction project from start to closeout. And to replace the current procedure with modern technology to achieve more efficiency and high performance for an affordable price in the digital landscape.

Objectives of the project

- Provide accurate and reliable construction project management with **less paperwork**.
- **Connect everyone and everything** on one platform related to a certain construction project and maintain the historical records for dispute resolution.
- Deliver projects **on time and budget** by managing the entire project from one platform and wherever the user goes.
- **Collaborate across teams and projects** to build a community of construction sector stakeholders and expand them to uplift a more productive mechanism.
- **Minimizing faults and errors** in the traditional system by digitizing it and establishing an efficient and transparent system.
- Able teams **can do more with fewer resources** to improve efficiency in monitoring and communicating information between the site and the office.
- Provide **accurate forecasting** from the data collected through the system to make the decision-making process easier.

Problem Definition and Motivation

Problem Definition

The construction industry in Sri Lanka faces difficulties and challenges related to project management. Following are some of them.

- Communication issues between stakeholders
- Increasing project and site complexity and reduces efficiency
- When project closeout, items aren't documented or finalized. There's no means of knowing the cost impact
- Inefficient resource management including money, labor, assets, time
- Improper quality & safety maintenance

The use of **construction project management software** would be one of the best solutions to overcome these issues. However, there's no software specifically designed for construction management **in Sri Lanka** with all the required functionalities.

The majority of construction companies use separate software for each task (E.g. Microsoft Project), which causes synchronization issues between the tasks as well as among the stakeholders. Even Though foreign software applications are available, most Sri Lankan

construction companies cannot afford them due to the high cost and the functionalities that do not correspond to their needs.

Motivation

The construction industry is a slow-moving industry with technology. Our motivation is to adapt the construction management workflow towards an open-based platform and enable the job site to be more accurate and complete than ever before.

Project Introduction

Edifice is a construction management system that construction companies can use to manage all phases and aspects of a project, from start to completion including project management, financial management, and resource management components.

The entire project management process can be customized and automated accordingly through application tools. It also provides necessary analyzing tools via graphical representations along with management of all documents, drawings, photos, reports, and equipment of a certain project.

- Speeds up the request for inspection(RFI) process (which is a domain-specific process in construction);
- Makes it simple to assign people to respond.
- Instantly links drawings and other information.
- Enables communication between all team members easy
- Daily job reports can be created by timecards.
- Timesheets are generated based on the crew details
- Works across all devices and platforms.

It offers easy access to anyone involved in a project without expensive, additional software seats or licenses or lengthy, drawn-out onboarding processes for subcontractors and consultants.

Edifice is inspired by [Procore](#) which is one of the leading construction management tools in the world. Most of the generic features of this application are based on the workflow of Procore, although Edifice is not as heavy as Procore.

The scope of the project

In-Scope

Users (possible actors) of the system

- Admin
- Project Director
- Project Manager
- Engineer
- Architect
- Sub-contractor
- Vendor

Main functionalities of the system

- **Core Tools**
 - **Admin**

Create a user account and manage user roles and permission, assign users for projects, create project teams, send system notifications for the users.
 - **Document**

Upload, store and organize project documents, manage revisions, and share via email.
 - **Directory**

Manage user accounts, distribution groups, and companies including active/inactive stages.
 - **Home**

Express the story of any project's schedule changes, work progress, etc.
 - **Reports**

Manage all stages of the company project reports.
 - **Tasks**

Track and manage the activities throughout the lifespan of the project.
- **Project Management**
 - **Portfolio**

Provide a high-level overview of the company projects.
 - **Request for Information (RFI) (Domain-specific)**

Able to run smoothly and on schedule to gain overall project success with RFI management.
 - **Daily log**

Help to keep track of every detail (including but not limited to) labor, communication, materials, and job site events each day.
 - **Meetings**

Manage aspects of the project meetings. from agenda distribution to post-meeting approval of minutes.
 - **Biddings**

Central location for managing and viewing the status of all bids, useful for contractors and managers.
 - **Action Plans**

To ensure unique company and project-specific requirements are clearly defined, centralized, organized and helps to maintain a high degree of accountability by preserving records of work completed and approvals.
 - **Drawings**

View, manage, and archive all project drawings and revisions
 - **Photos**

Capture, store and share the project photos.
 - **Punch List**

Keep a clear list of punch items, assign responsibility, select a due date, and track current status directly from the field.
- **Financial Management**
 - **Budget**

Set up and manage a comprehensive budget throughout the lifecycle of a project.
 - **Commitments**

Allows seeing the status and current value of all contracts and purchase orders.

- **Direct Costs**
Track all direct costs that are not associated with commitments.
- **Prime Contracts**
Easily create and manage contracts with the clients.
- **Invoicing**
Streamline the invoice collection, review, and approval process on all of the projects.
- **Resource Management**
 - **Timesheets**
Gives the ability to enter current-week timecard data for employees included in the directory.
 - **Crews**
Manage groups of laborers on your site*.
 - **Schedule (Calendar)**
Create, edit, and share schedules. It keeps the team up-to-date by giving a real-time view of the current project schedule.
 - **Equipment**
Effectively manage all the equipment on the construction site. Conduct equipment check-in.

*A crew is made of workers and led by a crew leader who is responsible for the crew's work.

Out-scope

- The preconstruction process including the tendering process is not part of this application.
- This application is implemented from the construction company's perspective, **not from the client's perspective.**
- The Quality and Safety component of Procore is not included.

Feasibility Study

Technical Feasibility

Assessing technical feasibility includes evaluating hardware and software to handle workload adequately.

- The web application can be executed on any device with internet accessibility.
- Construction companies usually will have on-premise devices.
- The program will be using comparatively fewer computational resources. (Operable in a web browser)
- Since it is constructed using a popular technology stack, maintainability is high.

Since technology is readily available for development and team potential with the current technology stack, the feasibility of the development in technical terms seems to be in order.

Operational Feasibility

- Only the necessary users will be needed to operate the system (Engineers, Quantity Surveyors, Architects, etc.)
- Above mentioned roles will have the necessary English and general knowledge to operate the system.

- Additional training to be given for handling the system will be minimal, as the above-mentioned user roles may not need additional training in general computer knowledge.

Economic Feasibility

- No costs for the developers and system development (will be developed using free and open-source software)
- No extra hardware is needed.
- Development costs only for electricity, internet, etc.

Schedule Feasibility

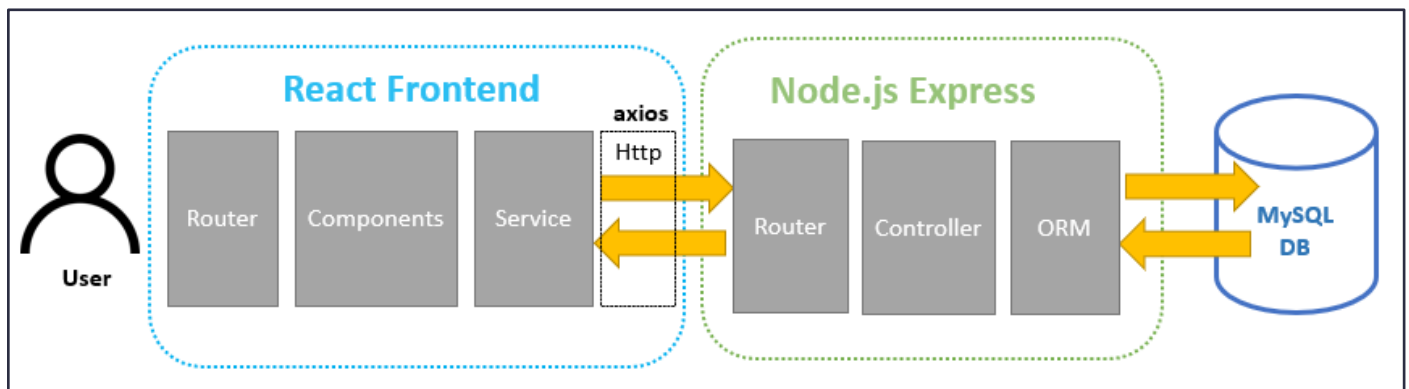
Scheduled to be developed and deployed within 15 weeks.

- The scope of the project is sufficient for a 3 credit course.
- During 15 weeks, each member has to work 10 hours per week.

Legal and Ethical Feasibility

- Privacy information - Data will not be enclosed to unauthorized parties or will not be used for any advertising purposes.
- User authentication and authorization - Passwords or any biometric identification will be used to protect and maintain security and only authenticated users will have access to the system.
- Doesn't affect the normal procedure of construction management

System Architecture



Frontend

React frontend implemented with axios and react components to improve the DOM manipulation and used http and JSON for data parsing and communicating with backend.

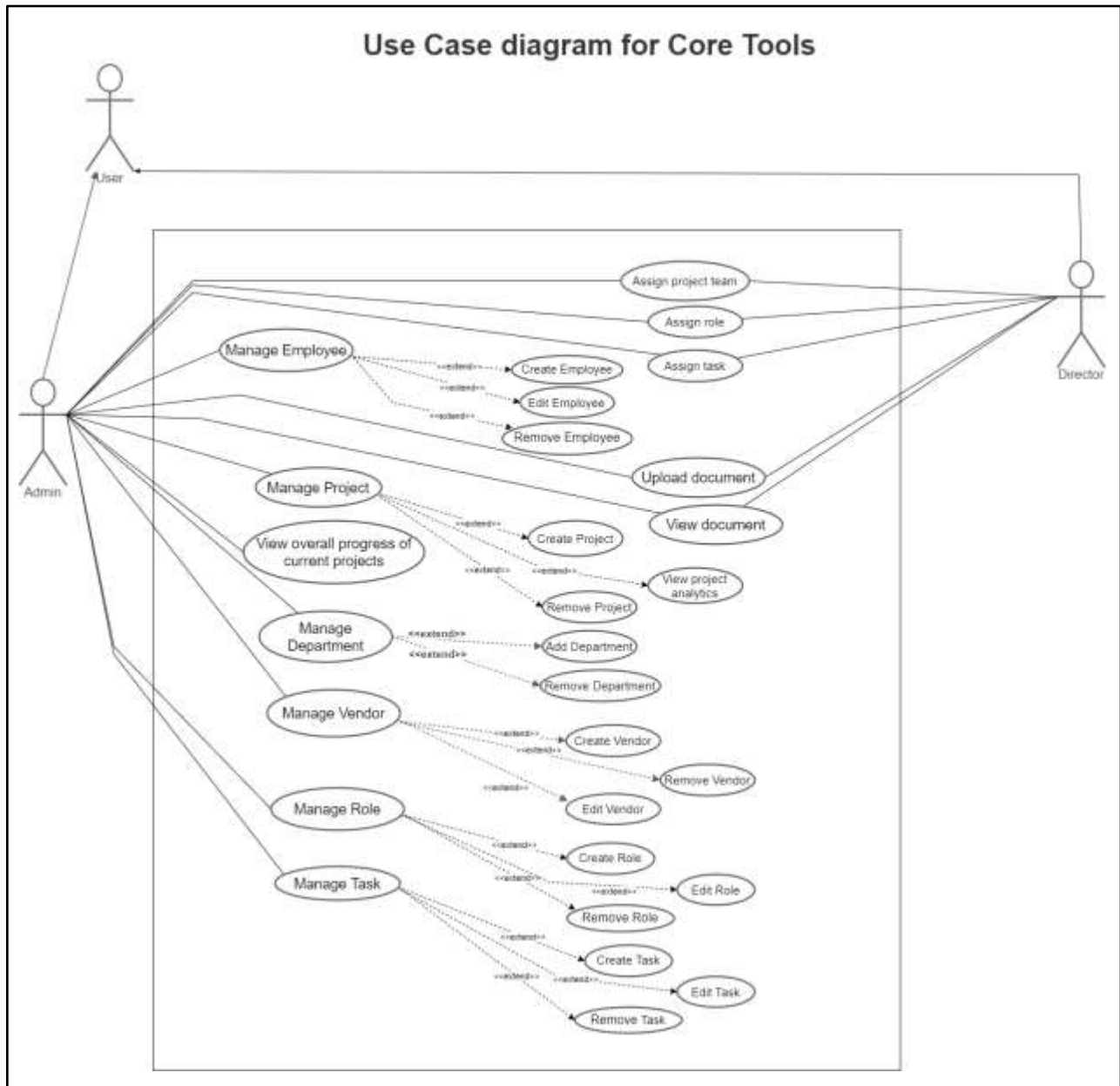
Backend

Node.js backend implemented through http router express framework for middleware and used MVC architecture to implement the read/ write operations from the database. To communicate with any relational database we used ORM(Object Relational Mapping) with Sequelize.

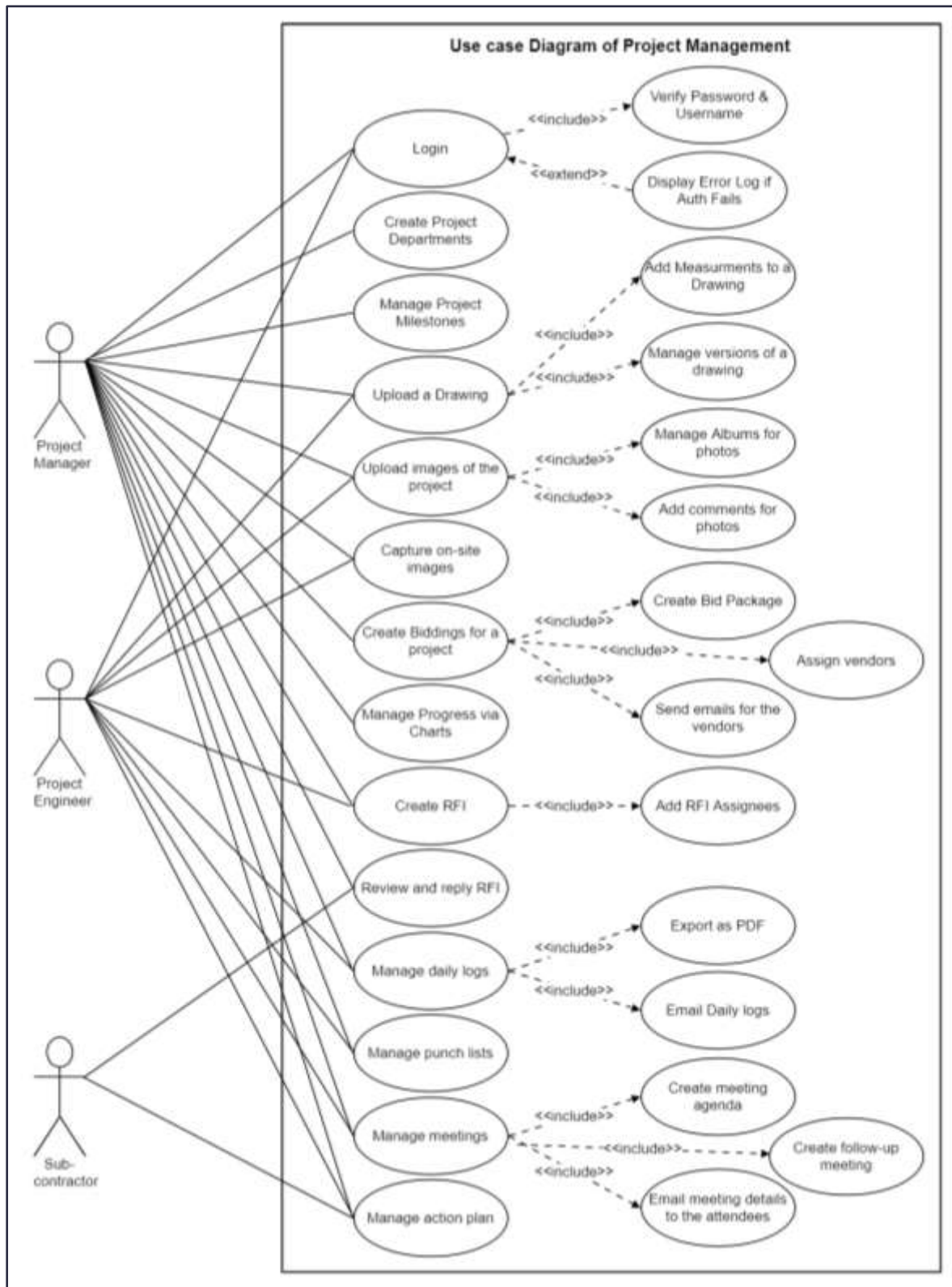
Requirement Specification

Use-case Diagrams

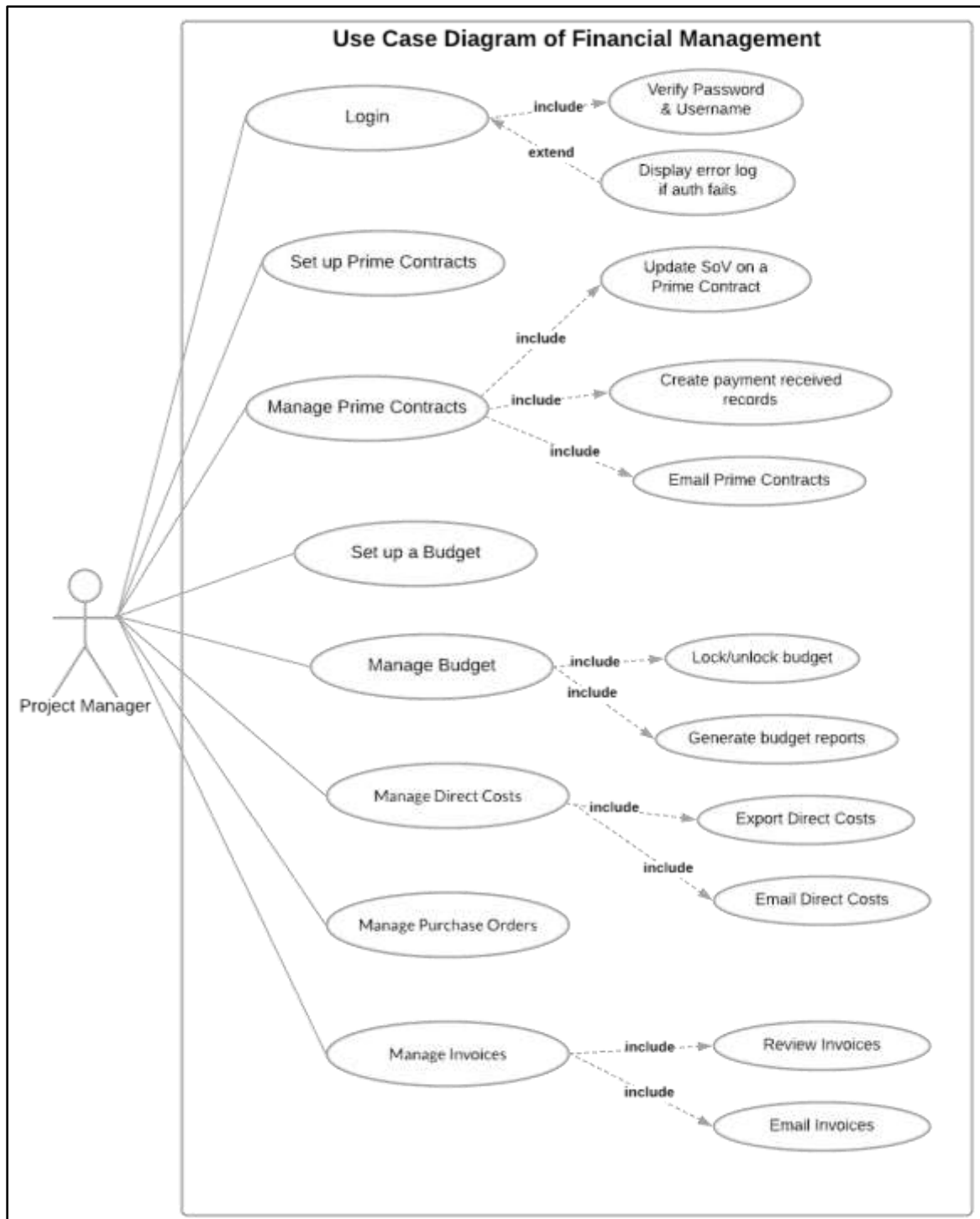
Core Tools



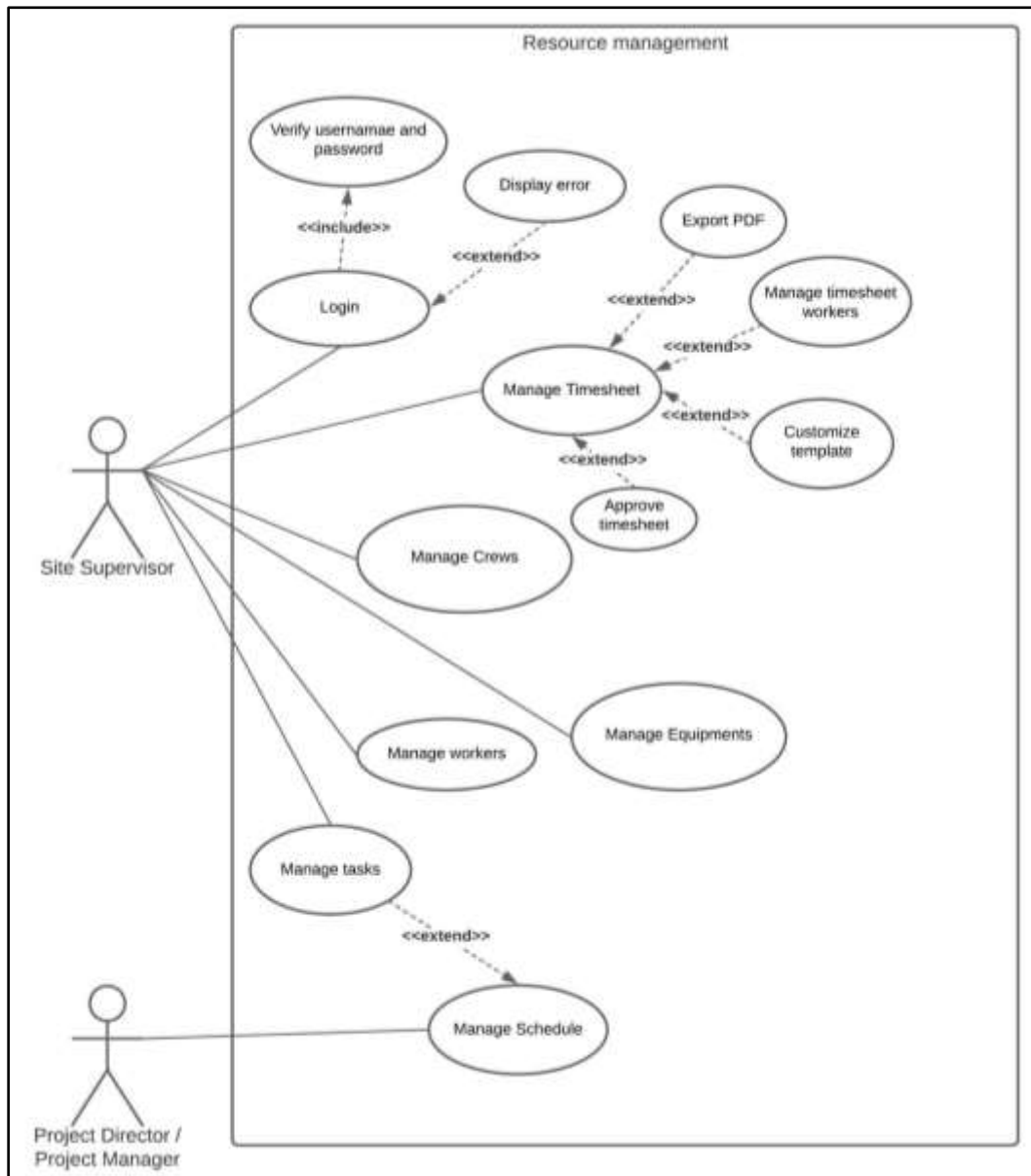
Project Management



Financial Management

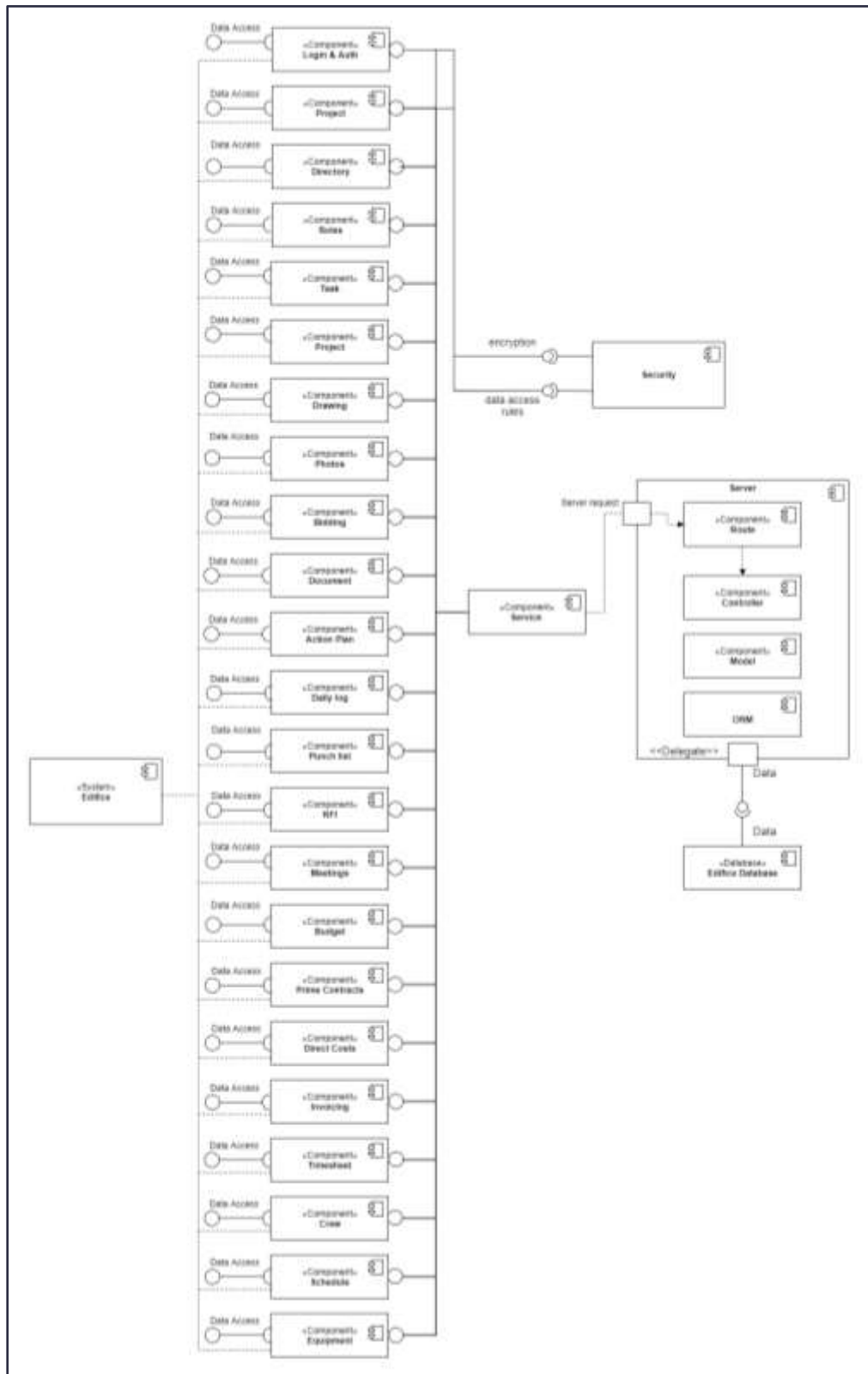


Resource Management



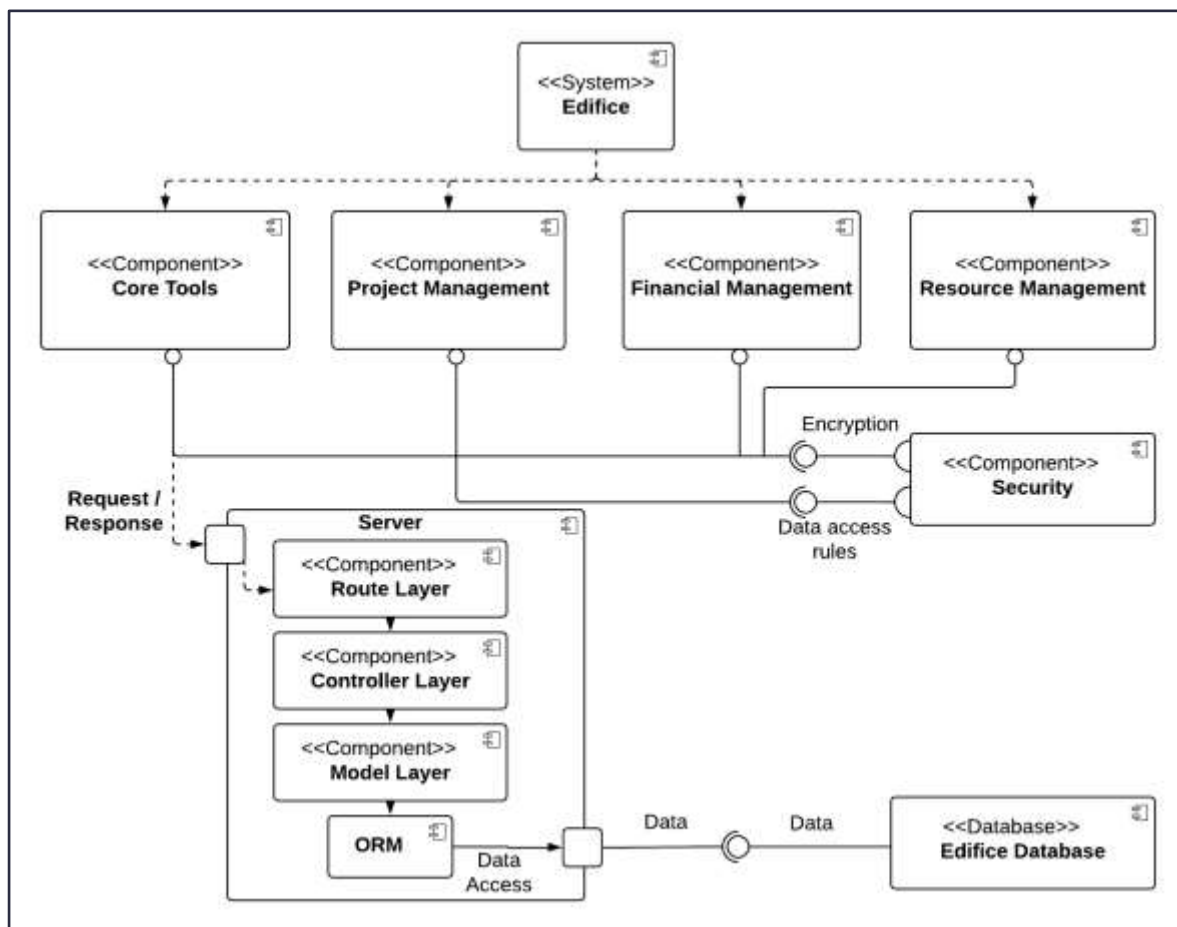
Component Diagrams

Extended Version



High-level Version

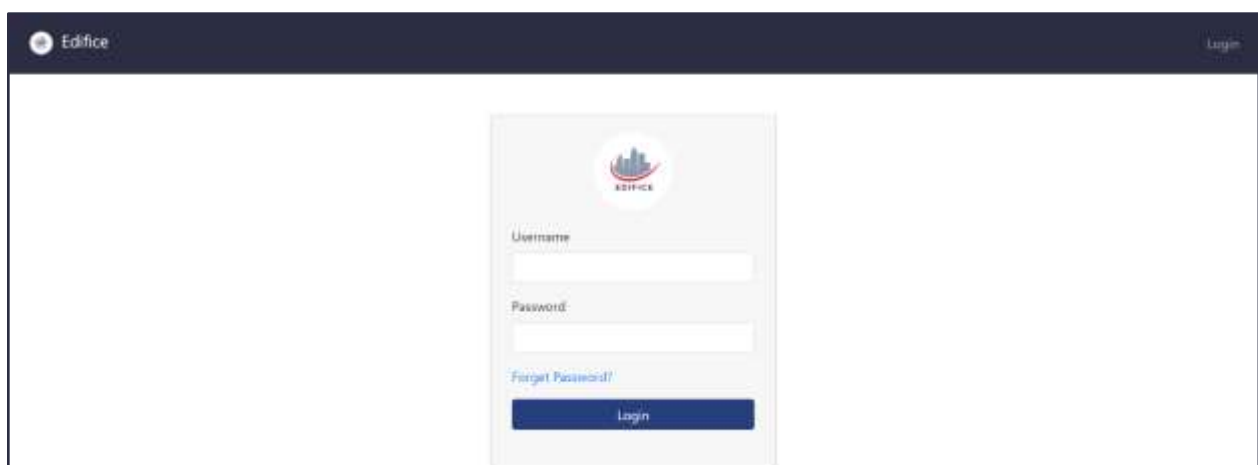
The following component diagram shows the major sub-components.



User Interfaces


Important Interfaces

Login Page



The screenshot shows the Edifice login interface. It features a dark blue header with the Edifice logo on the left and a "Login" link on the right. The main content area is white and contains a login form. The form includes the Edifice logo at the top, followed by input fields for "Username" and "Password". Below these fields is a link for "Forgot Password?" and a blue "Login" button.

Profile



Edifice

[Home](#)
[Project Management](#)
[Financial Management](#)
[Resource Management](#)
[Core Tools](#)

[Profile](#)
[Logout](#)

Profile

Username : admin
Email : admin@edifice.com
Role : Admin



My Account

Username :

Email :

My Roles & Permission

Authorities:

ROLE_USER

ROLE_MODERATOR

ROLE_ADMIN

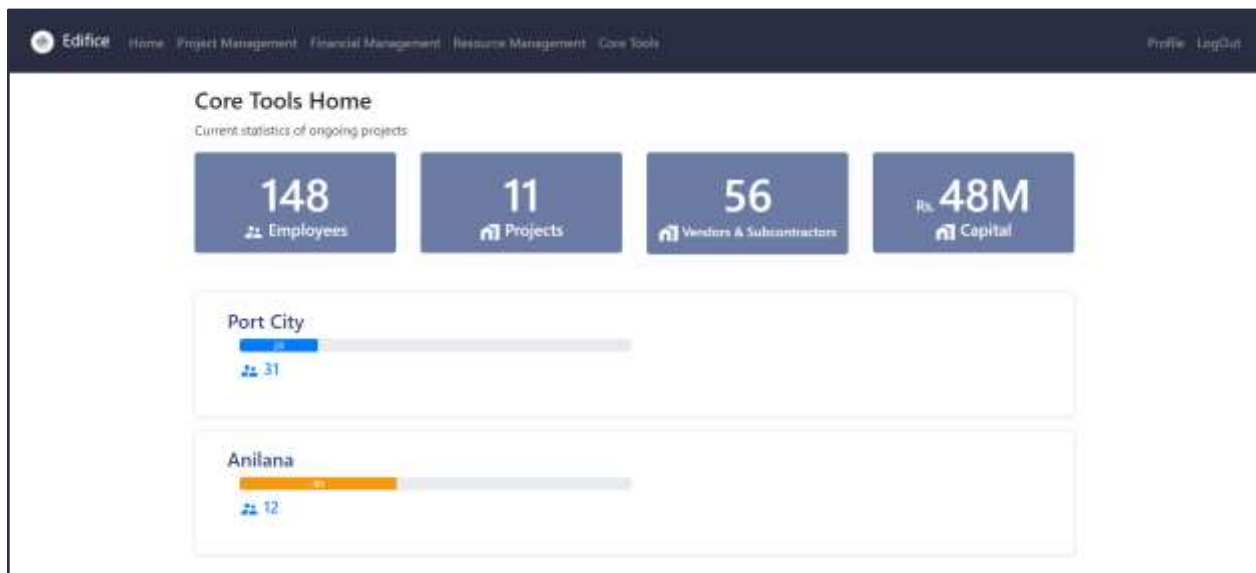
Permission:

Project Management

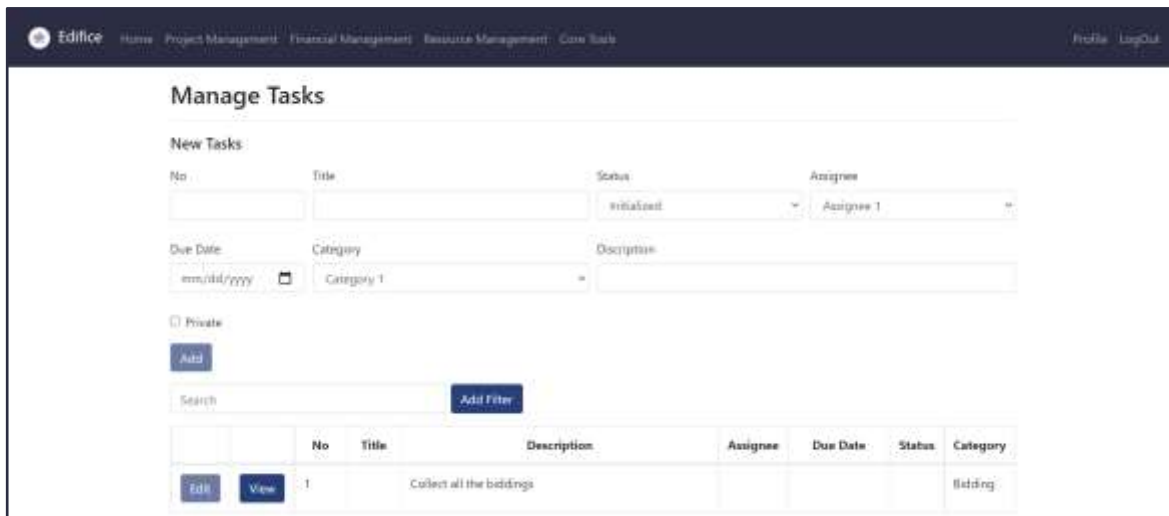
Finance Management

Core Tools

Home page of the core tools component.



Manage tasks page in task sub-component.



Manage Tasks

New Tasks:

No. Title Status Assignee

Due Date Category Description

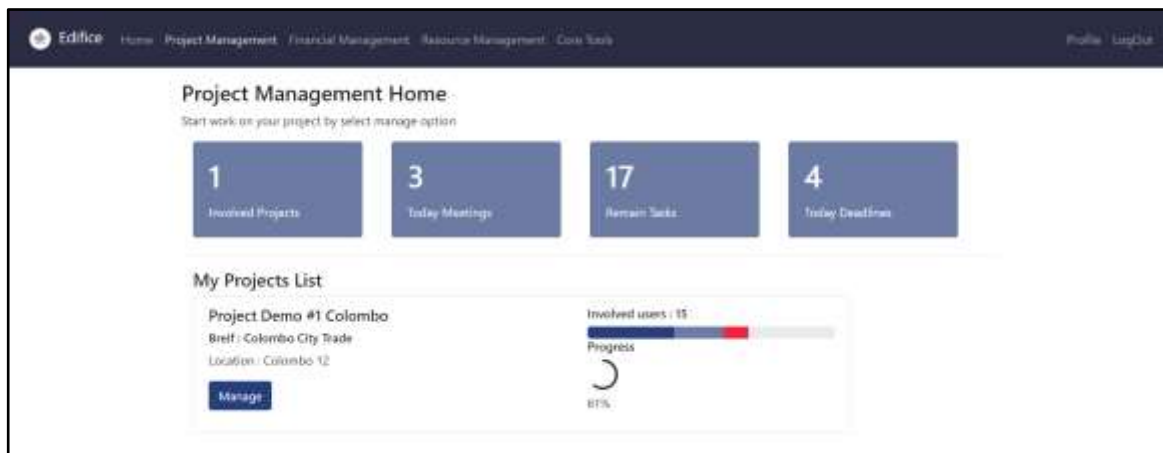
☐ Private

Search

No.	Title	Description	Assignee	Due Date	Status	Category
1	Collect all the biddings					Bidding

Project Management

Home page of the project management component.



Project Management Home

Start work on your project by select manage option

1 Involved Projects

3 Today Meetings

17 Remain Tasks

4 Today Deadlines

My Projects List

Project Demo #1 Colombo

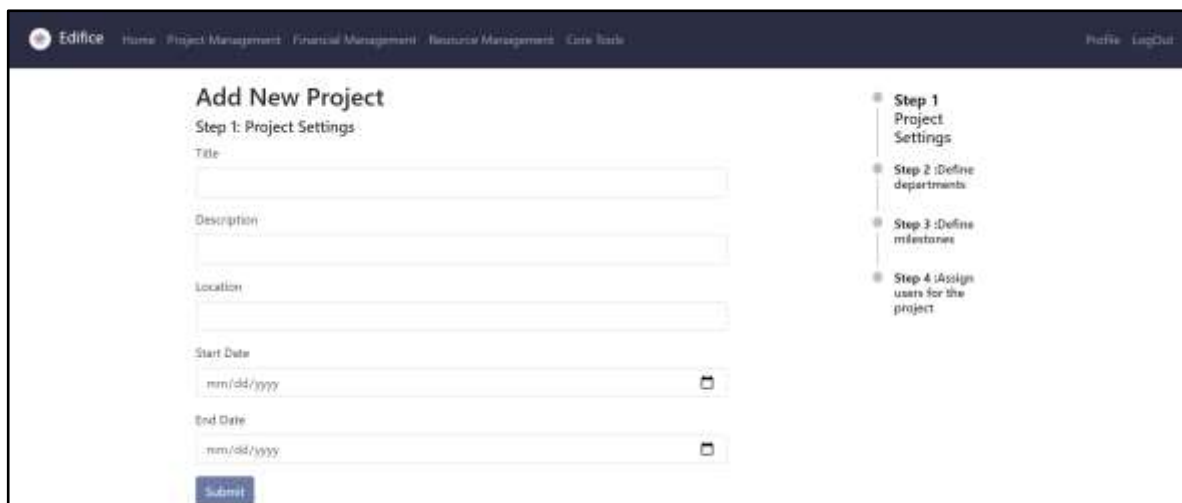
Brief: Colombo City Trade

Location: Colombo 12

Involved users / 15

Progress 87%

Add a new project page in the project management component.



Add New Project

Step 1: Project Settings

Title

Description

Location

Start Date

End Date

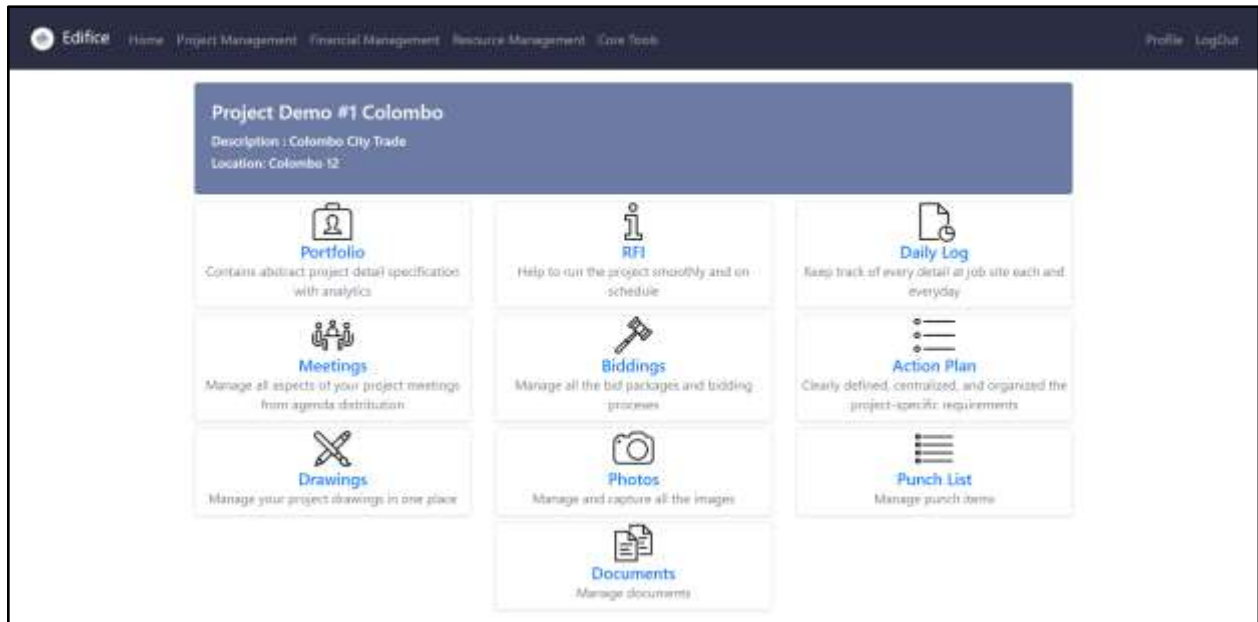
Step 1: Project Settings

Step 2: Define departments

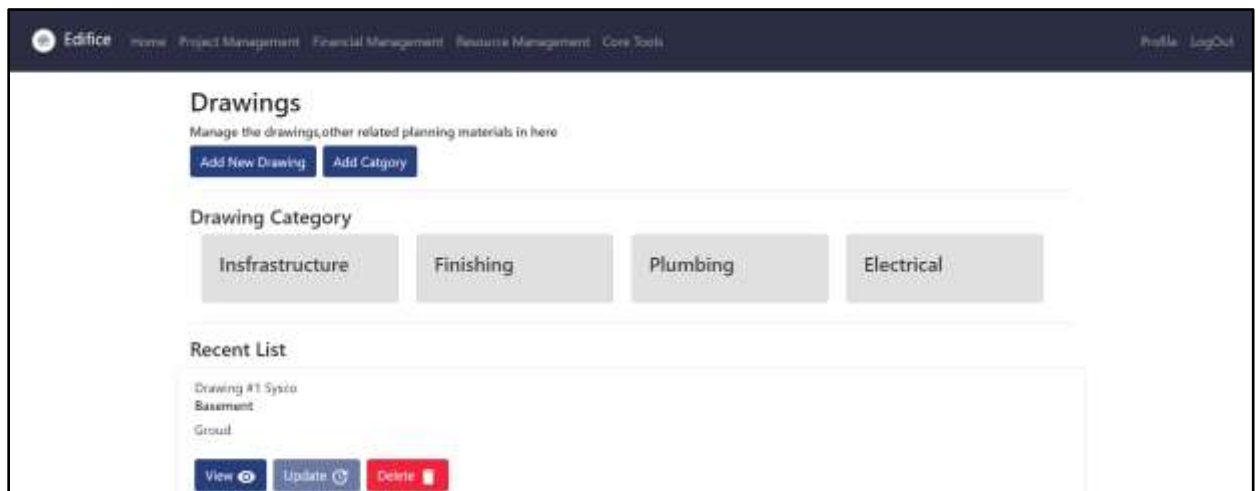
Step 3: Define milestones

Step 4: Assign users for the project

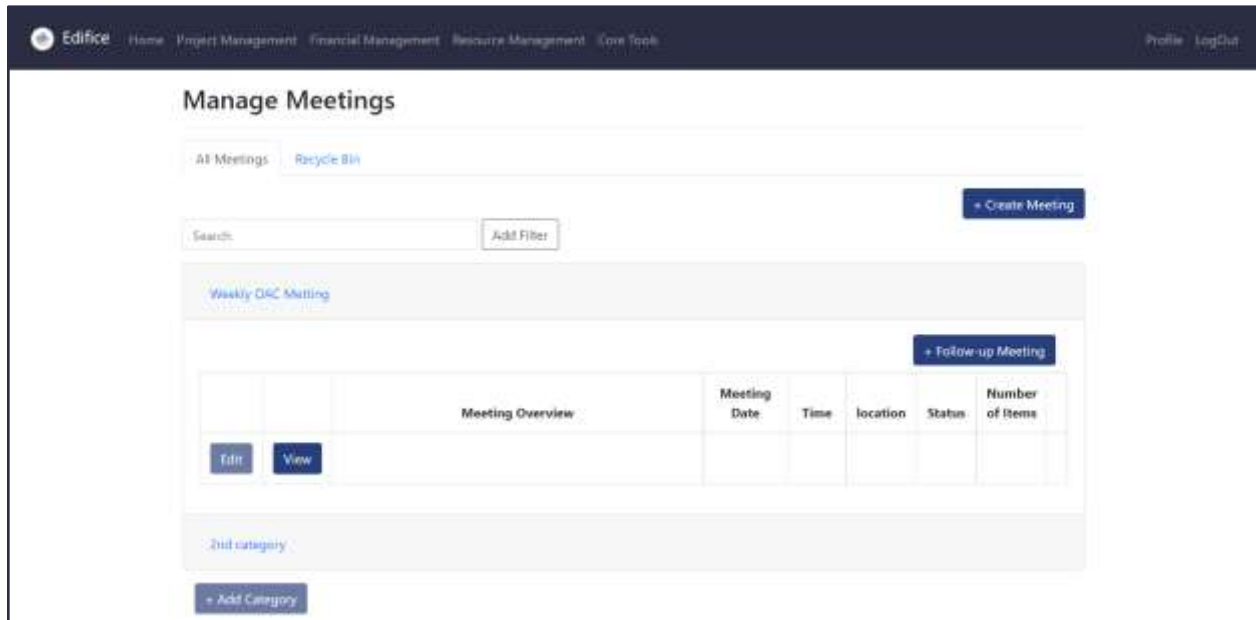
Tools that are shown under a particular project.



Drawings sub-component



Manage meetings page in meetings sub-component



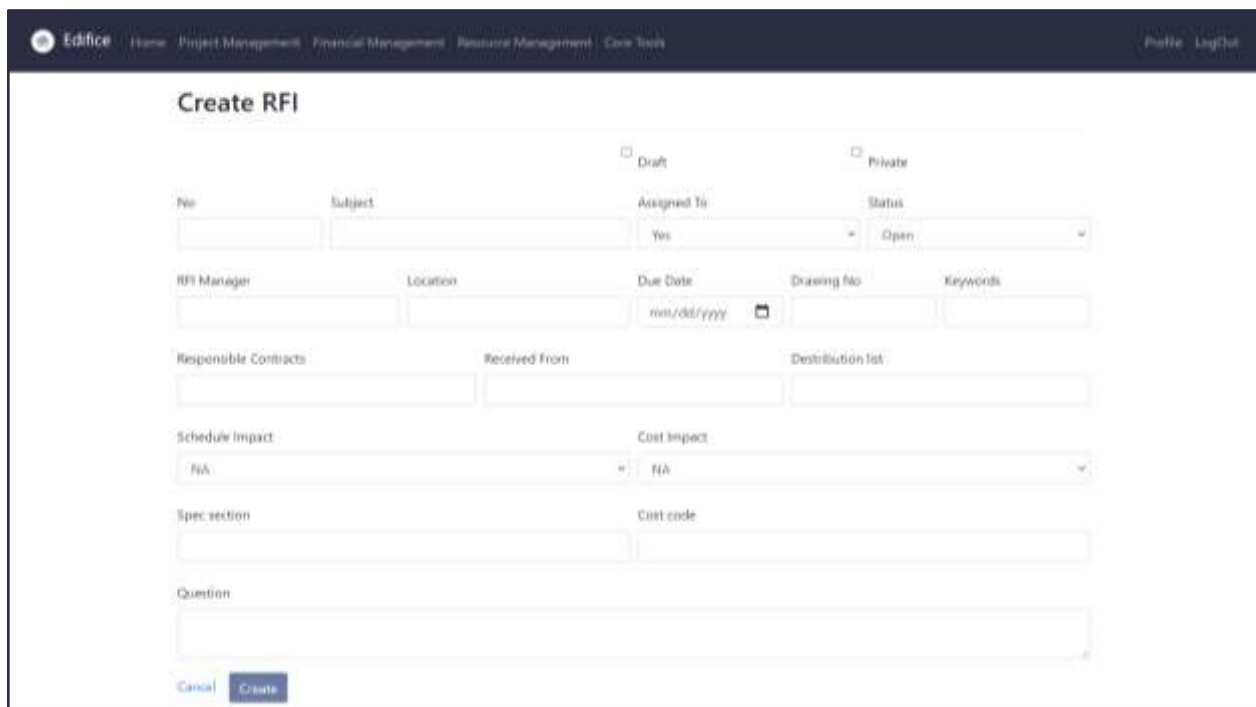
The screenshot shows the 'Manage Meetings' page in the Edifice system. The page has a dark blue header with the Edifice logo and navigation links: Home, Project Management, Financial Management, Resource Management, and Core Tools. On the right side of the header are links for Profile and Logout.

The main content area is titled 'Manage Meetings'. It includes a sub-header with 'All Meetings' and 'Recycle Bin' tabs. Below this is a search bar with a placeholder 'Search:' and an 'Add Filter' button. A '+ Create Meeting' button is located in the top right corner.

The central part of the page displays a table titled 'Weekly DAC Meeting'. The table has columns for 'Meeting Date', 'Time', 'Location', 'Status', and 'Number of Items'. There are 'Edit' and 'View' buttons for each row. A '+ Follow up Meeting' button is positioned above the table.

Below the table, there is a section for 'Add Category' with a '+ Add Category' button.

Create RFI page in RFI sub-component



The screenshot shows the 'Create RFI' page in the Edifice system. The page has a dark blue header with the Edifice logo and navigation links: Home, Project Management, Financial Management, Resource Management, and Core Tools. On the right side of the header are links for Profile and Logout.


The main content area is titled 'Create RFI'. It includes a sub-header with 'Draft' and 'Private' tabs. Below this is a form with various fields:

- No.**: A text input field.
- Subject**: A text input field.
- Assigned To**: A dropdown menu with 'Yes' selected.
- Status**: A dropdown menu with 'Open' selected.
- RFI Manager**: A text input field.
- Location**: A text input field.
- Due Date**: A date picker with a calendar icon.
- Drawing No.**: A text input field.
- Keywords**: A text input field.
- Responsible Contracts**: A text input field.
- Received From**: A text input field.
- Distribution list**: A text input field.
- Schedule Impact**: A dropdown menu with 'NA' selected.
- Cost Impact**: A dropdown menu with 'NA' selected.
- Spec section**: A text input field.
- Cost code**: A text input field.
- Question**: A large text area for the question.

At the bottom of the form are 'Cancel' and 'Create' buttons.

Finance Management


Financial Tools that are shown under a particular project.


[Home](#)
[Project Management](#)
[Financial Management](#)
[Resource Management](#)
[Core Tools](#)

[Profile](#)
[Logout](#)


Financial Management Tools

Title : Project Demo #1 Colombo
Description : Colombo City trade
Location: Colombo 12




Budget

Set up and manage a comprehensive budget throughout the lifecycle of a project.




Prime Contracts

Easily create and manage contracts with the clients.




Direct Costs

Track all direct costs that are not associated with commitments.



Commitments


Allows seeing the status and current value of all contracts and purchase orders.



Invoicing

Streamline the invoice collection, review, and approval process on all of the projects.

Invoice Management


[Home](#)
[Project Management](#)
[Financial Management](#)

[Profile](#)
[Logout](#)

INVOICING

[Owner](#)
[Sub Contractor](#)
[Billing Periods](#)

		Date	Vendor	Type	Invoice #	Status	Amount	Received Date	Paid Date	
Edit	View	05/04/21	Vertex Properties	Expense	C001	Approved	\$1,250.00	05/04/21	06/04/21	Delete
Edit	View	05/05/21	Teson Cement	Expense	C012	Draft	\$1,250.00	21/05/21	25/05/21	Delete
Edit	View	18/05/21	Fusion	Expense	C020	Approved	\$1,250.00	18/05/21	20/05/21	Delete
Edit	View	20/06/21	Xavia	Expense	C002	Approved	\$1,250.00	20/06/21	24/06/21	Delete

Design Decision

Since edifice is a commercial application, the color scheme must be simple and user-friendly and it has to be aligned with the color psychology in branding. That is the main reason for choosing colors like

Grey (#E0E0E0)		Neural, Calm, Balanced, and Luxury
Purple Blue (#6B7DA4)		Trust
Dark Blue (#273F7D)		Strength
Warm Red (#EF253D)		Power, Excitement

- Use of **progress bars** to indicate the level of completeness of certain items in the system to give the user a guiding system (Projects, adding new projects)
- Using **colors** to indicate the status of certain functions (Yellow for warnings , green for completeness etc.)
- Use minimalist design structures by focusing on the essential UI components and by removing unnecessary sections in the page.
- Use **metaphors** like a typical login page, home navbar to easily integrate with the system in terms of improving the usability of the system.

Main deliverables of the system

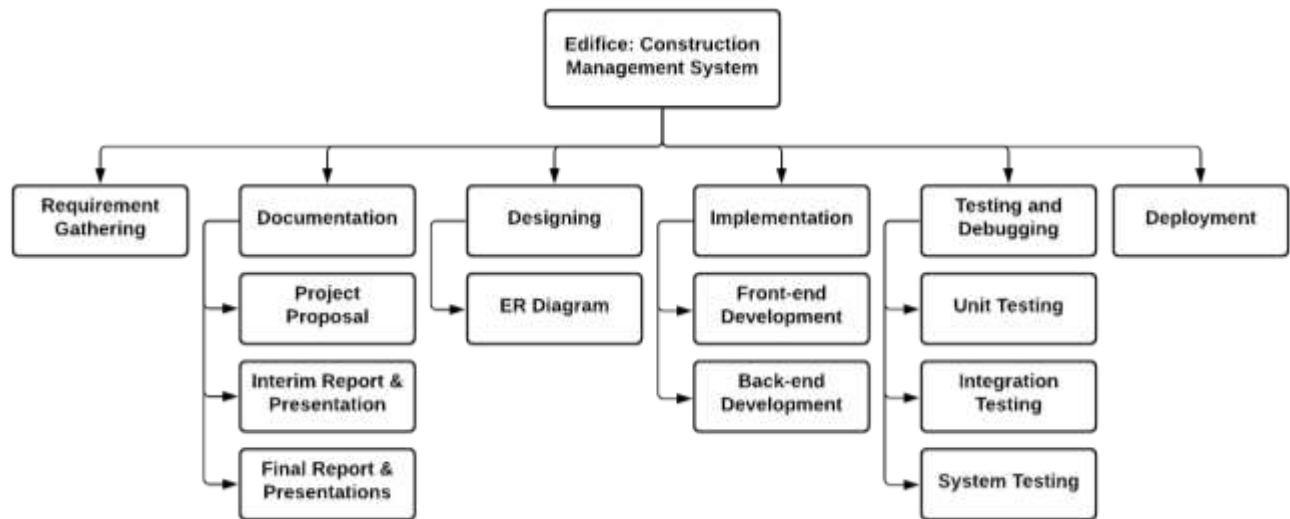
- Complete working software, source code, and Software Requirement Specification
- User manual
- Administrators manual together with deployment instructions
- The license of the software (LGPL)

The Project Plan

Methodology to be followed: **Rapid Application Development (RAD)**

- Due to time constraints and Agile methodologies being used in the industry.
- Ability to reiterate and fix if there are no issues
- Can obtain an idea of the product since a working demonstration is available after each iteration.

Work breakdown structure



Time frame analysis

Despite the timeline of the project with respect to each phase of the development of the project.

Task	Duration	Milestones
Gather Requirements Project Proposal ER Diagram	Two weeks	Project Proposal Submission
Front-end development Back-end development Interim Report Interim Presentation	Five weeks*	Interim Report Submission Interim Presentation
Back-end development Develop test cases Unit test Integration test System test Final Presentation	Six weeks*	Pre-Final Presentation and System Demonstration
Final Report	One week	Final Report Submission (1st Draft)
Final Report Final Presentation	Two weeks	Final Formal Presentation Final Report Submission (Final Version)
Total	16 weeks	Complete Working product User Manual

Gantt chart

Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Selecting a project																
Discussing the scope																
Requirement gathering																
Feasibility study																
Study-related technologies*																
Proposal documentation																
Proposal presentation																
Database design*																
UI design*																
Database Implementation*																
Implementation																
Interim presentation																
Testing*																
Deployment and user guidance																
Final presentation																

*These stages happen iteratively under Phase 2: User design and Phase 3: Rapid construction of RAD and may not occur in sequence.

Individual Progress





Name	To do	Going on	Done
Sahan Dissanayaka	<ul style="list-style-type: none"> Project Analytics Integrate core tools data into projects Bidding Backend 	<ul style="list-style-type: none"> Photos Backend Document Backend 	<ul style="list-style-type: none"> Project UIs & Backend Drawing UIs & backend Bidding UIs Photos UIs Document UIs
Malithya Fernando	<ul style="list-style-type: none"> Daily log Backend Punch lists Backend The connection between daily logs and resource management 	<ul style="list-style-type: none"> RFI Backend Action plan Backend 	<ul style="list-style-type: none"> RFI UIs Meetings UIs & Backend Action plan UIs Punch lists UIs Daily log UIs
Randie Pathirage	<ul style="list-style-type: none"> Timesheet backend Equipment backend 	<ul style="list-style-type: none"> Add delete update worker to crew 	<ul style="list-style-type: none"> Directory UIs Timesheet UIs Crew UIs Equipment UIs Create, update and delete crew
Thenuka Ovin Weerasinghe	<ul style="list-style-type: none"> Employee backend Vendor & subcontractor backend Task backend 	<ul style="list-style-type: none"> Basic animations for UIs Overriding stock framework components 	<ul style="list-style-type: none"> User CRUD Core tools UIs Color Codes Home UIs
Vinuri Piyathilake	<ul style="list-style-type: none"> Invoicing Backend Commitments backend 50% Synchronization between budget and other financial tools 	<ul style="list-style-type: none"> Prime Contracts Backend Commitments backend 50% 	<ul style="list-style-type: none"> Budget UIs & Backend 50% Direct Costs UIs & Backend Commitments UIs Invoicing UIs Prime Contracts UIs

References

- [1] G. Manorathna, "Effectiveness of software applications in construction project management", *DI.lib.uom.lk*. [Online]. Available: <<http://dl.lib.uom.lk/handle/123/10661>> [Accessed: 15 May 2021].
- [2] Procore.com. 2021. Procore Construction Management Software. [online] Available at: <<https://www.procore.com/en-sg>> [Accessed: 19 May 2021].

Declaration

We as members of the project titled Edifice, certify that we will carry out this project according to guidelines provided by the coordinators and supervisors of the course as well as we will not incorporate, without acknowledgment, any material previously submitted for a degree or diploma in any university. To the best of our knowledge and belief, the project work will not contain any material previously published or written by another person or ourselves except where due reference is made in the text of appropriate places.

Name	Signature
D. M. T. S. Dissanayaka	
M. T. Fernando	
P. D. R. Thathsaranie	
U. W. T. O. Weerasinghe	
S. A. V. S. Piyathilake	