University of Nevada, Reno

Department of Computer Science and Engineering

CS 425: Software Engineering

Optimum Property Fix

Team 5

Aisha Co, Melissa Flores, Joanna Lopez, Nasrin Juana and Araam Zaremenhjardi

Instructor: Sergiu Dascalu, Vihn Le, and Devrin Lee

Advisor: Erin Keith

November 4, 2021

Table of Contents

1. Introduction

Optimum Property Fix (OPF) is a web application with the purpose of overhauling University of Nevada, Reno (UNR) current dormitory facility service systems by providing a suite of tools to both facility management members and dormitory students to manage living spaces. OPF is targeted to dormitory students ensuring the application is designed to be simple yet intuitive for use anytime and anywhere. The current system has paper trails, is vulnerable to being lost, does not incentivize submission of minor issues within living spaces, and lacks progress tracking of maintenance requests to students. OPF will rectify these issues while providing analytical insights that allow Facilities and Management to preemptively manage dormitory buildings and assess dormitory buildings' health.

OPF's functional features for dormitory students are maintenance request submissions, a chatbot that students can interact with to handle simple requests, a communication center, compromising an information page containing frequently asked questions (FAQ), and a dynamic dashboard that changes based upon current issues. OPF's non-functional features describe the constraints, such as developing constraints including the utilization of JavaScript, React, and AWS DynamoDB, for OPF. In addition, unlike functional requirements, the non-functional requirements are applicable to the whole system.

OPF has added a minor user experience feature being a chatbox for dormitory students to use for fulfilling basic commands from the application. A chatbox would allow users to query for different application functionalities based upon text data entered into the chatbox. Within the chatbox, the user and a bot would simulate a text thread conversion that is deleted after each session. An example of the application conducting a query is creating a new maintenance request: when a user enters into the chatbox, "I have a leak in my faucet that needs to be repaired as soon as possible," the bot would aggregate data based upon inferences in the query for a new maintenance request. The addition of a chatbox would assist users in feature discovery without being overwhelmed with searching through menus. The chatbox feature would become an essential component of the user experience by making the application accessible to students.

OPF intends to be an overhaul of UNR's current dormitory upkeep service system through the elimination of paper trails while providing an accessible web application for both dormitory students and facilities and services members. While providing two different user-focused experiences, OPF intends to encase all records and management of facilities upkeep in one place while overall enhancing the original functionality of the previous paper-based system through artificial intelligence and content-rich data such as images and video.

2. Summary of Stakeholders' Interviews

The use of requirement elicitation aims to understand what the stakeholders do and how they might use a new system to support that work, in this case, OPF. Techniques such as interviewing and ethnography are used to collect information to derive requirements for OPF. The interview questions were targeted towards the users of the web application. The stakeholders interviewed were ones that live or have lived in the dormitories. A handful of questions are targeted towards housing faculty as some of their specific knowledge would be beneficial for the application. Following are a list of questions that the stakeholders answered as well as a summary of their responses:

1. How do you feel about the current system for asking maintenance requests (specifically for housing)?
    a. The application is made to act as a new bridge between the maintenance facility and students. Currently, the system uses a paper form as a way of communication. The responses fit into the category of "acceptable," where the students are mostly satisfied with the paper form as a way to request assistance for their issue as the issue was normally resolved. However, there is a mention that there is a lack of communication for when the issue was resolved. Furthermore, one of the respondents elaborated on the fact that they were irritated that the maintenance took over two weeks to fix their issue while they were still in the dormitories.

2. In what ways would you improve submitting a maintenance request?
    a. Two of the responses correspond with the lack of communication between maintenance and the student that requests maintenance assistance. One suggests for the form to include asking for the student's email, so there is a way for the maintenance facility to contact the student for when the service will arrive as well as when the service was completed. The other response suggests an online form because the way to gain access to the form is through the front desk of the dormitory. If the front desk is closed, then the student would be unable to request a form. An online form would resolve that issue. The final respondent did not include any improvements. However, they pointed out that many students do not understand the maintenance system or know its existence. As a result, bringing more awareness to the system would be beneficial.

3. What aspects of the current system do you dislike and why (specifically for housing)?
    a. The respondents are not definitive with what they dislike about the current system as they believe that the current system works for its purposes. One respondent, however, states that the maintenance facility was difficult to work with sometimes, and not only regarding housing maintenance. For instance, when a maintenance facility staff arrives, the worker would state that the issue would be

solved if the student(s) did not use the damaged property in certain ways. Generally, the worker would claim that the issue is minor and would not fix the issue.

4. If the form could be converted to a digital medium, what type of features do you believe would be beneficial for the student?
   a. This question focuses on features the team should consider including for OPF. One of the features is a notes section for the student, so they would be able to write in detail regarding the issue. Additionally, there should be a picture attachment functionality, so the student would be able to photograph the issue occurring if the issue is not constant or the student is unable to be present to demonstrate the issue. Similarly, another respondent mentioned the ability for real-time contact between the student and the maintenance facility, so immediate input could be provided from both sides. Lastly, there is an idea for a feature to display the student's availability time, as there are times when the maintenance facility staff arrives while the student(s) are not present. This would allow the maintenance facility staff to be able to question someone about the issue instead of guessing what the issue is.

5. How often do you file/see a request for the same issue? And what was the issue (i.e. broken sink)?
   a. Most of the respondents answered that they did not need to file the same issue multiple times. One of the respondents mentioned that they filed a request because their sink was not draining correctly. Another respondent did not need to file any issues, but they did mention that the communal bathrooms in their dormitory have repeatedly flooded. As a result, the housing staff in the dormitory had to file repeated maintenance requests for the issue. Similarly, one respondent mentioned that they have repeatedly filed an issue regarding a broken lightbulb, and as of the moment the respondent was interviewed, the issue has not been resolved.

6. If the maintenance requests can move online, which of the following devices do you think will be used more frequently? (mobile device or desktop)
   a. Half of the respondents believe a mobile device would be used more while the other half believe a desktop would be used more. For the respondents that believe a mobile device would be more useful, their reasoning is that people usually have a mobile device on their person. Additionally, they also believe a mobile device would suffice for describing an issue. As for the respondents that believe a desktop would be more useful, their reasoning is that the user would notice the

problem when they are at the dormitory, resulting in them using their computer since the user most likely owns a computer.

7. Do you prefer the student and the maintenance facility staff to be together when trying to resolve the maintenance issue?
   a. The consensus is that the maintenance facility staff and the student can work together if the student wishes to be present. One states that it would be better if the student is present, so they could assist with maintenance in case the staff needs help finding the issue. Another respondent states that students can be present, but the student should not be required as the student is already paying for housing, so they should not be required to fix everything themselves too.

8. Would an electronic ticket system (similar to the IT ticketing system) for maintenance requests be useful?
   a. There is a consensus that the electronic ticket system would be beneficial as it allows trackable information and the service request would not get accidentally lost. Furthermore, one respondent mentioned how the ticket system could act as a reference in case a student believes that an issue was not resolved.

9. What was the most recent maintenance request you submitted (what was the issue)?
   a. The common issue for maintenance requests is related to the restroom and bathrooms. In the dormitory with communal bathrooms, the bathrooms are repeatedly flooded. For the dormitories containing private bathrooms per room or suite, the issues are usually related to the sink.

10. Has there been a time when you wanted to file a maintenance request, but did not? If so, why?
    a. The respondents states that if there was an important issue, they have filed a maintenance request. For instance, minor issues such as "the sink handle is a little too hard to push down" would be considered as an issue that could be filed for maintenance but is usually disregarded (to be filed) as it is not considered a hindrance to everyday life.

11. How satisfied were you with past Facilities and Management communication?
    a. The respondents were given a scale from 1-6 to rate their satisfaction with the current communication system with the maintenance facility in the dormitories, where one represents very unsatisfied and six represents very satisfied. From the responses, everyone rated a four out of six. This scale is beneficial because one of the main reasons the team wants to create OPF is due to the team's desire to

improve the communication system between the maintenance facility and the students.

12. Has there been a time that you believed the maintenance staff did not solve the problem you requested help for?
    a. The consensus is that the issues are usually resolved. However, two criticisms were introduced. One criticism is that, even though the issue was resolved, the fix was sometimes temporary. As a result, the person had to file a maintenance request again to fix the problem. Another criticism is that, even though the issue was resolved, the time the maintenance facility staff took in arriving and resolving the issue was too long. Their experience, for instance, involved the maintenance facility staff arriving over two weeks after the request was filed.

13. (HOUSING FACULTY ONLY - RA, HOUSING DIRECTORS, ETC.) What is the process for processing maintenance requests once a student files one?
    a. This question is only for current/past housing faculty as students that have not worked on the front desk would not know how to answer. The respondent has never witnessed when a maintenance facility staff arrives nor collects the forms. However, they state that the recently filed form from the student is placed on a stack containing additional requests from other students inside the front desk office. Afterward, at some time, a maintenance facility staff arrives and collects the forms.

14. (HOUSING FACULTY ONLY - RA, HOUSING DIRECTORS, ETC.) What do you think are the main indicators of the condition of living space and/or building?
    a. The respondent mentioned that there is a strong correlation between the age of the building and the number of maintenance requests filed. For instance, Great Basin, the newest dormitory built, would have fewer structural/plumbing/electrical problems that result in maintenance requests in comparison to Manzanita Hall, the oldest dormitory on campus.

3. Technical Requirements Specification

The technical requirements aid the team in establishing the system services and the constraints for the system. The technical requirements are separated into functional requirements and non-functional requirements. The functional requirements state the services that OPF should provide, how OPF behaves in certain situations, and how the users are able to interact with OPF.

Table 3.1.1 displays the functional requirements for the OPF application while Table 3.1.2 displays the non-functional requirements for the OPF application. The tables include an

identification number, level number, and a brief description of the requirements. Each of the requirements is given a priority level. Level 1 represents the requirements planned for implementation by the end of the Fall 2021 semester. Level 2 represents the requirements planned for implementation by the end of the Spring 2022 semester. Lastly, Level 3 represents the helpful and useful requirements that will most likely not be implemented by the end of the Spring 2022 semester.

Table 3.1.1: Functional requirements for Optimum Property Fix (OPF).

ID	Level	Description
FR01	1	OPF shall allow users to log in to their account
FR02	1	OPF shall allow users to create an account.
FR03	1	A user shall be able to log in as a student or as a member of Facilities and Management.
FR04	1	Dormitory residents shall be able to submit maintenance requests.
FR05	1	OPF shall allow dormitory students to add the date, location of their issue, description of their issue, and dorm location to their maintenance.
FR06	1	A user shall be able to verify their email when registering an account on OPF.
FR07	1	OPF shall allow dormitory students to submit inspection reports.
FR08	1	OPF shall allow users to answer questions in the inspection report.
FR09	1	OPF shall allow users to include a description of the damage, an image submission of the damage, and a rate for the room's condition.
FR10	2	OPF shall send a confirmation text and/or email regarding the maintenance request to the dormitory student.
FR11	2	OPF shall implement a chatbot for the dormitory students.
FR12	2	Dormitory students shall be able to receive an automatic two-week follow-up survey after an issue has been solved.
FR13	2	OPF shall allow the dormitory students to answer questions and include comments in the two-week survey.
FR14	2	OPF shall schedule maintenance appointments for the members of the Facilities and Management at UNR.
FR15	2	OPF shall allow users to log into their account using a Single sign-on (SSO).
FR16	2	The chatbot shall be able to infer what the user wishes to do based on the conversation.
FR17	2	The chatbot shall be able to open a maintenance ticket.

FR18	2	The chatbot shall be able to guide the user and recommend solutions for simple issues.
FR19	2	OPF shall implement an information page and FAQ page for the users.
FR20	2	The information page shall encompass announcements and the user needs.
FR21	2	OPF shall be able to adjust the dashboard, containing the activities and announcements, depending on the users' status (i.e. student or member of Facilities and Management).
FR22	2	Dormitory students and members of the Facilities and Management shall view different dashboards.
FR23	3	OPF shall be able to filter and search maintenance tickets.
FR24	3	Members of Facilities and Management shall be able to add notes, descriptions, and pictures after completing any maintenance requests.
FR25	3	All members of Facilities and Management shall be able to view notes added by a member.
FR26	3	OPF shall be able to generate health reports for buildings depending on the inspection reports and the number of maintenance tickets.
FR27	3	OPF shall be able to generate inventory lists for members of Facilities and Management.
FR28	3	OPF shall be able to recommend renovations for dormitories.

Table 3.1.2 displays the non-functional requirements for the OPF application. The non-functional requirements are the constraints on the services and the functions provided by OPF. The constraints include timing constraints and constraints on the developing process. The non-functional requirements apply to the whole application rather than the individual features.

Table 3.1.2: Non-Functional Requirements for Optimum Property Fix (OPF).

ID	Level	Description
NFR01	1	OPF shall be implemented in JavaScript and utilize the React framework.
NFR02	1	OPF shall utilize the AWS platform for its database.
NFR03	1	OPF shall provide an intuitive and elegant user interface.
NFR03	1	Each of the maintenance requests shall be uniquely identified with a ticket number.
NFR04	1	OPF shall be compatible with Google Chrome and Firefox web browsers.
NFR05	2	OPF shall utilize a database to store information.

NFR06	2	OPF shall facilitate the communication between dormitory students and members of the Facility and Management of UNR.
NFR07	2	OPF shall perform as a well-developed front-end website.
NFR08	3	OPF shall utilize AR implementation in the inspection report.
NFR09	3	Inspection reports shall occur at the beginning of the school year and the end of the school year.
NFR10	3	OPF shall perform as multi-platform software.
NFR11	3	OPF shall be able to run on different operating systems such as IOS, Android, and web applications.

4. Use Case Modeling

The creation of OPF's use cases, and use-case diagrams define the functions of the application from the perspective of the user and the system. The use-case diagram, therefore, demonstrates the various use cases and the different types of users of the OPF system. Figure 4.1.1 outlines the use cases which are represented by ellipses and color-coded as red, blue, and yellow for each respective user. The users (also known as actors) act as stick figures and represent the student, the admin, and the facilities and management (facility in Figure 4.1.1).
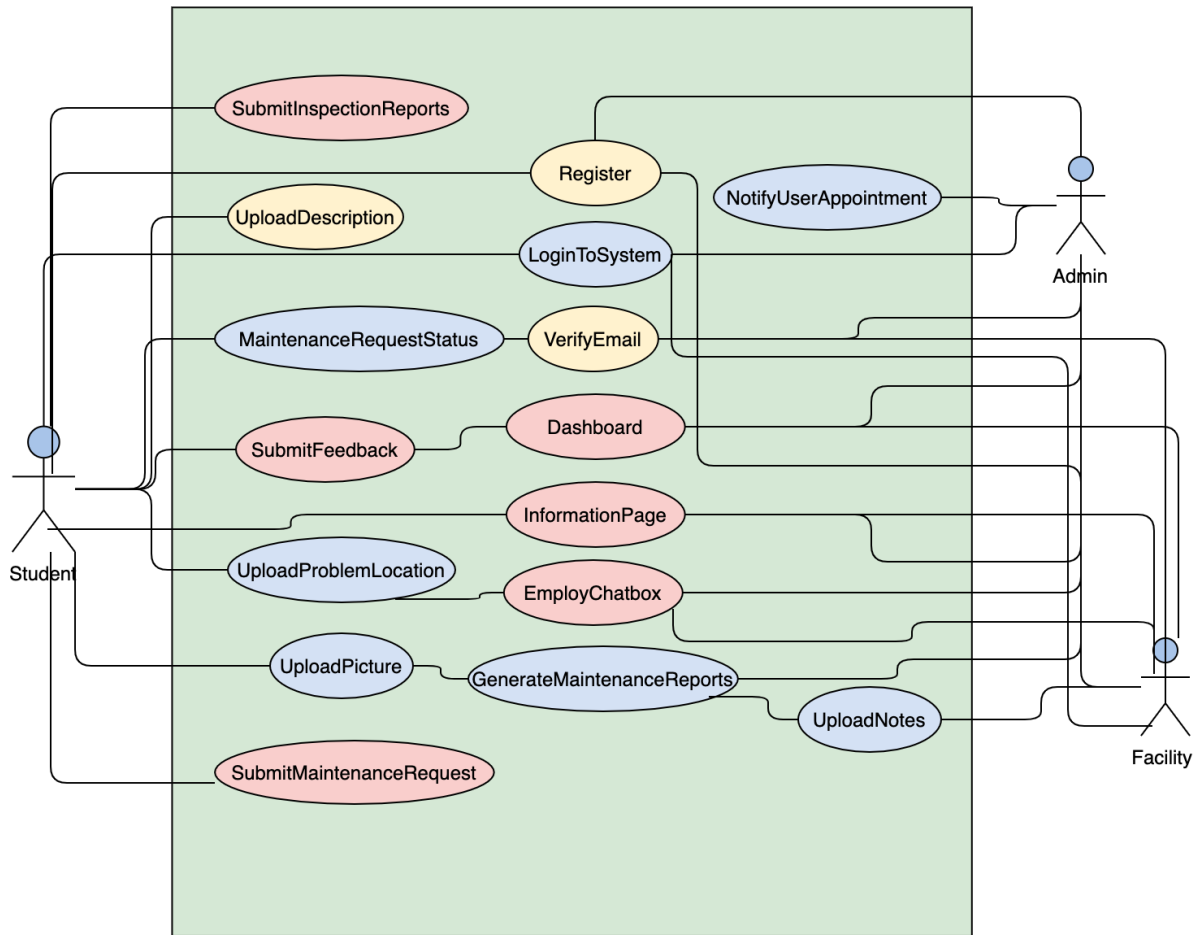
Fig. 4.1.1: Use Case Diagram.

A detailed use case description describes the narrative of the functionality of the web application OPF. The detailed use-case diagram consists of detailed, step-by-step interactions between the user and the system, OPF. The description is the action taken to accomplish a specific goal set by Team 05. Additionally, the use cases are written from the point of view of the user of OPF. Table 4.1.1 describes the use cases by an identification number, a use case name, and a brief description of the functionality.

Table 4.1.1: Use Case Description.

ID	Use Case	Description
UC01	Register	Upon registration of the account, the user will enter information identifiable only to that specific user.
UC02	VerifyEmail	Upon registration of the account, the user will have to verify their respective email to login into OPF.

UC03	LoginToSystem	The user will be able to log in to the OPF account using provided credentials.
UC04	SubmitMaintenanceRequest	The user will be able to submit maintenance requests for their dormitory issue.
UC05	SubmitInspectionReports	The user will be able to submit multiple inspection reports throughout the year.
UC06	EmployChatbox	The user will be able to use a chatbox function for various questions and guidance for maintenance issues.
UC07	UploadDescription	Upon the creation of a maintenance ticket, the user will have an option to upload a description of the issue.
UC08	UploadPicture	Upon the creation of a maintenance ticket, the user will have an option to upload a picture of the issue.
UC09	UploadProblemLocation	The user will be able to upload the location of their maintenance issue within their respective dormitory/ facility.
UC10	NotifyUserAppointment	OPF will be able to notify the user of an appointment with their provided registration information.
UC11	UploadNotes	The user will be able to upload notes on completed work in the form of a pdf file containing timestamps for work completed.
UC12	MaintenanceRequestStatus	The user will be able to view the status of their created maintenance request submitted on OPF.
UC13	GenerateMaintenanceReports	The user will be able to generate maintenance reports for each respective dormitory and building.
UC14	SubmitFeedback	The user will be able to provide feedback for the completed ticket.
UC15	ViewInformationPage	The user will be able to view an information page for frequently asked questions of users and announcements from proper authority.
UC16	ViewDashboard	The user will be able to view their respective dashboard based on user type.

Tables 4.1.2, 4.1.3, 4.1.4, 4.1.5, and 4.1.6 describe the elements of the use cases composed of the use case identification numbers, the actors involved, preconditions, the flow of events, and postconditions. The actors are defined as the individual users using the OPF that perform a behavior. Actors can fall into different categories such as primary actors, secondary actors, and

stakeholders. Next, the preconditions specify what must happen before and after the use cases run but may also act as a constraint on the completion of the case. Moreover, the flow of events constitutes paths that must be taken by the actor and the solution while the case is performed. Lastly, the postconditions are conditions in which the use case is completed for all possible flow events. The conditions therefore must be met when the paths are successfully executed.

Table 4.1.2: The use case register describes the user and enters specific identifiable information.

Use Case: Register	
Use Case ID	UC01
Actor	The actor is the user representing the students, facilities, and management workers.
Precondition(s)	1. The OPF web application is opened with their internet browser of choice to create an account page for a maintenance request. 2. The user is not already signed into the OPF web application.
Flow of Events	1. The users will need to input data identifiable to their identity to create an account on OPF. 2. The user must select either a role of 'Student', 'Admin', or 'Facility' from the drop-down menu of OPF's homepage. 3. The user will need to register their respective full name in the text box. 4. The user will need to register their choice of email in the text box. 5. The user will need to register with their respective Nevada System of Higher Education (NSHE) ID, a 10-digit number.
Postcondition(s)	1. The account on the OPF web application is created once the user submits the required information. 2. The users will be directed to the main OPF dashboard where the user can make requests.

Table 4.1.3: The use case LoginToSystem describes the process of a user logging into the system and accessing their account with OPF.

Use Case: LoginToSystem	
Use Case ID	UC03
Actor	The actor is the user representing the students, facilities, and management workers.
Precondition(s)	1. The OPF web page is opened within a browser of the user's choice and the user already possesses an account on OPF.

	2. The user is not signed into an OPF web account or has created an account.
Flow of Events	1. The user clicks on the top right of the page, "Sign In". 2. The user is then taken to the sign-in page on the OPF website. 3. The user can input their email address of choice and their NSHE ID under "Email" and "NSHE ID", respectively. 4. The user can input their password of choice under "Password".
Postcondition(s)	1. The user can then click "Sign In" on the OPF website on the top right corner of the web page. 2. The user's email and/or ID are verified during the sign-in process. 3. The user now has full access to the OPF website and its features. 4. The users are then taken to the main dashboard with their respective roles as either student, admin, or facility. 5. The users have access to OPF's functionalities found in the side navigation.

Table 4.1.4: The use case SubmitMaintenanceRequest describes the process of a student submitting a maintenance request.

Use Case: SubmitMaintenanceRequest	
Use Case ID	UC04
Actor	The actor is a student.
Precondition(s)	1. The student is already signed in to their account on the OPF website. 2. The maintenance request tab is opened on the OPF web page.

Flow of Events	1. The student selects the "Make new request" button.
	2. The student inputs data needed by the facility for maintenance.
	    a. The student enters the issue type.
	    b. The student enters the location of the issue.
	    c. The student enters the description of the issue.
	    d. The student enters the severity of the issue.
	    e. The student uploads a picture or a video of the issue.
	3. The student submits the maintenance request in OPF.

Postcondition(s)	1. A maintenance request is submitted in the system. 2. The request is sent to the facility and management. 3. The facility and management are notified of the request.

Table 4.1.5: The use case VerifyEmail describes the users' respective authentication processes.

Use Case: VerifyEmail	
Use Case ID	UC02
Actor	The actor is the user which includes facilities, admins, and students.

Precondition(s)	1. The user has initiated the registration process and filled out the information related to themselves.
	    a. The user clicked "Sign In" on OPF's homepage.
	    b. The user selects either "Student", "Admin", or "Facility" from the drop-down menu.
	    c. The user registered their full name on the respected text box.
	    d. The user registered their choice of email on the respected text box.
	    e. The user will register their respective NSHE ID on the respected text box.
	    f. The user clicked the "Sign up" button.
	2. The user does not have access to their OPF account.

Flow of Events	1. The user will proceed to the inputted email account (from the registration process). 2. The user will locate and view the email sent from OPF. 3. The user will open the email sent from OPF containing a link. 4. The user will click the link provided in the email. 5. The user will be taken to their respective main dashboard.
Postcondition(s)	1. The user's email is verified from their provided credentials during user registration. 2. The users have access to the OPF website to create maintenance requests. 3. The users are taken to their respective main dashboard upon logging into OPF.

Table 4.1.6: The use case SubmitFeedback describes the process of a student providing feedback for their completed maintenance request.

Use Case: SubmitFeedback	
Use Case ID	UC14
Actor	The actor is a student.
Precondition(s)	1. The students are already signed into OPF using their login credentials. 2. A maintenance request has been submitted by the user

	requesting services. 3. The maintenance request has been completed by the facilities and management department.
Flow of Events	1. The students can review their completed maintenance requests. 2. The students may "Sign In" and select the "Feedback" tab. 3. The students can select which maintenance request they would like to submit feedback for in the dropdown menu. 4. The students may answer the questions on the feedback form pertaining to their request. 5. The students submit the feedback form where the appropriate department will be notified.
Postcondition(s)	1. The feedback form is sent to the appropriate department in a pdf file. 2. The maintenance facility is notified and can read feedback provided by the user.

5. Requirement Traceability Matrix

The Requirement Traceability Matrix relates both functional requirements with use test cases to ensure validation and that all requirements are checked. Functional requirements are statements to which the system should behave to certain inputs and also what the system should do. Additionally, the use cases identify the individual interactions between the system and users. Figure 5.1.1 provides the mapping of OPF's use cases and the functional requirements.

		USE CASES														
		UC 01	UC 02	UC 03	UC 04	UC 05	UC 06	UC 07	UC 08	UC 09	UC 10	UC 11	UC 12	UC 13	UC 14	UC 15	UC 16
F U N C T I O N A L	FR01			■													
	FR02	■															
	FR03			■													
	FR04				■												
	FR05							■		■							
	FR06		■														
	FR07					■											
	FR08					■											
	FR09							■	■								

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16
FR10										■						
FR11					■											
FR12														■		
FR13														■		
FR14										■						
FR15			■													
FR16					■											
FR17					■											
FR18					■											
FR19															■	
FR20															■	
FR21																■
FR22																■
FR23												■				
FR24							■	■								
FR25											■					
FR26													■			
FR27													■			
FR28													■			

(Row label spanning the leftmost column, reading vertically: **REQUIREMENTS**)

Fig. 5.1.1: The Requirement Traceability Matrix displays the relationships between use cases, functional requirements, and non-functional requirements.

6. Initial Snapshots

The snapshots demonstrate the potential user interfaces at the moment for OPF. Figures 6.1.1, 6.1.2, 6.1.3, 6.1.4, 6.1.5, and 6.1.6 display six snapshots of the OPF user interface with brief descriptions regarding each figure. They show how the users will be able to interact with OPF and the user interfaces are designed to be simple, interactive, useful, elegant, and accessible. All six snapshots are created in AdobeXD.
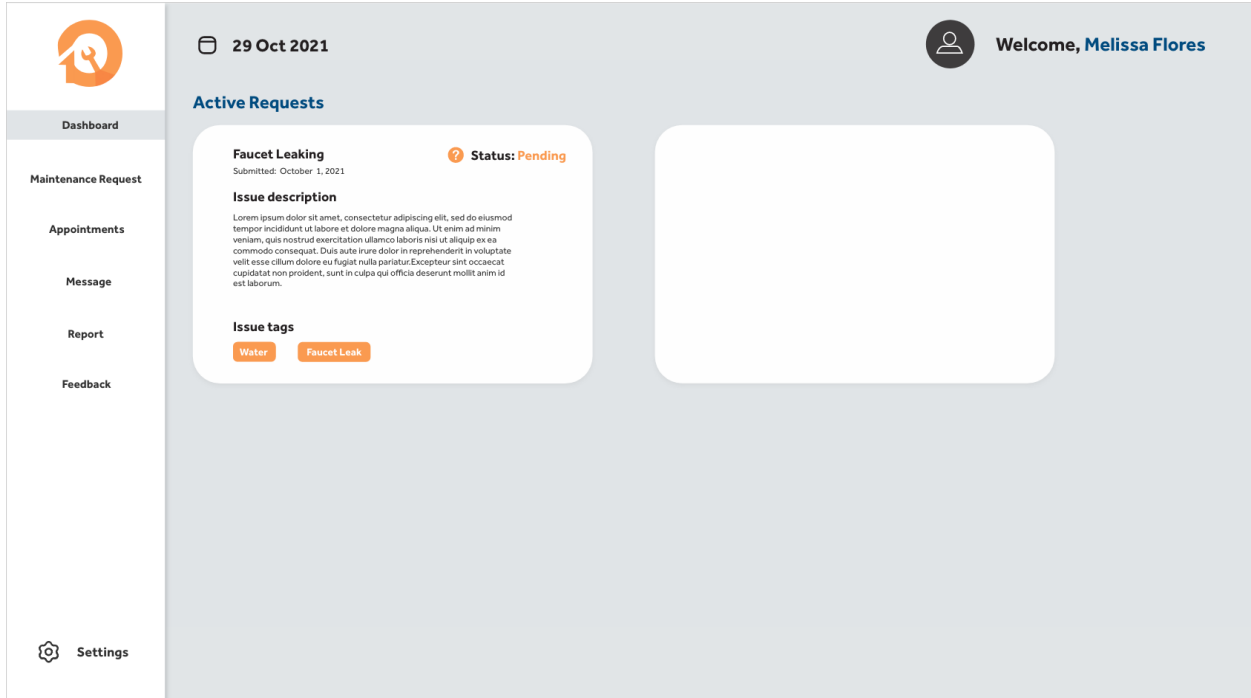
Fig. 6.1.1: The snapshot of the UI shows the dashboard in student mode. The user's dashboard is where important information will be displayed such as active requests, new messages, alerts, and the user's calendar. In the dashboard, the user will be able to access their profile, requests, messages and navigate through the side navigation.

Fig. 6.1.2: The snapshot shows the page where the user is able to select who they are such as student or admin and then proceed to make an account. They will input information such as their full name, their email address, and their NSHE ID. On the top right corner, if the user already has an account, they may proceed to sign in.

Fig. 6.1.3: The snapshot shows the maintenance request page in student mode. Here is a list view of all maintenance requests which can be sorted by clicking on the quick filter button. The list may be filtered by date, status, severity, or priority. In addition, the students will be able to make new maintenance requests on this page.

Fig. 6.1.4: The snapshot shows the feedback tab where students will be able to select a request they previously filed and would like to write the feedback form. This is a simple design for a feedback form that consists of questions to be submitted to the administration.

Fig. 6.1.5: The snapshot shows the maintenance request tab in Admin mode. Here is a list view of all maintenance requests which can be sorted by clicking on the quick filter button. The list may be filtered by date, status, or priority. The admin may also view more details of the request and view the student's information. In the status section, symbols can better capture the user's eye.
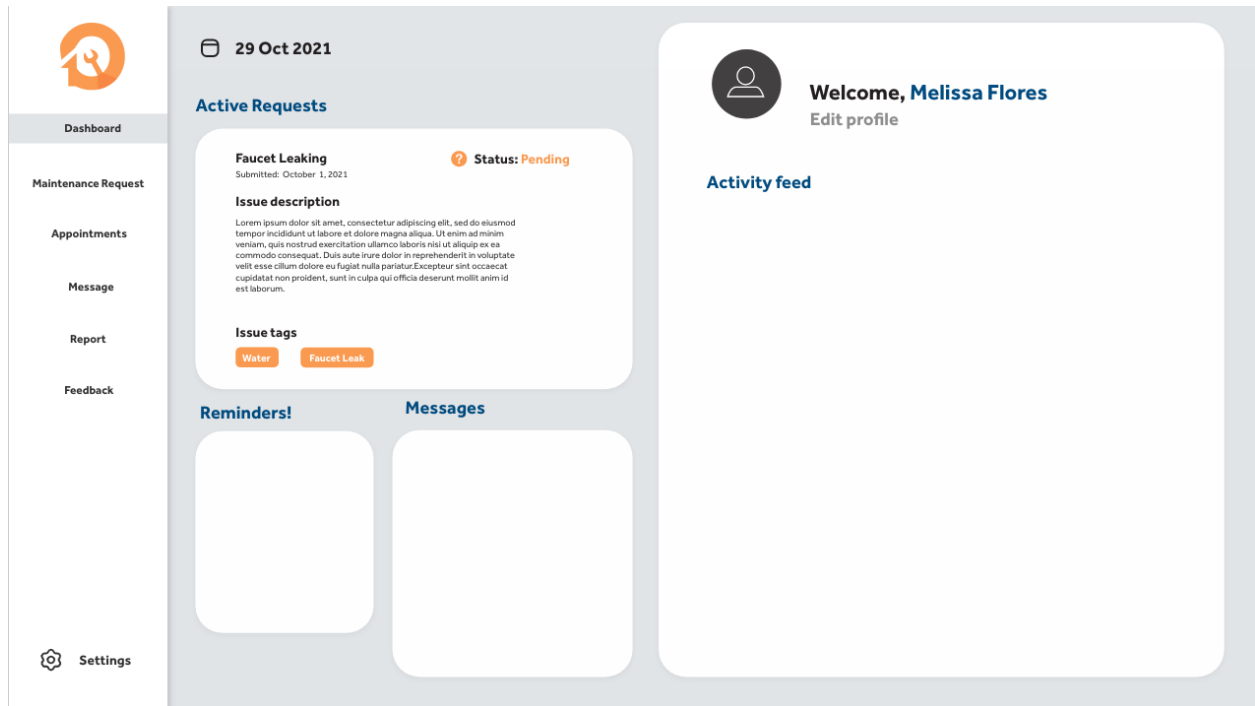
Fig 6.1.6: The snapshot shows the dashboard when the user selects their profile. Here, the user will be able to view their profile, activity feed, and edit their profile. The screen is a split-screen where the left-hand side contains the user's dashboard while the right-hand side contains the user's profile.

7. Glossary

Adobe XD

Adobe XD is a vector-based user experience design tool for web apps and mobile apps developed and published by Adobe Inc.

Amazon Relational Database Service (Amazon RDS)

Amazon Relational Database Service is a managed service that allows for the operation, and scaling of a relational database via cloud storage. It provides cost-efficient and resizable capacity while managing time-consuming database administration tasks.

Amazon Rekognition

Amazon Rekognition is a service that makes it easy to add powerful visual analysis to applications while giving the ability to search, verify, and organize images.

Chatbot

A computer program designed to simulate conversations with human users, especially over the internet.

Chatbox

A software application used to conduct an online chat conversation via text or text-to-speech instead of providing direct contact with a live human agent.

Current system

The process is where students fill a form located at the front desk of the dormitory if their room requires maintenance assistance. Once filled, the form would be placed onto a stack at the front desk, and a person from Facilities and Management would arrive and pick up and deliver the forms. At some point, a Facilities and Management staff would arrive at the designated location and fix the issue if the form is received.

Dashboard

A graphical user interface that provides an at-a-glance view of key performance indicators.

Facilities and Management

Professional management focused on the efficient and effective delivery of logistics and other services related to real property.

Functional Requirements

A form of statements of services a system should provide and how the system should react to inputs given particular situations.

Ethnography

    An observational technique used to understand operational processes and derive requirements for software to support processes.

Interview

    Either formal or informal, used for overall insight and understanding of what the stakeholders do, interaction with the new system, and the difficulties with current Systems.

Inspection Report

    A document that is written by a home inspector after a thorough evaluation of the home's condition, including the electrical system, plumbing, furniture condition, and other structural features.

Non-Functional Requirements

    Constraints on the services (functions) offered by the system that applies to the system as a whole rather than individual system features or services.

Prototyping

    Process of building a simulated user interface for purposes of ideation, evaluation, and user feedback.

Paper trail

    A series of documents providing written evidence of a sequence of events or the activities of a person or organization.

React

    React is a free and open-source front-end JavaScript library for building user interfaces or UI components.

Reliability

    The rate of failure occurrence or probability of unavailability of a system.

Single sign-on (SSO)

    An authentication method that enables users to securely authenticate with multiple applications and websites by using just one set of credentials.

Use Case

    A specification of one type of interaction with the system.

Use-Case Diagram

A UML diagram that identifies use-cases and depicts the users involved. Can be supplemented with additional information to describe use-cases.

8. List of References

Similar Products

"The #1 School Facilities Maintenance Software Platform." *Fiix*, 23 Aug. 2021, https://www.fiixsoftware.com/cmms/industry-solutions/university-maintenance-software/.

Fiix, a Rockwell Automation Company, allows for the management of facilities and maintenance at institutions. The software accounts for access to tools that allow for simplification of management. The software accounts for web and mobile devices including iPhone and Android accessibility allowing for inspections in real-time, inventory/ stock notifications, prebuilt reports that allow for metrics and future project work. Fiix is a subscription-based model that charges per user and services tailored to each customer.

"CMMS Software for Maintenance, Facility and Property Management." *NetFacilities*, https://www.netfacilities.com/?hsLang=en.

NETfacilities, an AMTdirect Company, is a management tool used for collaboration, scheduling, and labor cost tracking using historical data. Moreover, NETfacilities is the largest organization to offer services to upwards of 500+ customers ranging from industries such as education, government, healthcare, hospitality, manufacturing, and food services. Reports are generated by the facility, department, service type, and vendors. Additionally, NETfacilities allows tracking and management of assets and schedules tasks automatically that generate preventive maintenance work orders.

"Management Software Designed to Simplify Maintenance at Schools." *Maintenance Care*, 13 May 2021, https://www.maintenancecare.com/education.

MaintenanceCare is a management tool that allows for preventative maintenance of all facility assets. Features include asset tracking/repair history, parts, and inventory tracking, and preventative maintenance forms as well as task assignments. Additionally, MaintenanceCare includes a dashboard for automated reports including data export options. Pricing of MaintenanceCare offers tailored choices of features and yearly payments as a pay-as-you-go option.

Websites

https://www.adobe.com/products/xd.html
Adobe XD allowed Team 5 to make prototypes of the OPF website. The application allows for communication of the design and maintenance across the team. Additionally, Adobe XD has integrations with creative cloud applications such as photoshop and illustrator to create a simple user interface design. Adobe XD lets the team streamline the process of creating the application by reusing common elements and components such as buttons. Prototyping a design leads the team to better test user experiences while maintaining design systems.veg

https://reactjs.org/tutorial/tutorial.html

React, a JavaScript library is a free and open-source framework used for building user interfaces or components. React allows software developers to create web applications that change data without reloading the page. Subsequently, React is fast, scalable, and simple making the reliability of OPF valuable. In addition to the benefits, the extensive online documentation and user tutorials using React are straightforward.

https://aws.amazon.com/

Amazon Web Services (AWS) allows for payment for the compute power, storage, and other resources one uses without up-front commitments. AWS enables developers to select operating systems, programming languages, databases, and other services all in one place. Additionally, the use of AWS allows for applications to quickly and securely host applications while scaling up or down based on demand. Rekognition is a service that makes it easy to add powerful visual analysis applications. Other services such as Amazon DynamoDB is a fast and flexible non-relational database service that allows developers to offload the burdens of operating and scaling.

Problem Domain Articles

Iveta Pukite., "Different Approaches to Building Management and Maintenance Meaning Explanation." *Procedia Engineering,* Vol. 172. 2017.
Journal paper describing organizational approaches to property management overview economic operations, problems and solutions to repairs and maintenance, and key insights to effective property management. Building management systems are imperative to ensuring upkeep savings by being preemptive to issues that may arrive.

Rains, Harriet., "Federal Real Property : Management Issues of Structures, Historic Buildings, and Underutilized Property." *New York: Nova Publishers*, 2014. Print.
Journal article assessing federal government's efforts of property management with solutions to particular points of failure. Some comprehensive assessments are of government provided housing and property management solutions that can be used in cost savings. Overarching goal to ensure solutions is proper tracking of issues.

9. Contributions of Team Members

Araam Zaremehrjardi's Contribution
Araam Zaremehrjardi's total time worked on the project specification totals six hours. Contribution entails writing the following sections: introduction and some use cases, and snapshots.

Joanna Lopez's Contribution
Joanna Lopez's total time worked on the project specification totals ten hours. The contributions include aiding in the writing of the use cases, references, glossary, and traceability matrix.

Melissa Flores' Contribution
Melissa Flores's total time worked on the project specification totals six hours. The contributions include the creation of the use case diagram and initial snapshots.

Nasrin Juana's Contribution
Nasrin Juana's total time worked on the project specification totals nine hours. The contribution includes the writing of the technical requirements specification, and glossary. Additional work includes editing of the report in conjunction with Aisha Co.

Aisha Co's Contribution
Aisha Co's total time worked on the project specification totals to eleven hours. The contribution includes writing the following: creating and finalizing the questions for the interviews, interviewing the stakeholders, and summarizing the stakeholders' interviews. Additional work includes editing the report alongside Nasrin Juana.