

An-Najah National University



Faculty of Engineering and Information Technology

Computer Engineering Department

Software Graduation Project

# Craftopia

## **Students:**

Mahmoud Shouli

Nabeel Jamous

## **Supervisors:**

Haya Samaana, MSc.

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Computer Engineering.

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# Acknowledgement

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This project wouldn't be possible without the huge support of our families who were the backbone behind us, our supervisor who kept watching and assessing our progress, giving us periodic feedback and comments, whether they were positive or negative, and our instructors who taught us valuable experiences and lessons throughout these past five years.

# Disclaimer

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This report was written by students Mahmoud Shouli and Nabeel Jamous at the Computer Engineering Department, Faculty of Engineering, An-Najah National University. It has not been altered or corrected, other than editorial corrections, as a result of assessment and it may contain language as well as content errors. The views expressed in it together with any outcomes and recommendations are solely those of the students. An-Najah National University accepts no responsibility or liability for the consequences of this report being used for a purpose other than the purpose for which it was commissioned.

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# Abstract

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In our community, people have a hard time finding and connecting with the right craftsmen for finishing their bare shell apartments, including electrical, plumbing, floor, wall, ceiling, doors and windows finishing's, this is where Craftopia comes in handy.

Craftopia is a platform that bridges between clients and craftsmen, it's a win-win situation for both as clients can browse through different room design templates and then see recommended craftsmen filtered by different parameters such as closest location, best price for your budget, or ones who have worked in similar rooms.

If a client didn't like any of the designs that they see on the app, then they can create one themselves using an AI model where users can generate custom templates. A booking system is also available, clients can check the craftsman schedule and book him for work.

Clients can create a workshop that behaves similar to a group project and add all the craftsmen that will work in the room. The workshop is a method for the client to be in touch with the crafters and get updates and feedback from them, it's also a way for crafters to communicate with each other and mark checkpoints or milestones for the progress, as the room finishing process is an accumulative process where one cannot work before another, for example a painter cannot paint the wall unless it's first plastered by a plasterer, it's like a pipeline.

This application will be available for both mobile and web. Craftopia is user-friendly, efficient, convenient and innovative.

# Chapter 1 Introduction

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We should always seek solutions that benefit our society and have an actual impact on it, that's what we aimed for, we observed, thought thoroughly, listened, and finally came up with the idea, and it always starts with an idea.

Let's say you just bought a bare shell place, whether it is an apartment or a storage, now you start looking for crafters to finish the place, an electrician and a plumber for the infrastructure, a plasterer and a painter for your walls, a tiler for your floors, a carpenter for your furniture, aluminum specialist for your windows, and the list goes on. The key phrase here is "looking for" crafters, that process is not always pretty and simple, this could take a lot of time. Typically, you would start thinking of any acquaintances, friends, or relatives, you make multiple calls to find the crafter that suits your needs, the price you afford, the time of work, and even there's no guarantee that you will like what they did after they finish.

This previous process is not reliable, nor practical, especially in the world of continuously evolving technology, that's where our app comes to play. Craftopia solves all these issues, it provides a platform that bridges these gaps between the customers and crafters, you get to search for the right crafters for you, communicate with them, see their work, book them, and many more! It's a win-win situation for both parties, the customer is satisfied and the crafter is working. Our app saves you time, money, and effort.

This paper provides all the details behind this app, Chapter 2 discusses the constraints and the earlier coursework. Chapter 3 links some literature review done for the project. Chapter 4 talks about the overall system architecture and design. Chapter 5 lists the technologies, tools, and frameworks used to build the app. In Chapter 6 we dive deep into the features and functionalities. Chapter 7 shows what an admin could do. Mobile version is shown in Chapter 8, and lastly we will conclude in Chapter

# Chapter 2 Constraints and Earlier Course Work

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## 2.1 Constraints

- **3D room design infeasibility:** the original plan was to build a 3D room where you can virtually build your room, but this was unfeasible so alternatively we implemented a feature where customers can view a 3D template from all its corners.

## 2.2 Earlier Course Work

- **Software Engineering Course:** This course provided the basics of software engineering and SDLC, we followed the Agile model.
- **Advanced Software Engineering Course:** Taught us the different architectures, and REST APIs
- **Web Development Course:** fundamentals of web development like HTML, CSS and JavaScript.
- **Udemy Web Development Course:** learned most of the techs used in this project such as React and Node

# Chapter 3 Literature Review

---

Most of the technologies and techniques that we used were relatively new to us, so we had to watch a lot of YouTube videos and read multiple articles to understand the mechanism and science behind it, here is some of the topics we looked at:

## **3.1 The Ultimate Beginner's Guide to Scraping, Embedding and Ollama**

Gained basic understanding of the LLMs and Ollama and how they actually work and how to use them in our project. [1]

## **3.2 What is Rule-Based System?**

Introductory to the rule-based systems, how to write the rules and apply them, it was a great read for our recommendations system. [2]

## **3.3 WebSockets explained: What they are and how they work**

Acquired basic understanding of the WebSocket protocol, how the connection works, and how to apply it in our system for real time communication. [3]

# Chapter 4 System Architecture

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## 4.1 Architecture

We divided the project into two separate folders, the backend and the frontend. We used the MVC architecture where the business logic is separated from the presentation logic.

We applied the Repository pattern to separate data access logic.

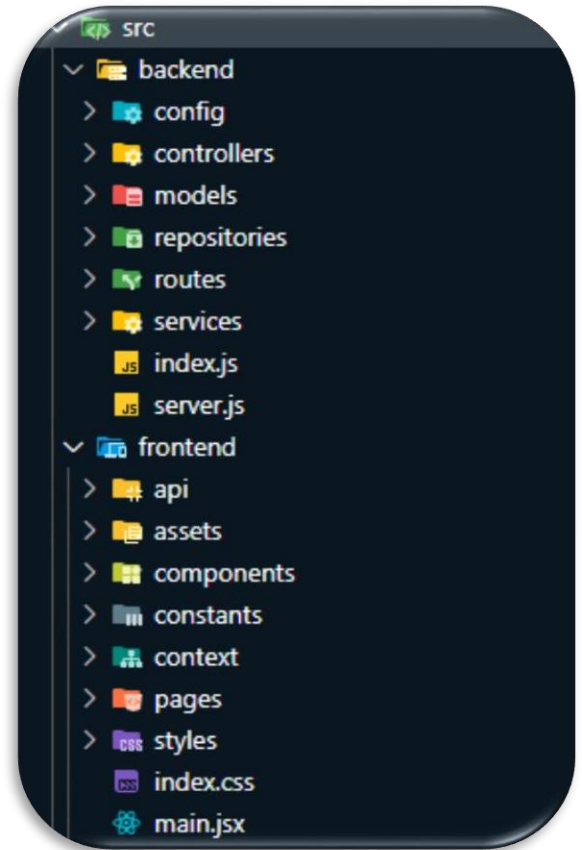


Figure 4-1: Folder Structure

## 4.2 Data Flow

When a request comes, it's routed to a controller action, then it is passed to the service layer when business logic might be done, then it is passed to the persistence layer where interactions with the database occur, then a response is formed and propagated back to the user.

# Chapter 5 Tech Stack

---

## 5.1 Frontend

We used React for web and React Native for mobile, because of its huge ecosystem and big community. It has a lot of support and features like state management, components architecture, and it is easy to switch to mobile.

We used styled components along with react bootstrap for styling.

## 5.2 Backend

We used NodeJS runtime environment along with ExpressJS as the web framework for building web APIs.

We chose Node to develop the full stack using JavaScript because of its huge community that has packages with support of thousands of functionalities.

For the database we went with NoSQL MongoDB because our schema isn't fixed and the entities kept changing, and because of its fast lookup and flexibility.

# Chapter 6 Features

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## 6.1 Roles

We have three roles in our system, customer, crafter, and admin. We implemented the Role Based Access Control (RBAC) where each access to resources and services must be authorized first, each role has specific access rights.

## 6.2 Registration and Login

First thing users need to do whether they were a customer or a crafter is to create an account.

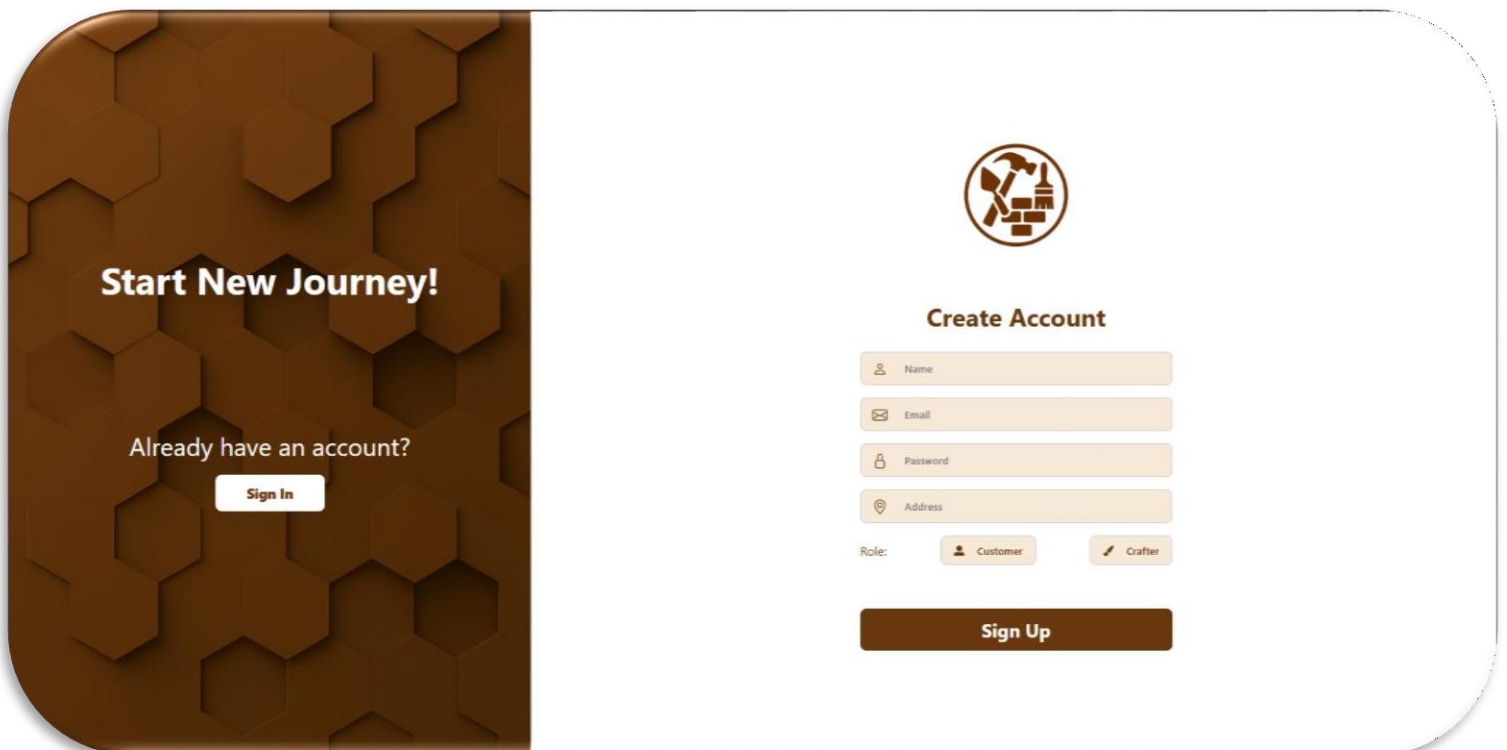


Figure 6-1: Registration

They need to provide a name, a unique email, a strong password, a location, and their role.

When they click on the location icon in the address field, this map pop ups:

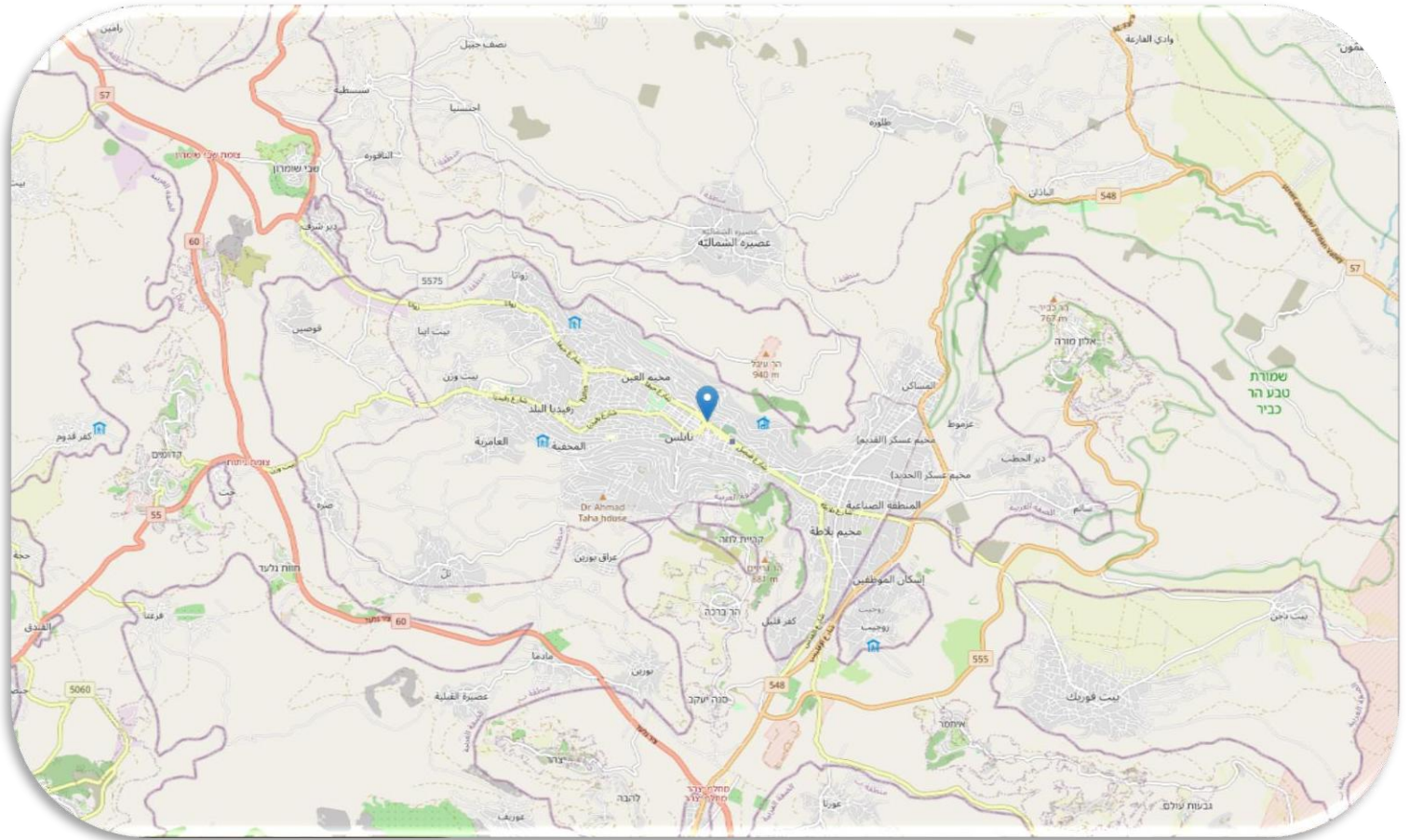


Figure 6-2: Map

When they click on any point in the map, the coordinates are resolved into their full address containing the village, city, and country. This is done using **openstreetmap** API [6] and the map is rendered using the **Leaflet** library.

When they sign up as a crafter, a list of available crafts appears for them to choose one:

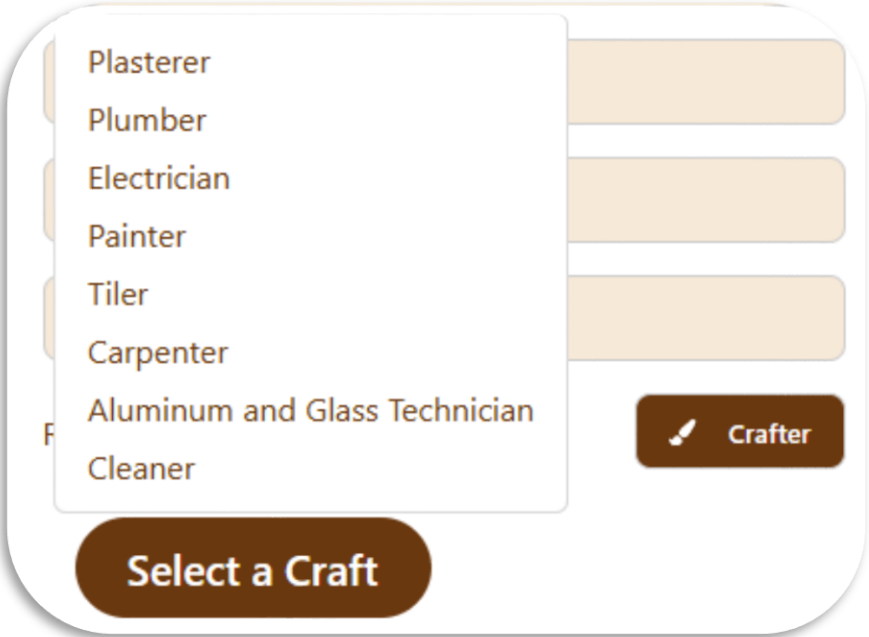


Figure 6-3: Crafts

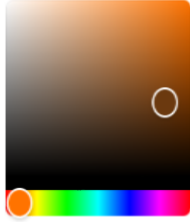
When a user signs up as a customer, they will be redirected to the references page. This page collects some information about what they favor or prefer such as their favorite colors, and they can pick multiple tags or topics that they find interesting.

These data are further processed to provide tailored recommendations for each user.

This is the references page:

**Select Your Preferences**

**Favorite Colors**



**Select Color**

**Preferred Tags**

pipe installation   leak repair   water heater   bathroom setup   drain cleaning   wiring   lighting   circuit breaker   electrical repair

panel upgrade   wall painting   interior   exterior   spray paint   color matching   woodworking   custom furniture   cabinetry   door repair

shelving   floor tiling   wall tiling   grout repair   ceramic   mosaic   deep cleaning   move-out cleaning   carpet cleaning   disinfection

window cleaning   wall finishing   drywall   ceiling work   skim coating   patch repair   glass repair   window installation   shower enclosures

aluminum frames   sliding doors

**Save Preferences**

Figure 6-4: Preferences

Users can pick multiple colors too.

After they create an account, they need to login using our login page:

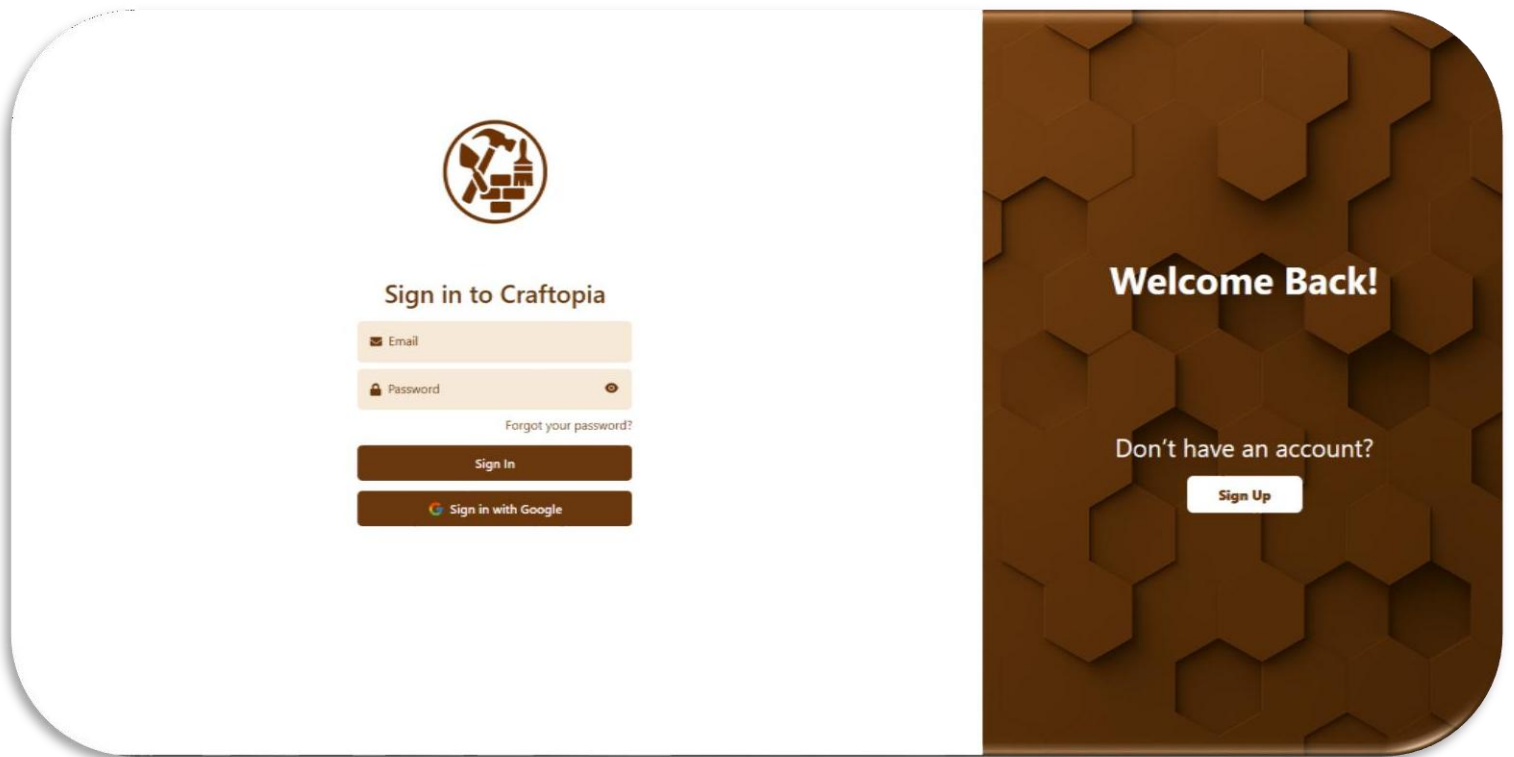


Figure 6-5: Login

Users can sign in with their email and password, or with their google account using OAuth2. after they sign in, they will be directed to the Home Page which just shows an overview of the website and its services, and at the bottom of the page they get to see the reviews.

## 6.3 Reviews

There are two type of reviews that user can submit in our system, one for the website, and one for a crafter, which we will cover later.

The site's reviews are shown at the bottom of the home page:

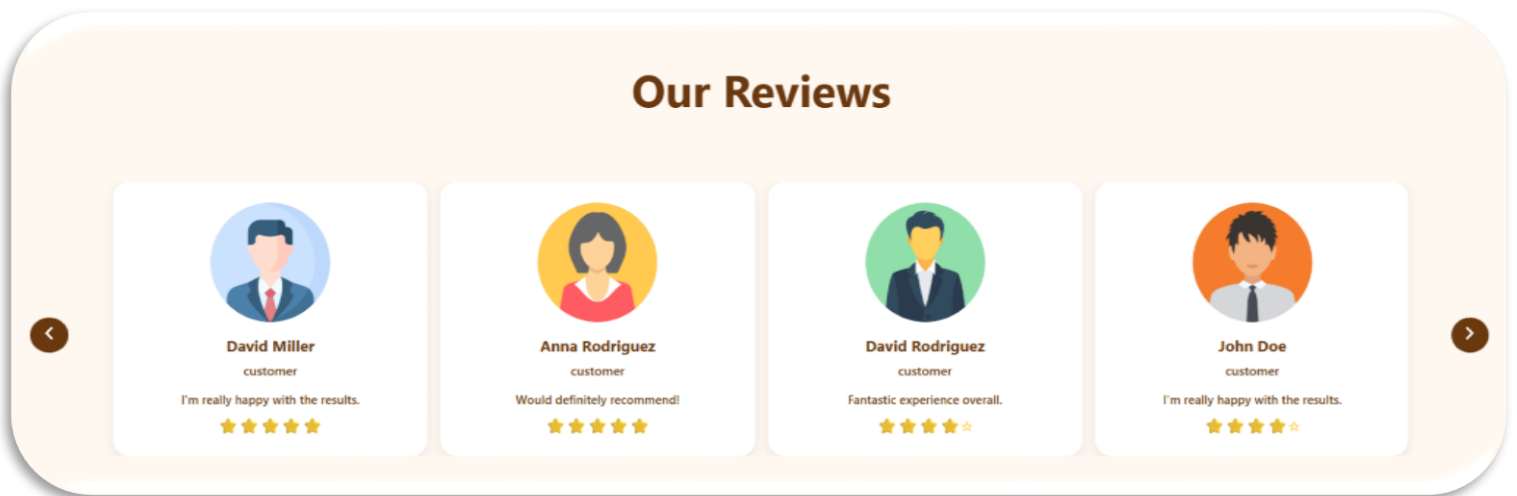


Figure 6-6: Site Reviews

Users can see information about each review like who submitted it, what it says, and its rating. One site review per user is a decision we made to prevent abusing the service and spamming bad reviews by attackers.

Review submission is done at the very end of the home page:



Figure 6-7: Submit Review

## 6.4 Profiles

Each user has a profile page that shows their personal information:

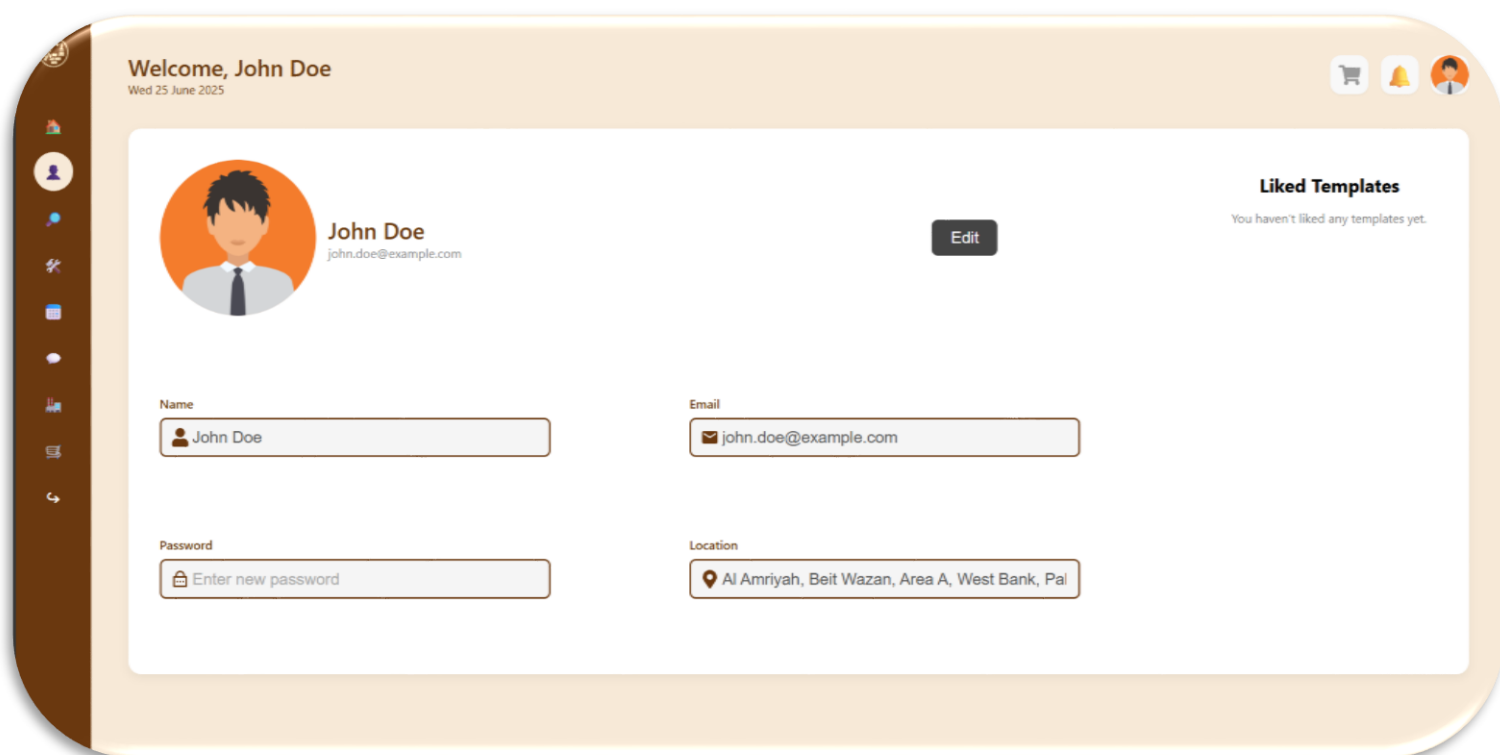


Figure 6-8: Profile

The user can upload a profile picture, and can edit all their information except for the email.

On the left, a sidebar is available to navigate through the different services and pages. On the right a list of liked templates appears, and on the top right corner, notification and cart menus exist.

## 6.5 Search Functionality

The system provides a robust and flexible search service where users can search for crafters in different ways, all crafters appear by default.

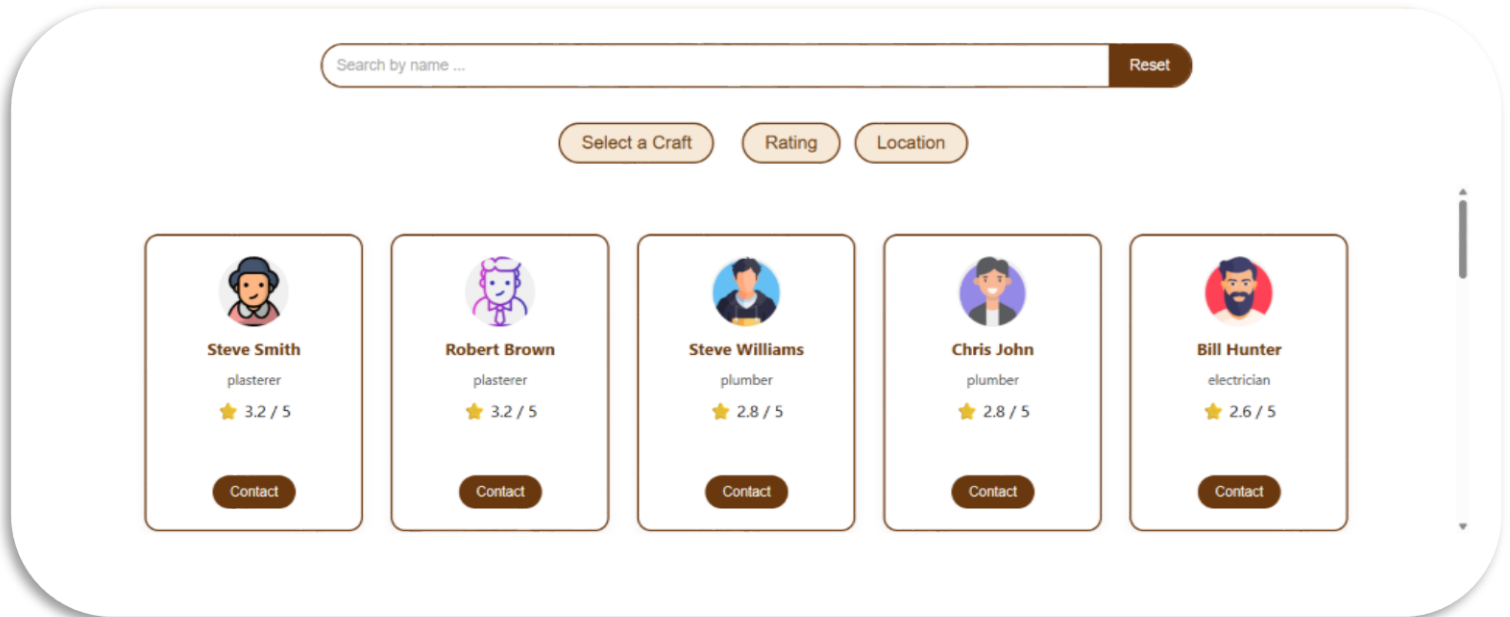


Figure 6-9: Search

Multiple filters are available as seen, a search by a name, a craft, rating, or even location. A combination of filters is also possible.

When you search by location, a map appears with crafters close to you by 5 KM by default, you can change the distance if you wish and the crafters will appear dynamically. This is done by using 2dsphere index for geospatial queries which is a built-in feature in MongoDB.

this is where you change the distance

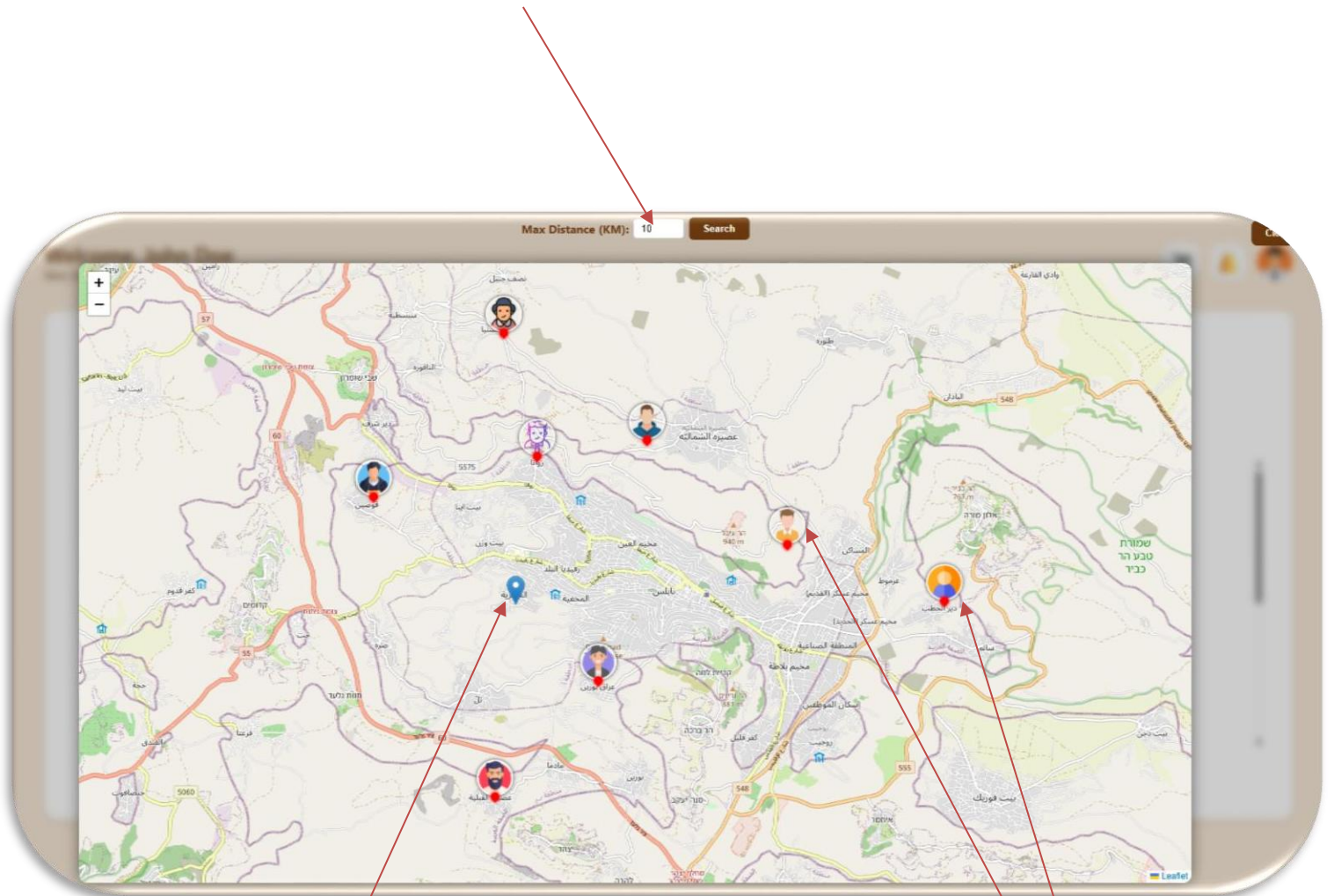


Figure 6-10: Nearby Crafters

your current location

crafters nearby

## 6.6 Sentiment Analysis

After searching for crafters, a click on the crafter's card will show you the reviews for that specific crafter, and **sentiment analysis** is done where the feeling of the review is analyzed and then categorized to either Positive or Negative, so you can see the number of positive and negative reviews.

Whatever language the review is written in, it's translated to English when the analysis is done using Google Translate API.

The rating of the crafter shown under his name is the average rating from his reviews.

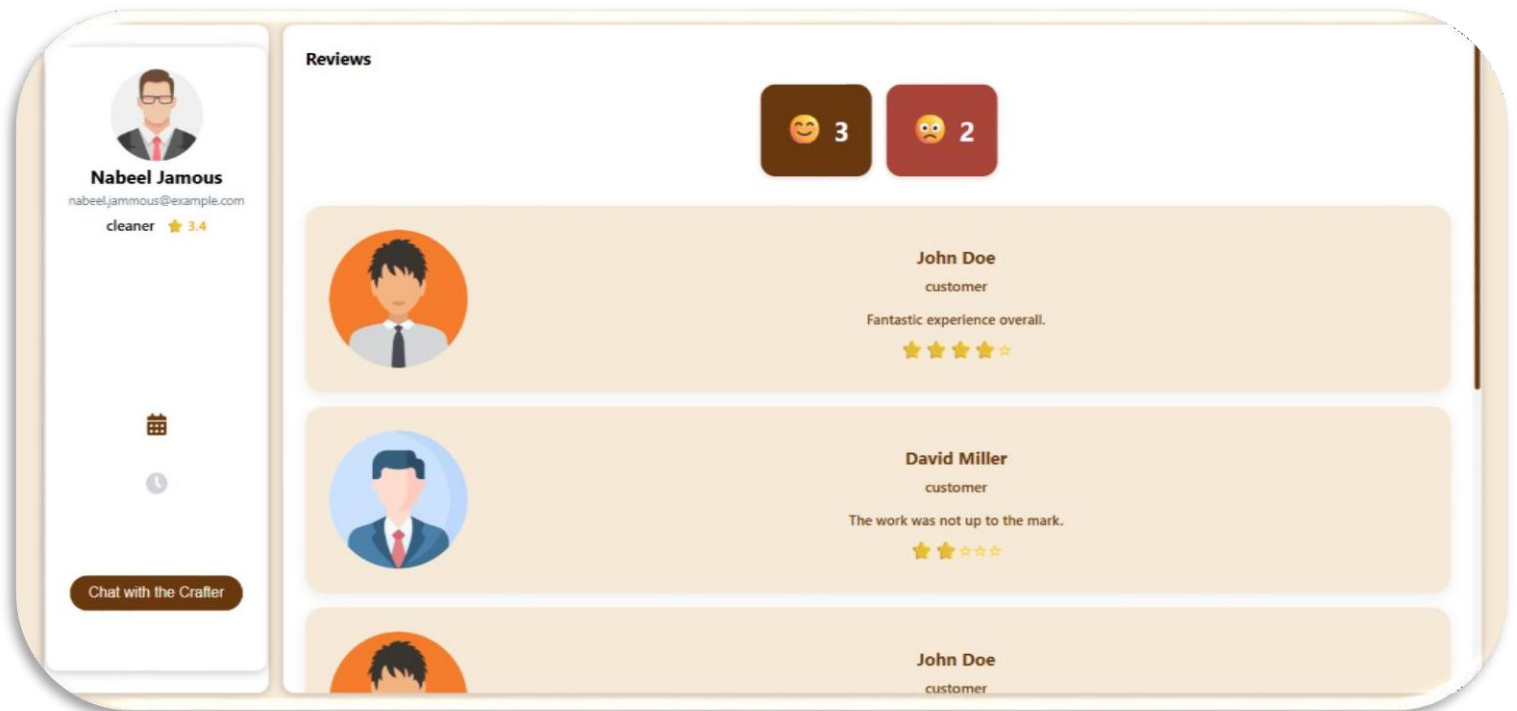


Figure 6-11: Crafter Reviews

## 6.7 Schedules and Appointments

A click on “Contact” in the crafter card will take the customer to the crafter’s schedule where they can see which days the crafter is available in.

When a booking is made, its status will be “*pending*” until the crafter confirms or cancels it, and the customer can cancel that appointment as long as the status is still pending.

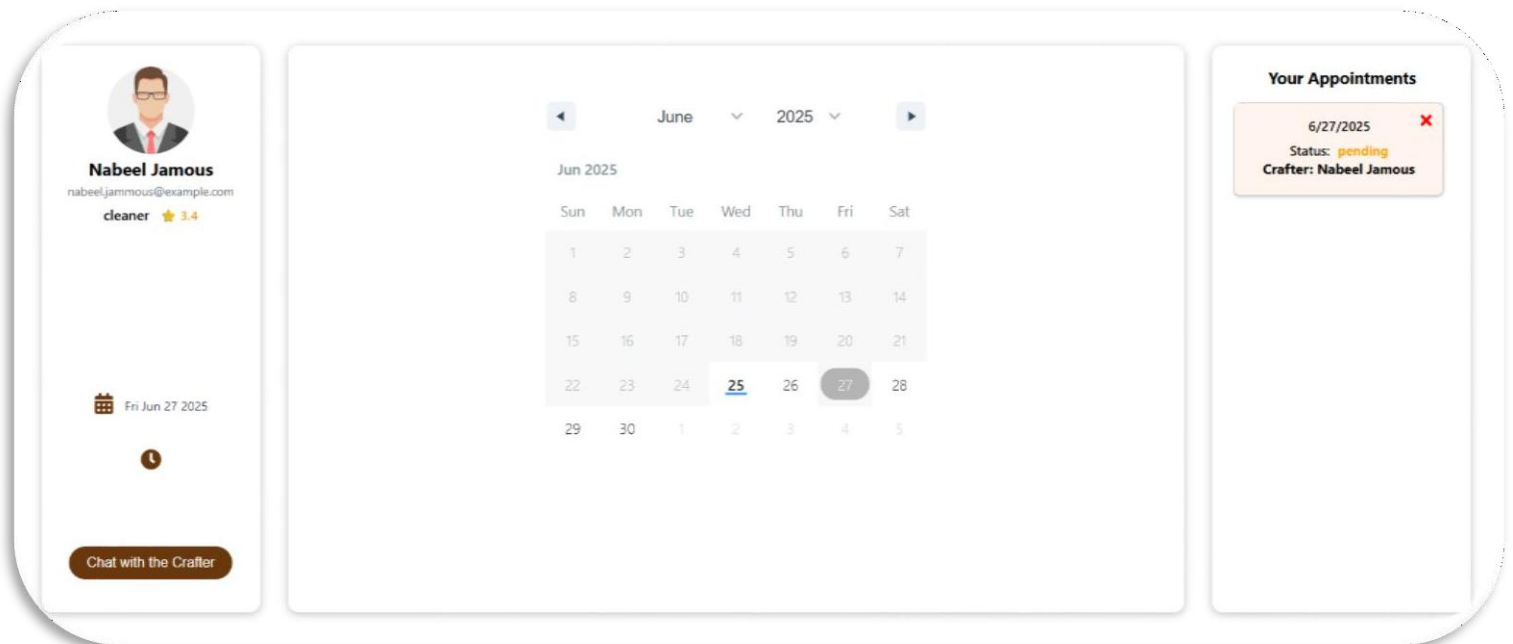


Figure 6-12: Schedule

If the crafter decides to cancel the appointment, he will have to choose one of the generated cancellation reasons, and that reason will be sent to the customer via the chatting system that we will cover soon.

**Select cancellation reason:**

- Crafter is unavailable
- Double booking conflict
- Emergency situation
- Customer did not confirm
- Other

**Confirm Cancel**

Figure 6-13: Cancel Reason

If the crafter confirms the appointment, the status will be *“Confirmed”*, and after the crafter finishes the work, he can change the status to *“Completed”* which will then allow the customer to give a review.

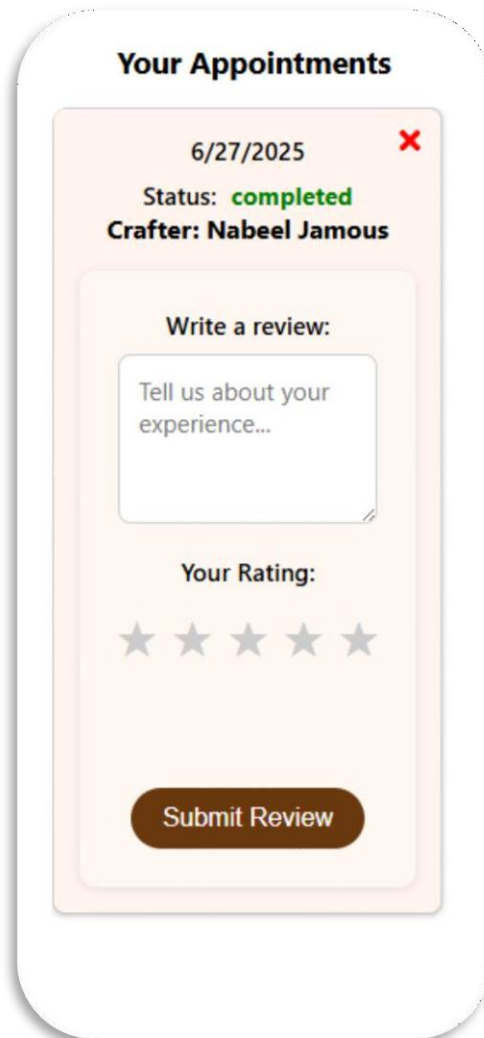


Figure 6-14: Completed Appointment

The crafter can also disable a day which means making it unavailable to book by clicking on it.

## 6.8 Chatting System

Customers can chat with the crafters by clicking on “Chat with the crafter” which will take them to our chatting page. The chatting system was built using **Web Sockets** via **socket.io** library to enable real time communication and instant updates without having to refresh the page.

You can send text messages and pictures, you can like a message by double clicking on it, and you can delete a message by mouse right click.

You can also see the status of the user (online/offline) by looking at the small circle on the image which also updates instantly using the socket.

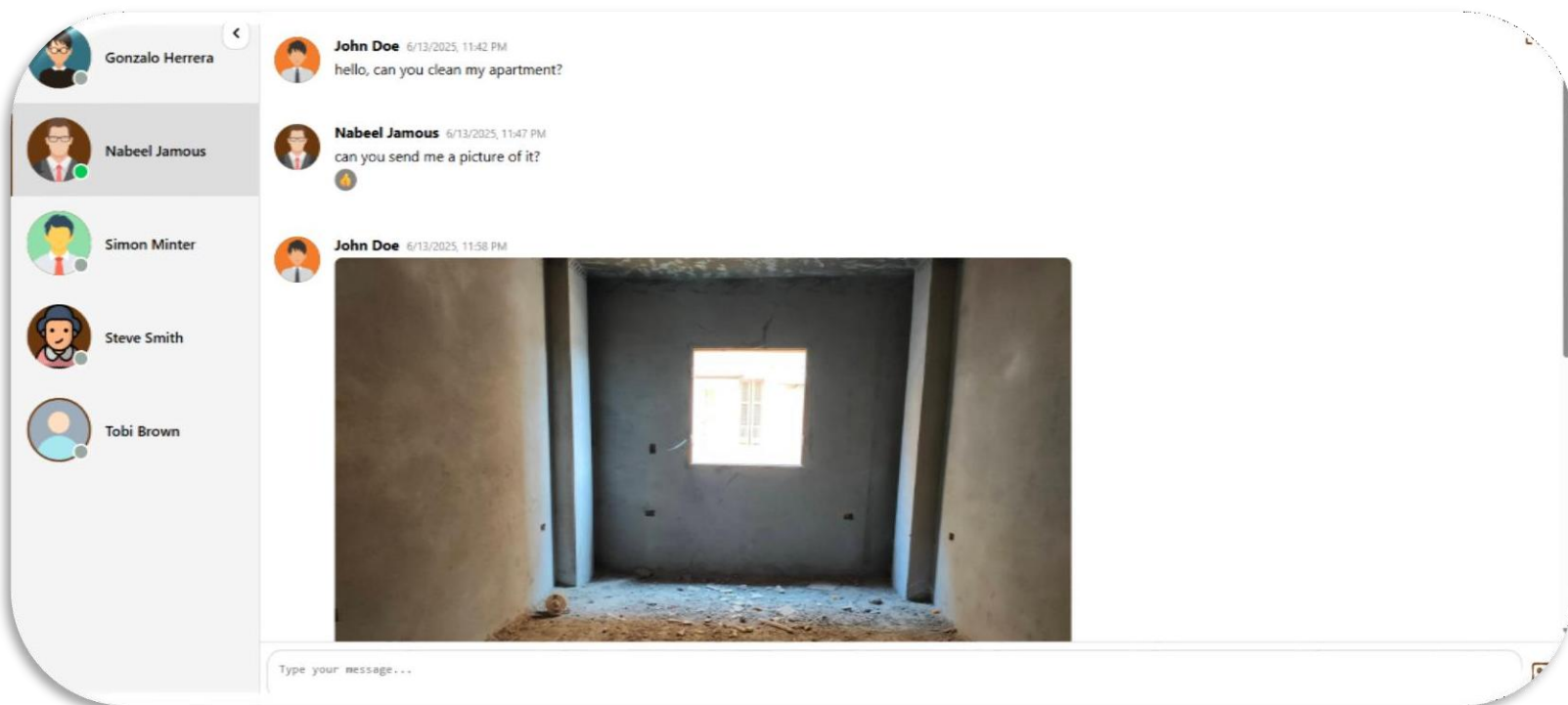


Figure 6-15: Chat

## 6.9 Templates

Crafters can create templates to show their own work and put it on the market for customers to see. and can use Ollama to generate the description and colors.

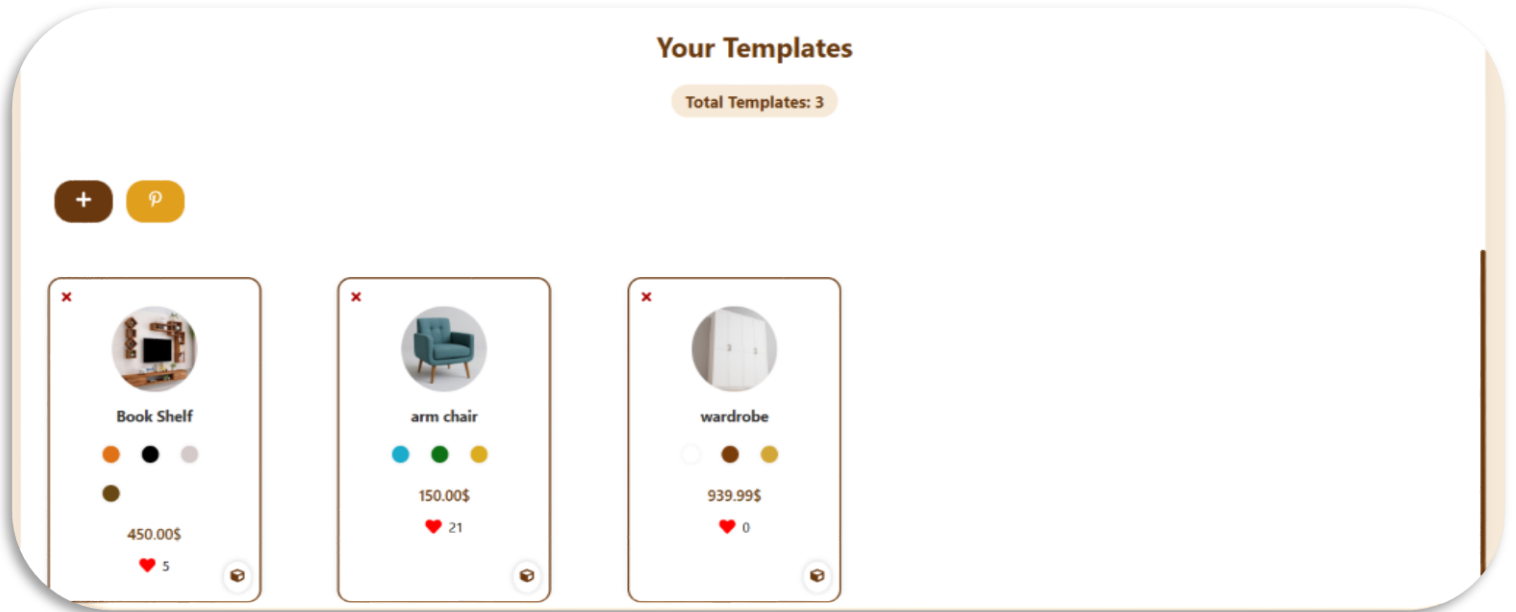


Figure 6-16: Templates

The screenshot shows a form for creating a template. On the left side, there is a large area with a button labeled "Add Image". On the right side, there are several input fields and a toggle switch. The fields are: "Name" (empty), "Craft Type" (filled with "carpenter"), "Crafter" (filled with "Romario"), "Description" (a large empty text area), and "Price" (filled with "Enter price in USD"). There is also a "Purchasable" toggle switch which is currently turned off.

Figure 6-17: Template Info

## 6.9.1 Web Scraping

Instead of manually creating templates, crafters can link their Pinterest URI that contains their work and then all the posts are scraped and generated into templates. This is done using Puppeteer library which launches a headless browser, visits the Pinterest profile given, loads the content and extracts images, titles, and tags and saves it as templates.

## 6.9.2 Recommendations

Customers can then browse the templates and search by name, craft or a price range.

They can also get recommended templates for them which is done by a rule-based system where it uses predefined rules and weights for colors and tags for the preferences entered by the user at the start and then generates the recommended templates.

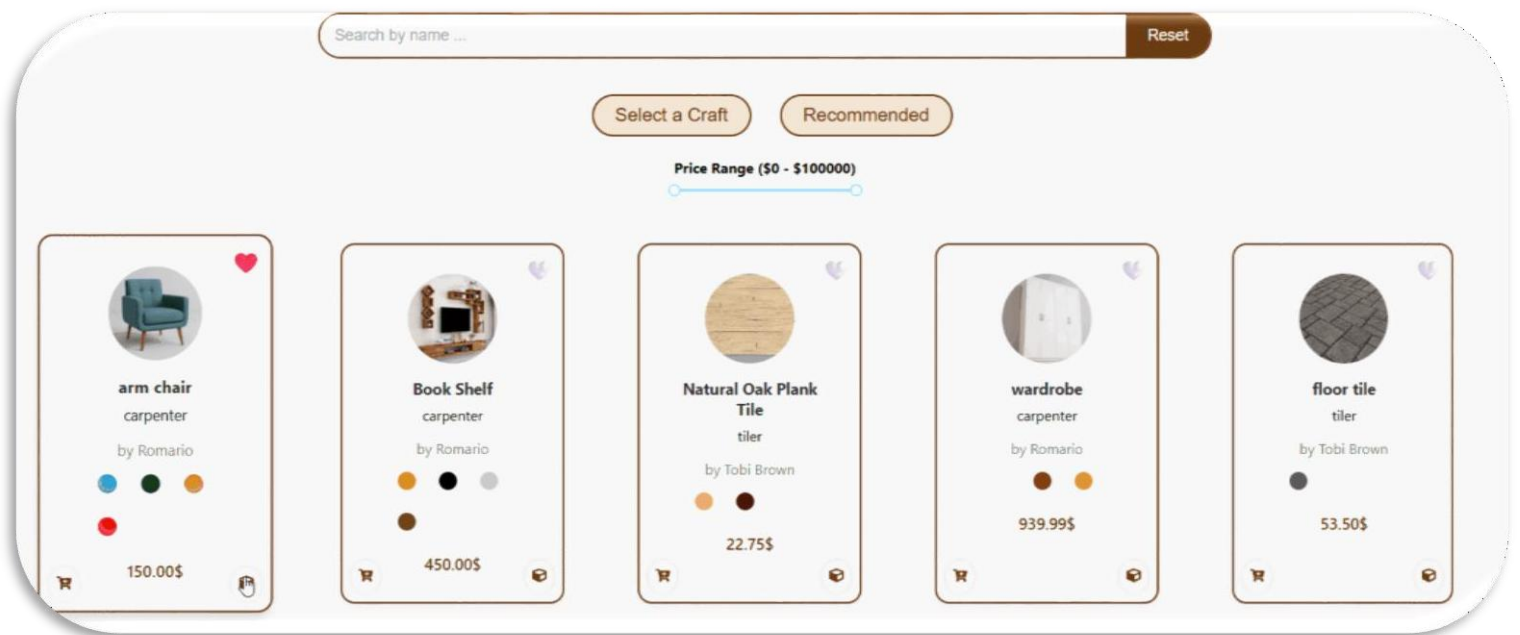


Figure 6-18: Browsing Templates

### 6.9.3 3D Models

Some templates are provided as 3D models so customers can inspect them from different angles.

For example you can click on this chair and rotate it.

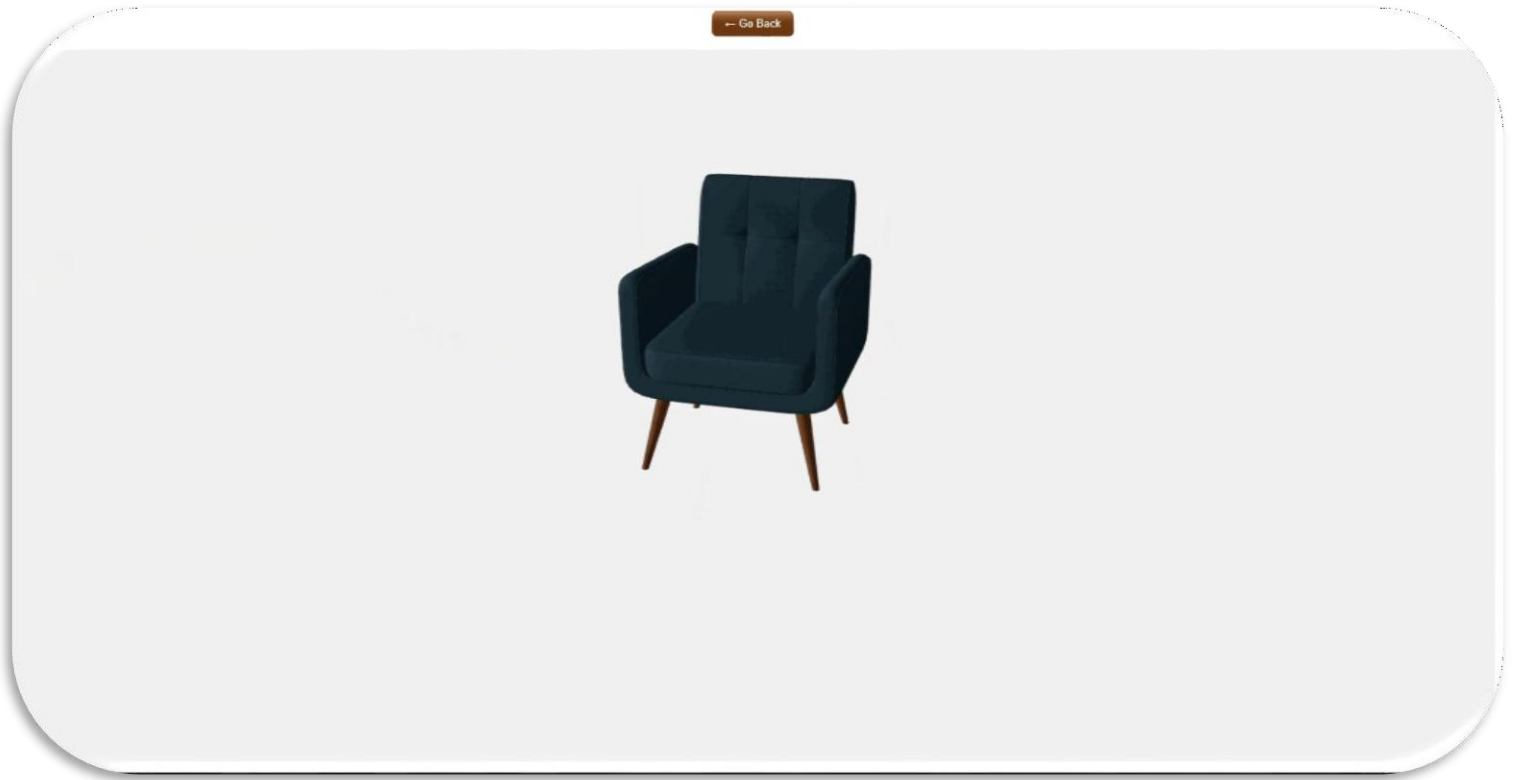


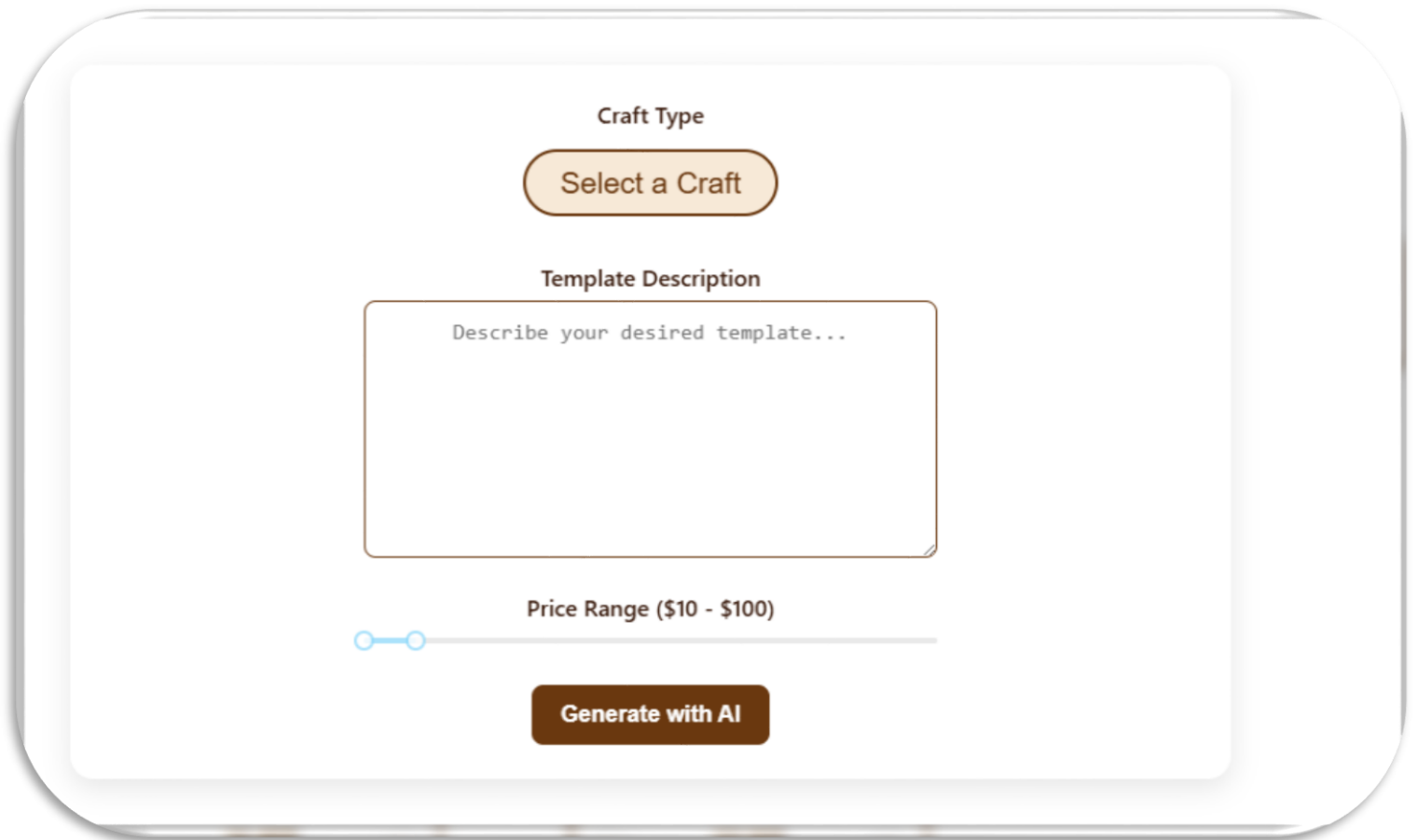
Figure 6-19: 3D Sofa

This is done using Three.js library and React Three Fiber which is a React renderer for Three.js. OrbitControls is used for mouse interactions (rotate, pan, zoom) and the models are in .glb format.

## 6.9.4 AI generated templates

Customers can create their own custom templates and then request that template to be made from a specific crafter. This is done using OpenAI API. [7]

When you click on the robot icon on the bottom right corner of the templates page, this window appears:



The image shows a user interface for generating AI templates. It features a central white rounded rectangle with a light gray border. At the top, the text "Craft Type" is centered above a rounded rectangular button labeled "Select a Craft". Below this, the text "Template Description" is centered above a larger rounded rectangular text input field containing the placeholder text "Describe your desired template...". Underneath the text field, the text "Price Range (\$10 - \$100)" is centered above a horizontal slider control with two blue circular handles. At the bottom center, there is a dark brown rounded rectangular button labeled "Generate with AI".

Figure 6-20: AI Template

As demonstrated, you can choose a craft type, the prompt for the AI, and the price range to be sent to a crafter. A list of crafters with the selected craft for appear to choose which one you want to make the request to.

## 6.10 Orders

Crafters can make orders for the templates they like by adding them to their cart which displays the items and the total price. A deletion option is available for items.

They can also navigate to the Orders tab to see their orders along with their states, when the purchase is confirmed the Payment status will be “paid”, then the crafter can confirm that it was actually paid so the main status becomes “confirmed”.

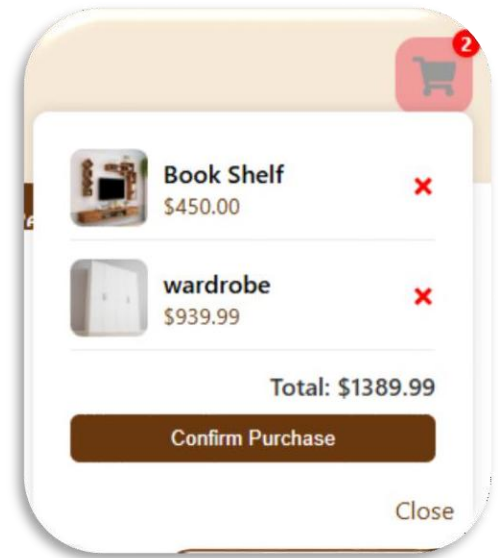


Figure 6-21: Cart

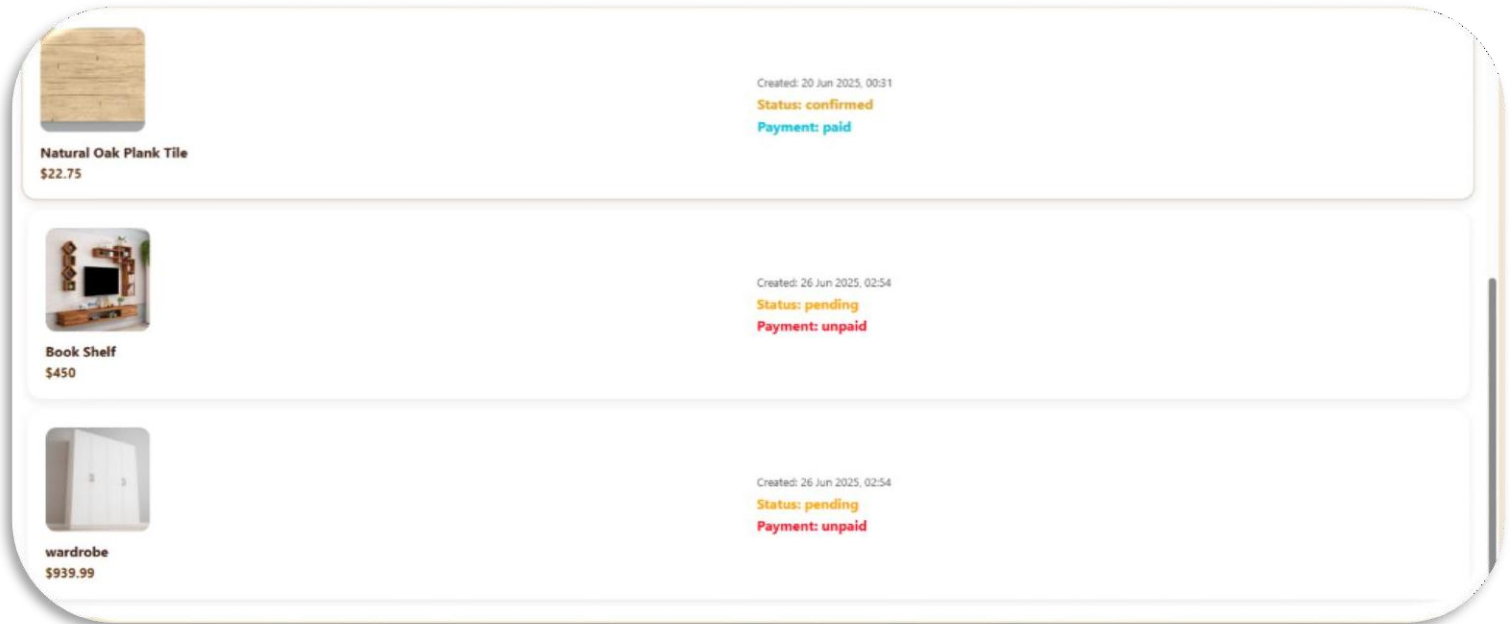


Figure 6-22: Customer Orders V1

The crafters can check the orders made for his templates:

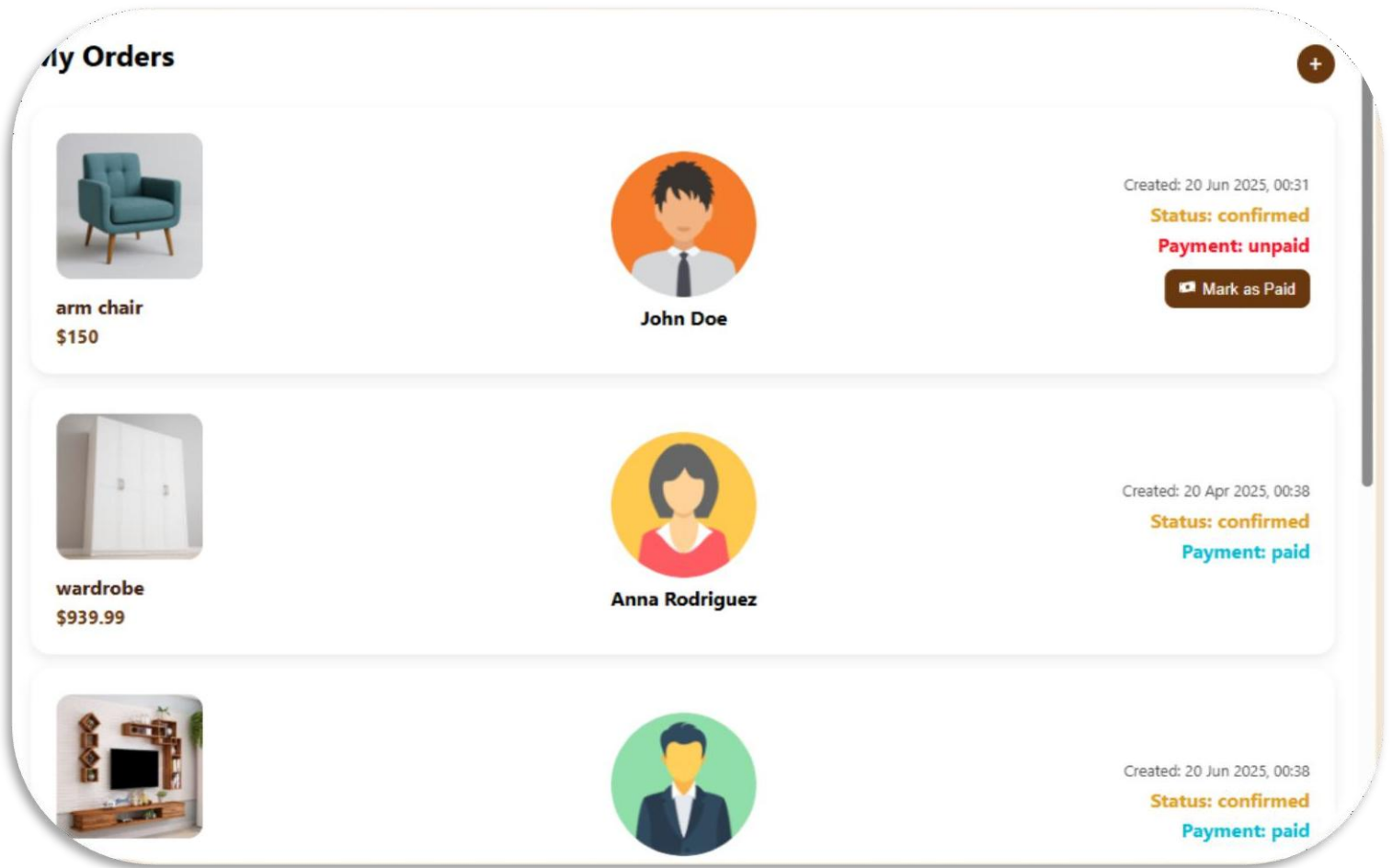


Figure 6-23: Customer Orders V2

They can also add a new order, this is useful for cases when users make special requests for custom generated templates like we seen.

Crafters can see some insights such as the paid vs unpaid orders, and their monthly sales displayed with nice charts and visuals.

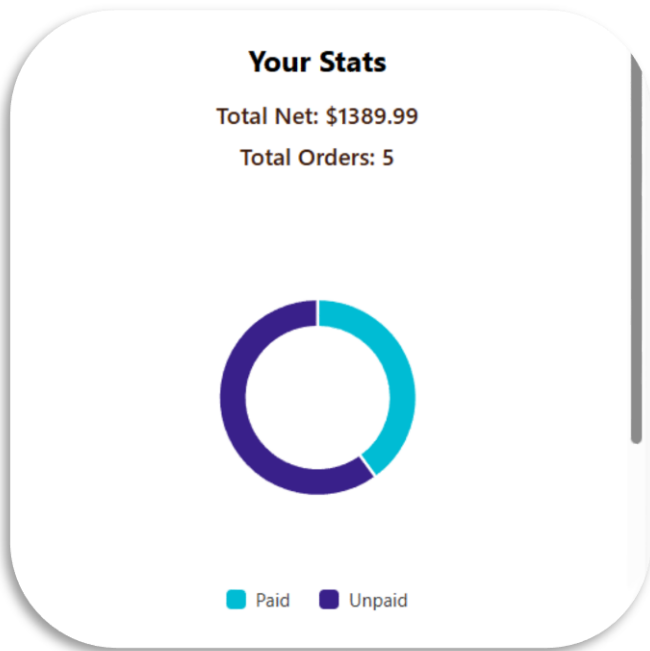


Figure 6-24: Paid/Unpaid

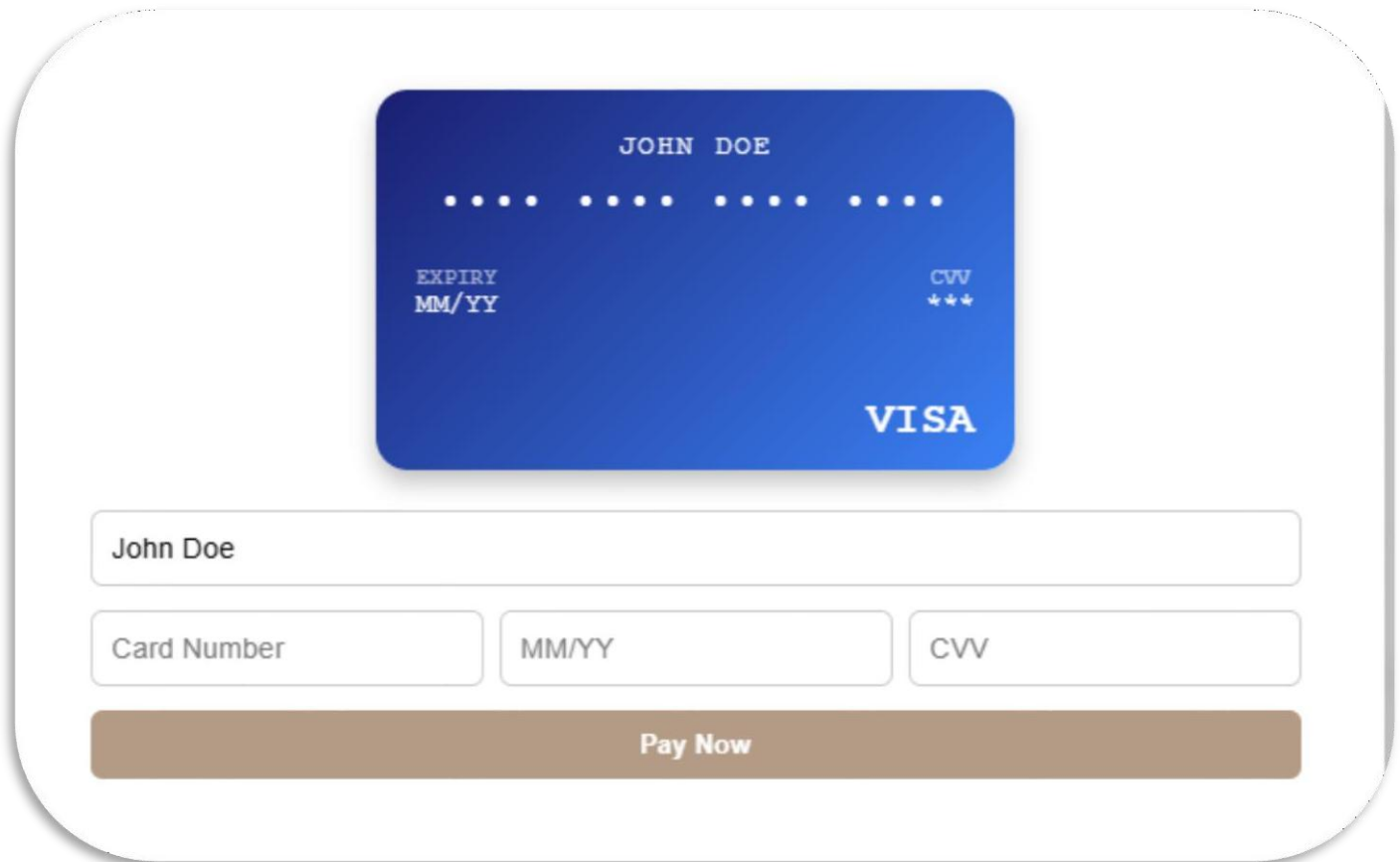


Figure 6-25: Monthly Sales

### 6.10.1 Payment

There are two payment methods, cash or with card.

If you pick to pay with card, this will pop up:



JOHN DOE

.....

EXPIRY MM/YY CVV \*\*\*

VISA

John Doe

Card Number MM/YY CVV

Pay Now

Figure 6-26: VISA

Basically enter your card information and they will be saved so you don't have to reenter them the next time.

We are in development still, so this is not integrated with real third party services like stripe.

# 6.11 Workshops

In most cases, multiple crafters will work on the same apartment, and in order, so they need a way to communicate and synchronize with each other. Customers can create a workshop and invite the target crafters to join it, crafters can then reject or accept the invite.

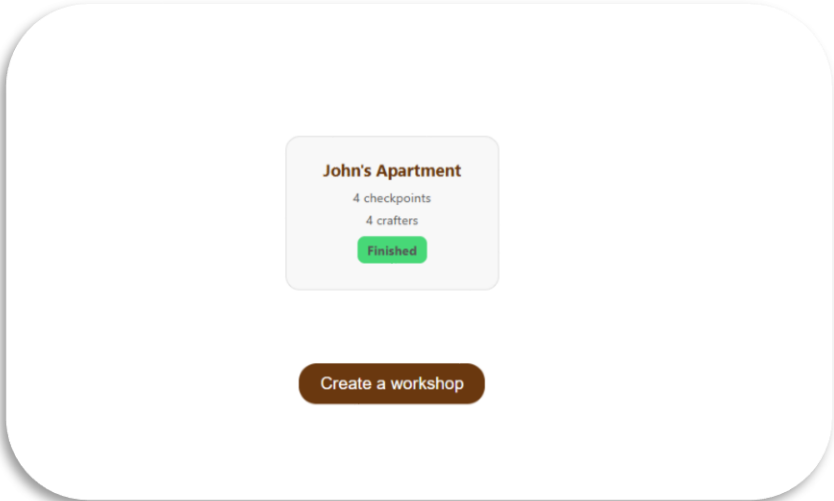


Figure 6-27: Customer Workshop POV

Here, this customer (John) has a finished workshop, when he clicks on "Create a workshop", this window appears where he selects the crafters to invite and the checkpoints to track progress, then another popup will show to provide a name for the workshop.

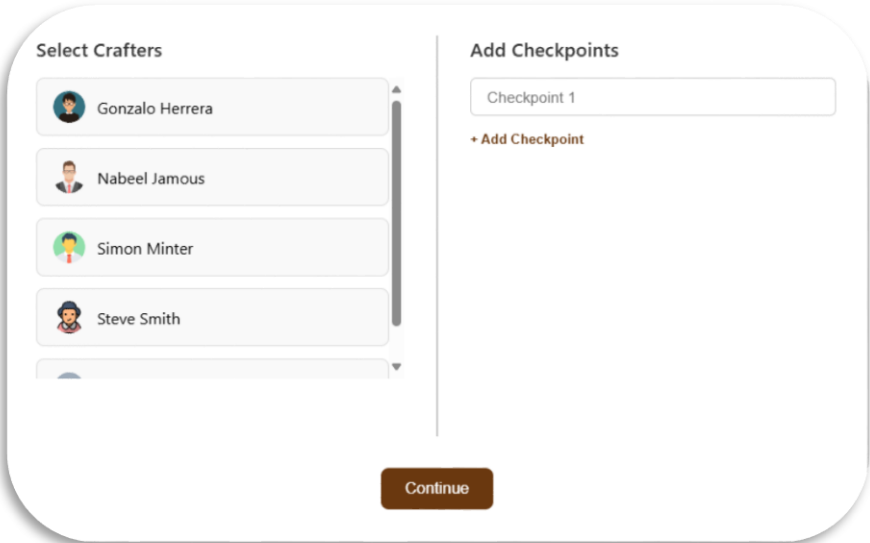


Figure 6-28: Workshop Creation

Now let's take a look at crafter's point of view:

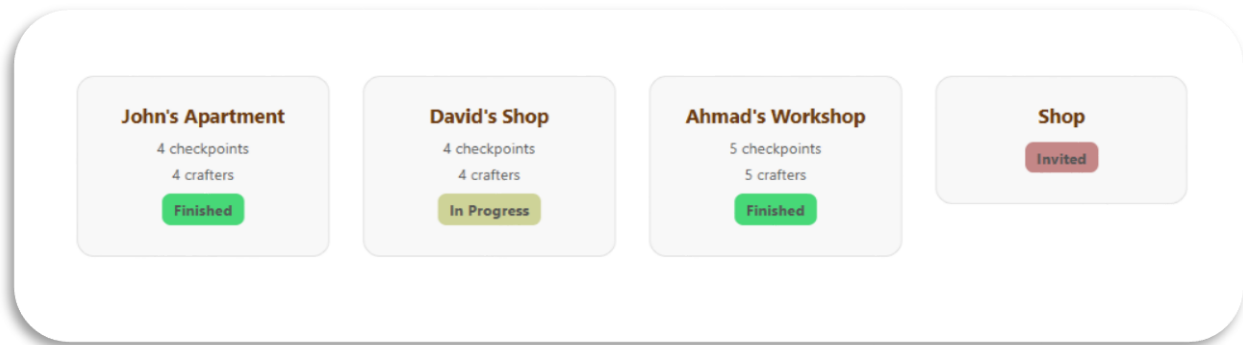


Figure 6-29: Crafter Workshop POV

As we can see, this crafter is already enrolled in three workshops, two of which are finished and one is still in progress. The crafter cannot see the workshop details unless he accepts the invite.

We can see the members of the workshop by navigating to the Members tab inside it.

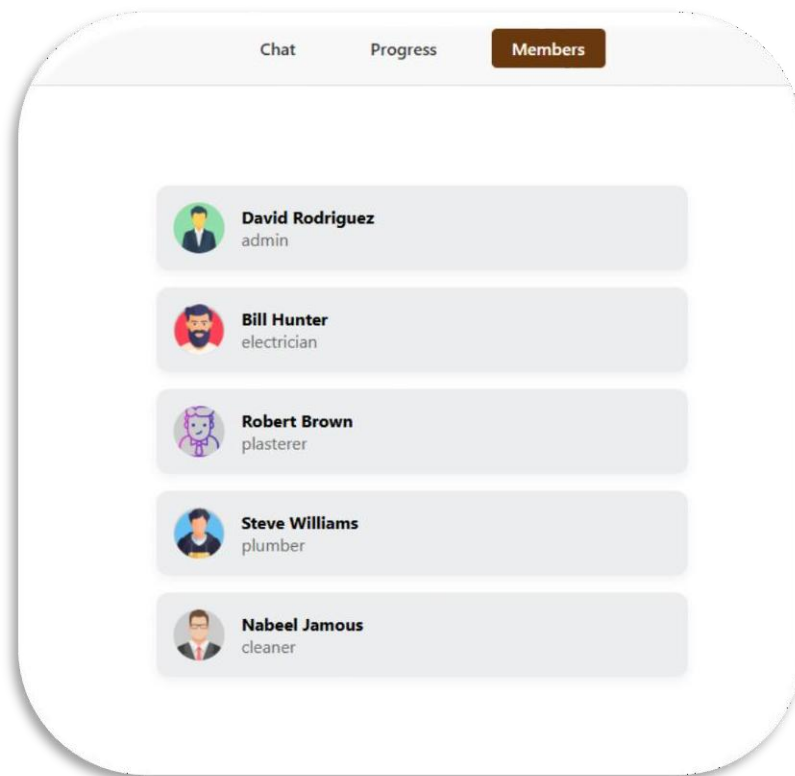


Figure 6-30: Workshop Members

### 6.11.1 Group Chat

The workshop provides a group chat for all crafters, it has the same functionalities as the private chat in addition to a mention feature where you can mention someone in the group by using the '@' symbol.

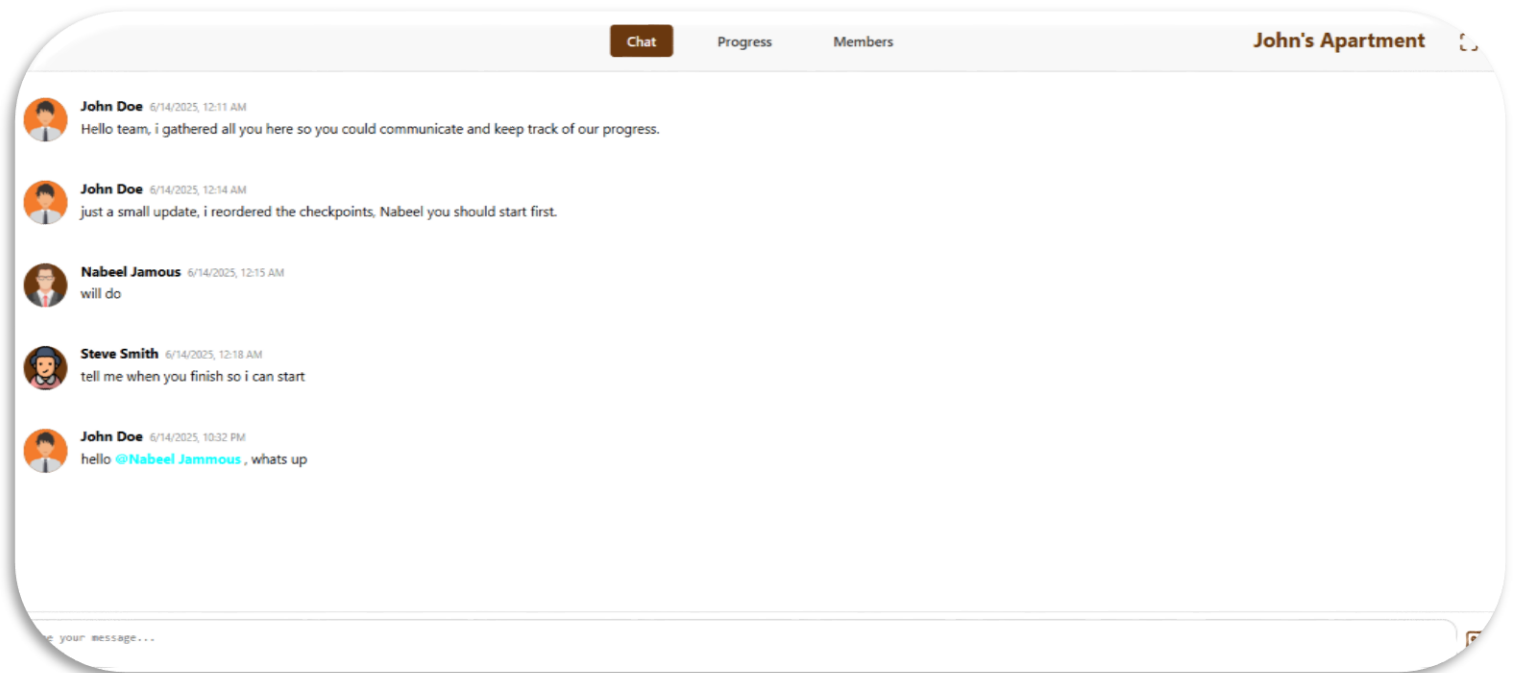


Figure 6-31: Group chat

## 6.11.2 Progress Tracker

Remember the checkpoints? here is where they come in handy. The workshop provides a way to track progress, it displays the checkpoints in the order they were added.

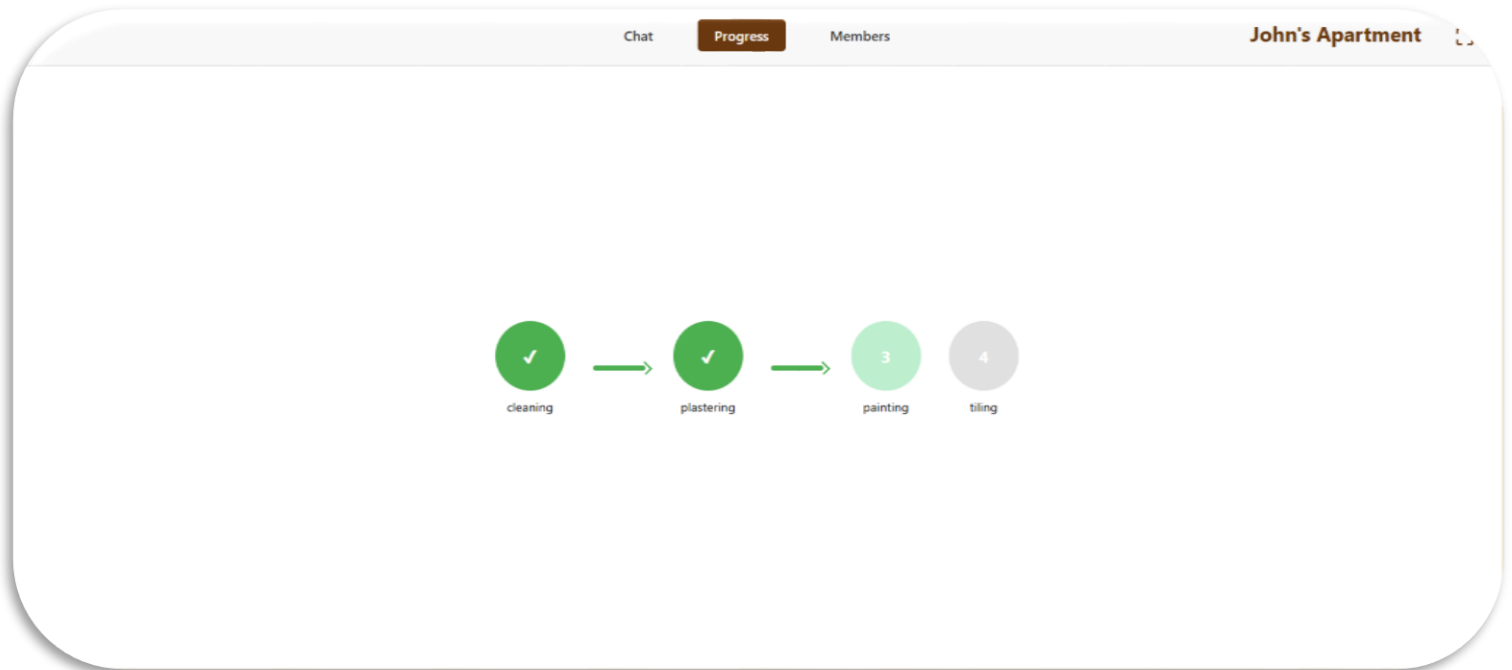


Figure 6-32: Progress Tracker

You can drag and drop the circles to change the order of the checkpoints, and you can mark/unmark the checkpoint by clicking it. These operations are only allowed for the admin of the workshop which is the customer that created it.

This was implemented using the `@dnd-kit/core` library.

## 6.12 Notifications

Our system provides a notification system where users are notified when some events occur, these events could be: receiving a message, being invited to a workshop, being booked, and many more.

The notifications are implemented using Web Sockets for instant updates, the server pushes the notification to the target user.

The notification menu shows the count of unread notifications sorted by timestamp. Once a notification is read (clicked on), it will be removed after 5 minutes.

A notification will redirect you to the correlated page when clicked on it.

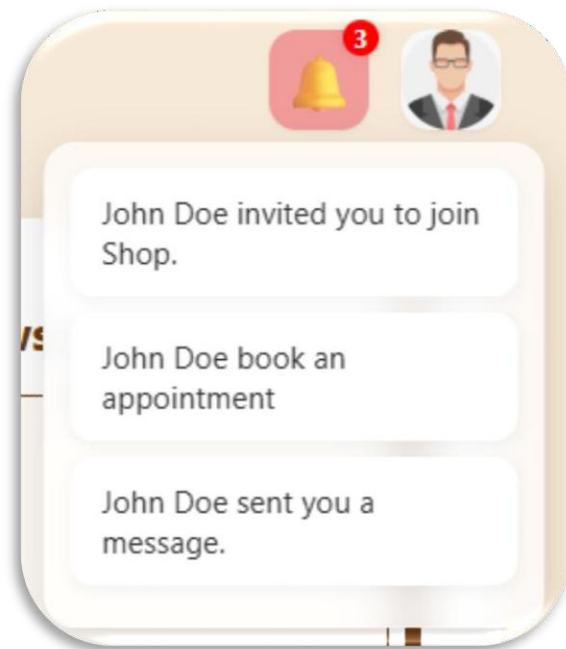


Figure 6-33: Notifications

# Chapter 7 Management

## 7.1 Data Analysis

The admin can see insights about a lot of things in the system such as users joined per role, template category distribution, template interactions over time.

The data is visualized using charts like bar charts and pie charts.

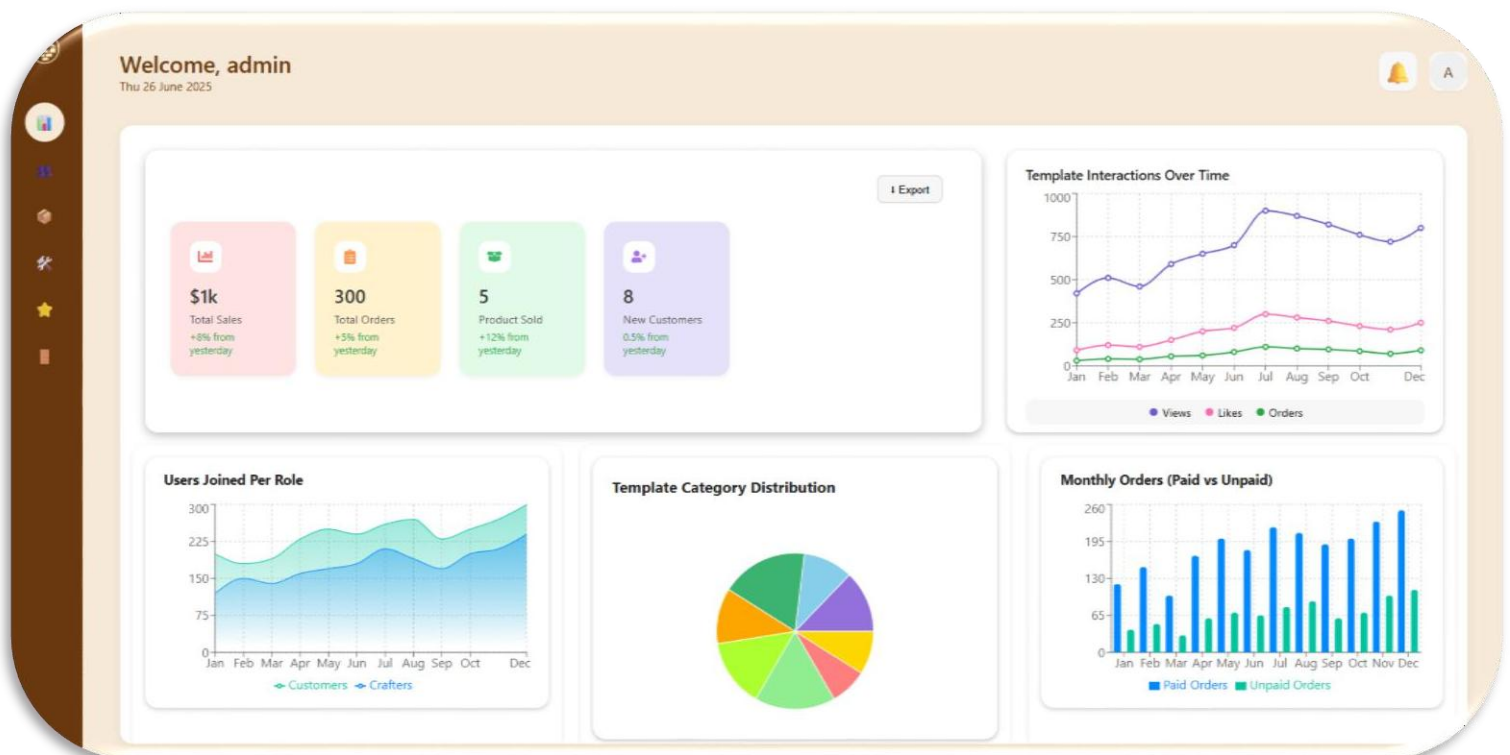
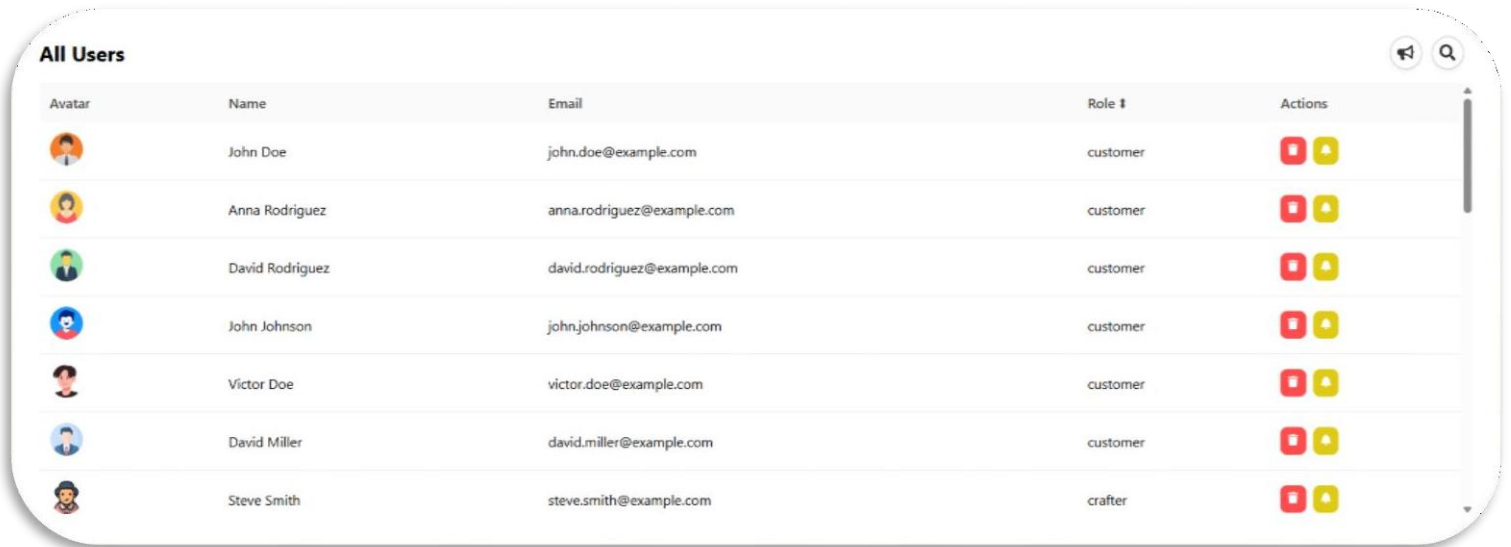


Figure 7-1: Admin Insights

## 7.1 Data Management

- **Users Management:** the admin can see a list of all users in the system with all their details, and can delete one or notify him. A notification to all users is also doable.



Avatar	Name	Email	Role	Actions
	John Doe	john.doe@example.com	customer	
	Anna Rodriguez	anna.rodriguez@example.com	customer	
	David Rodriguez	david.rodriguez@example.com	customer	
	John Johnson	john.johnson@example.com	customer	
	Victor Doe	victor.doe@example.com	customer	
	David Miller	david.miller@example.com	customer	
	Steve Smith	steve.smith@example.com	crafters	

Figure 7-2: Users Management

- **Orders Management:** the admin can see a list of all orders in the system with all

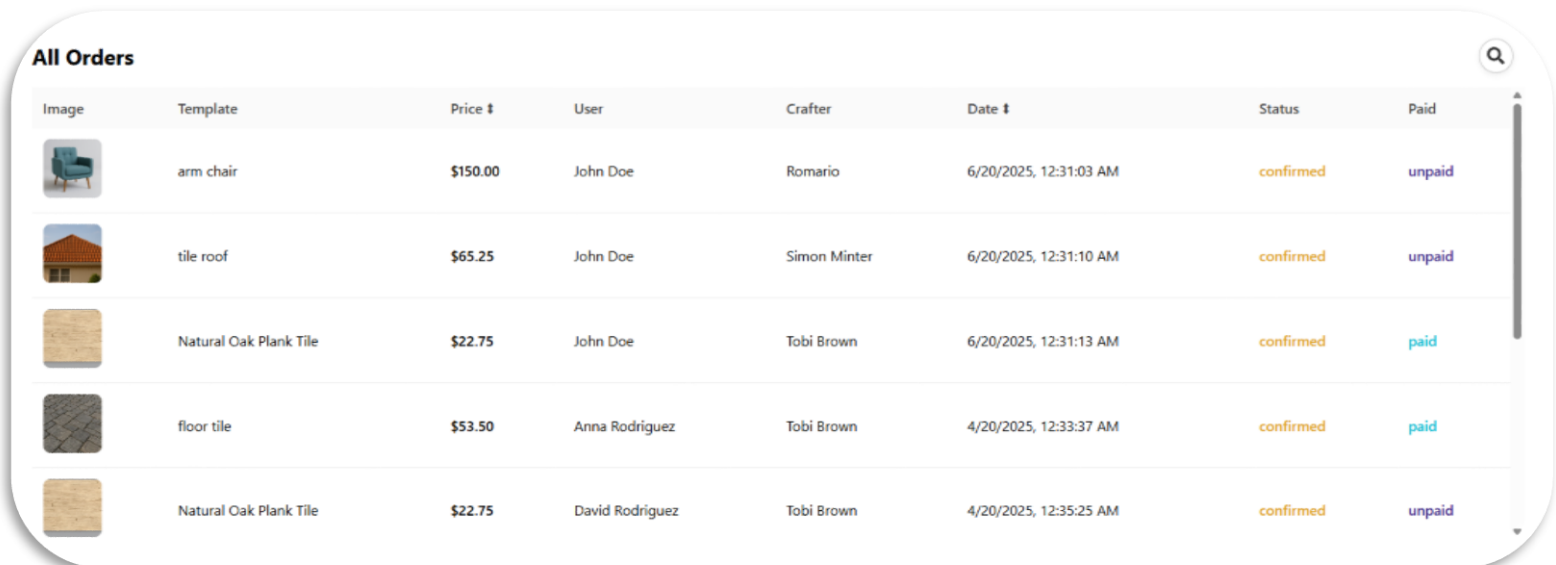


Image	Template	Price	User	Crafter	Date	Status	Paid
	arm chair	\$150.00	John Doe	Romario	6/20/2025, 12:31:03 AM	confirmed	unpaid
	tile roof	\$65.25	John Doe	Simon Minter	6/20/2025, 12:31:10 AM	confirmed	unpaid
	Natural Oak Plank Tile	\$22.75	John Doe	Tobi Brown	6/20/2025, 12:31:13 AM	confirmed	paid
	floor tile	\$53.50	Anna Rodriguez	Tobi Brown	4/20/2025, 12:33:37 AM	confirmed	paid
	Natural Oak Plank Tile	\$22.75	David Rodriguez	Tobi Brown	4/20/2025, 12:35:25 AM	confirmed	unpaid

Figure 7-3: Orders Management

- **Templates Management:** the admin can see a list of all templates in the system with their details, and can delete any.

Image	Name	Crafter	Price †	Likes †	Purchasable †	Actions
	Book Shelf	Romario	\$450	5	Yes	
	arm chair	Romario	\$150	21	Yes	
	wardrobe	Romario	\$939.99	0	Yes	
	floor tile	Tobi Brown	\$53.5	0	Yes	
	Natural Oak Plank Tile	Tobi Brown	\$22.75	3	Yes	

Figure 7-4: Templates Management

- **Reviews Management:** the admin can see a list of all reviews in the system.

User	Message	Type ↕	Rating ↕	Crafter	Sentiment ↕
David Miller	I'm really happy with the results.	Site	5 ★	—	positive
Anna Rodriguez	Would definitely recommend!	Site	5 ★	—	positive
David Rodriguez	Fantastic experience overall.	Site	4 ★	—	positive
John Johnson	Fantastic experience overall.	Person	5 ★	Robert Brown	positive
Anna Rodriguez	Not what I expected.	Person	1 ★	Robert Brown	negative
John Doe	Very disappointed with the service.	Person	2 ★	Steve Williams	negative
David Miller	Fantastic experience overall.	Person	4 ★	Steve Williams	positive
John Johnson	Would definitely recommend!	Person	4 ★	Steve Williams	positive

Figure 7-5: Reviews Management

# Chapter 8 Mobile

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The mobile version was done using React Native, here's some photos of it:

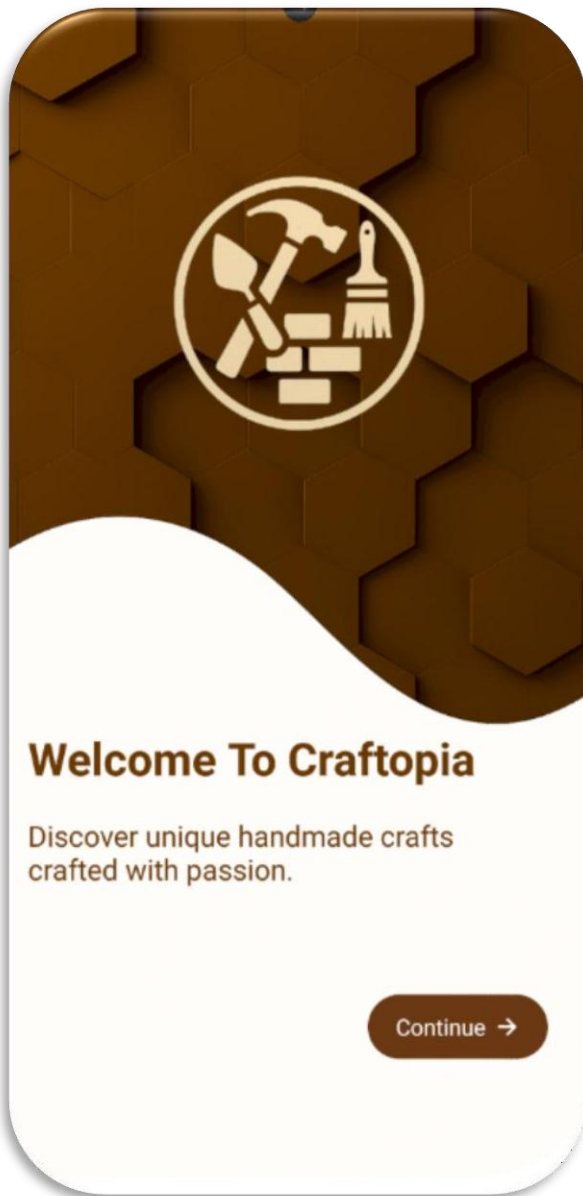


Figure 8-1: Mobile F1

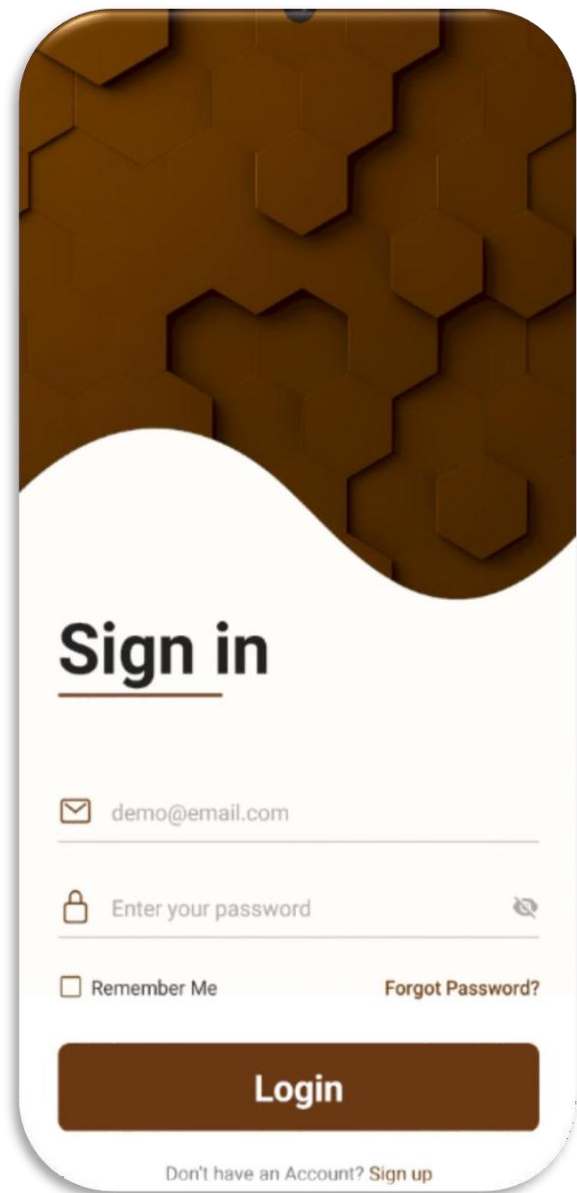


Figure 8-2: Mobile F2

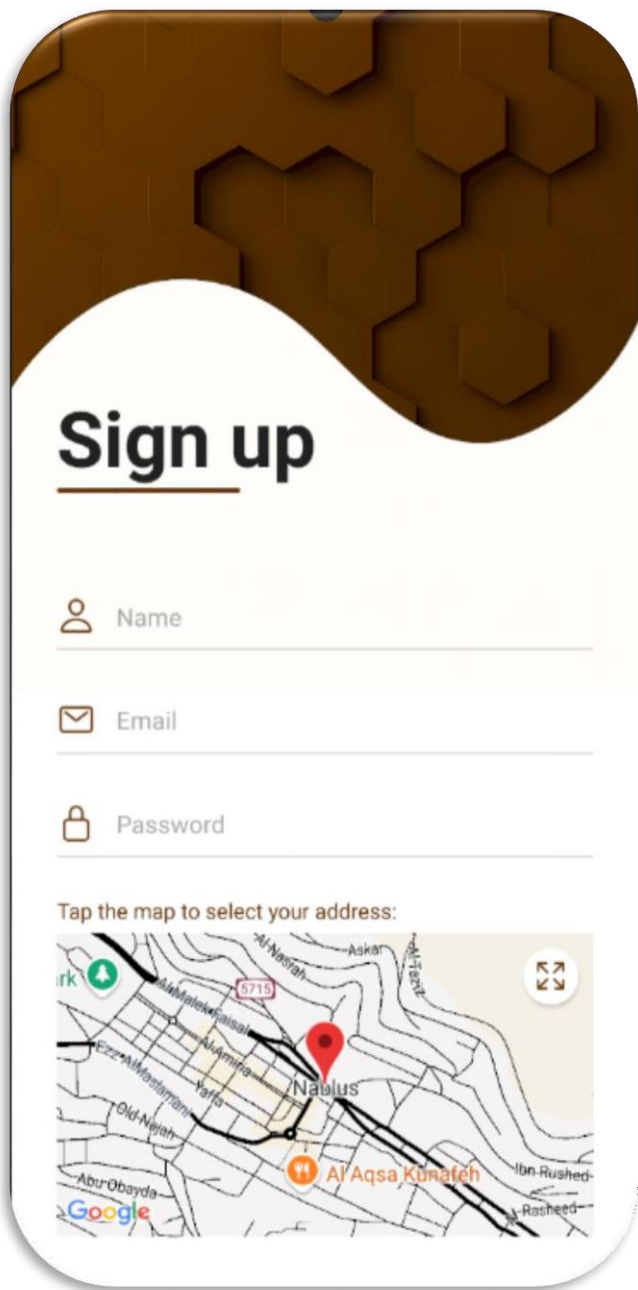


Figure 8-3: Mobile F3

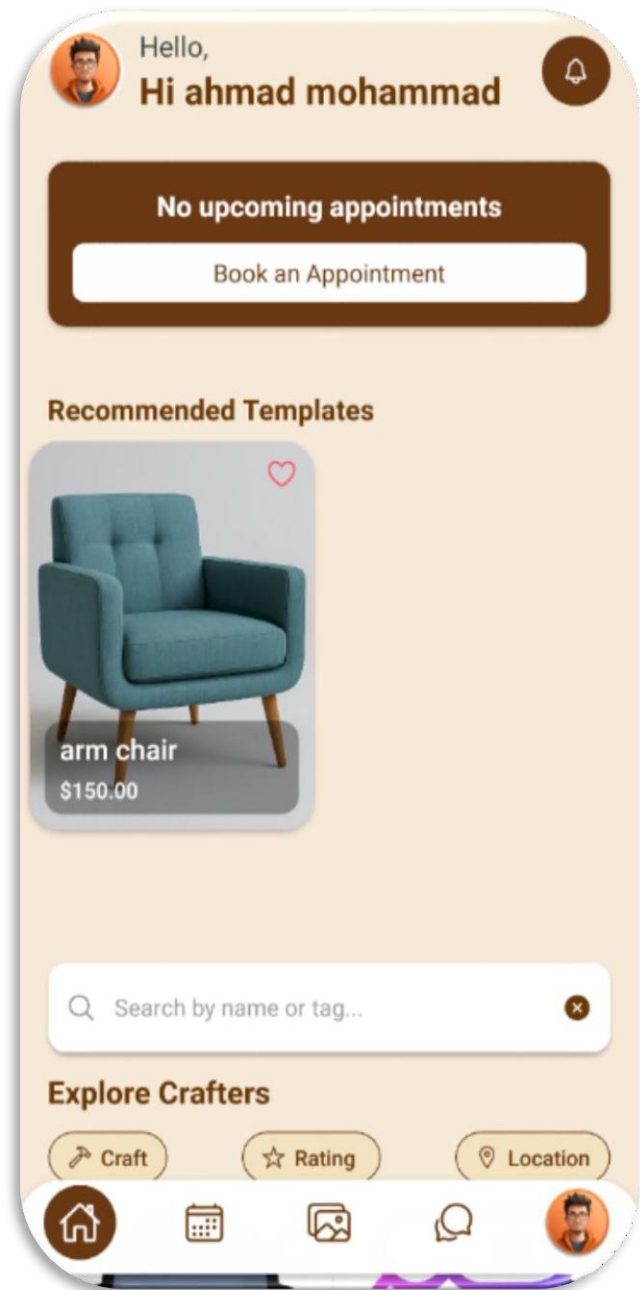


Figure 8-4: Mobile F4

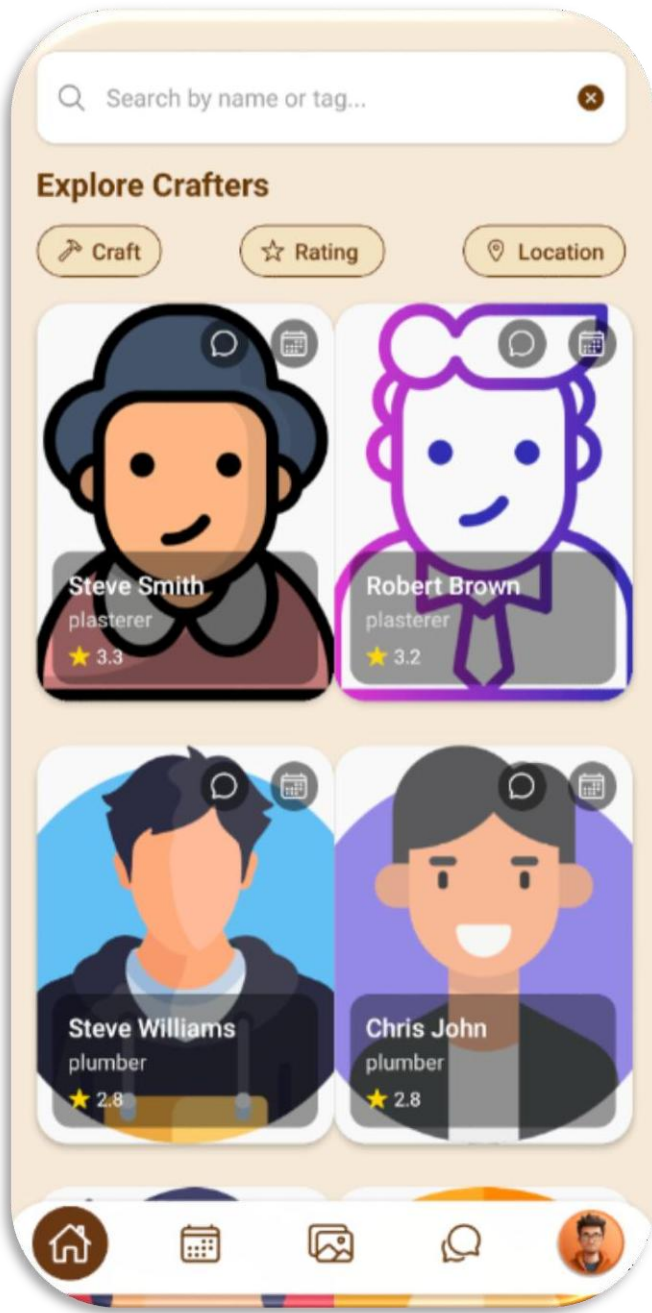


Figure 8-5: Mobile F5

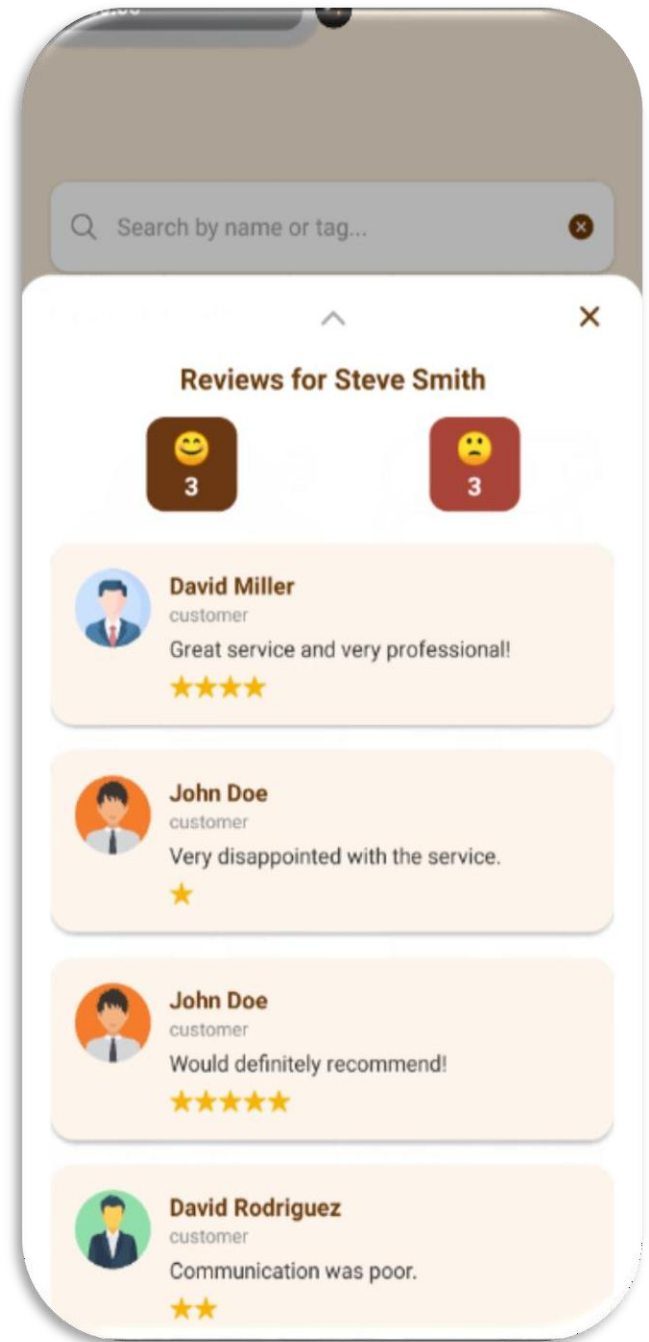


Figure 8-6: Mobile F6

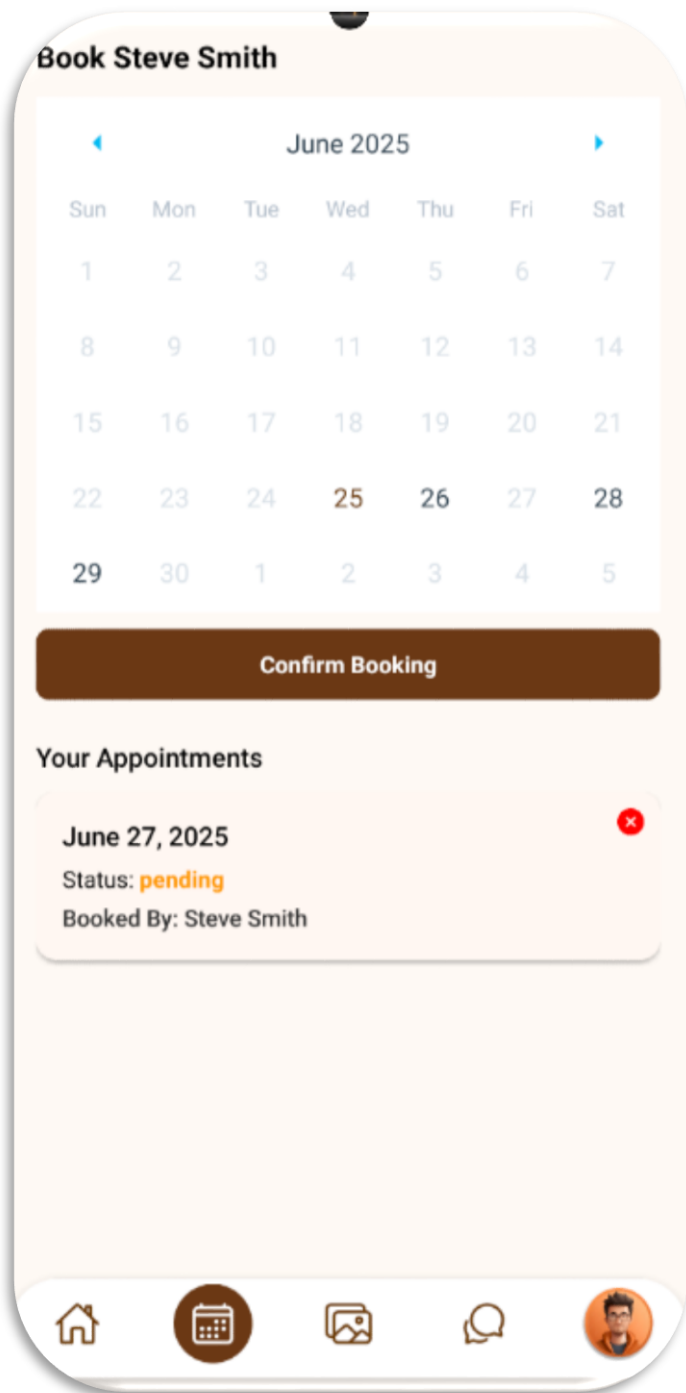


Figure 8-7: Mobile F7

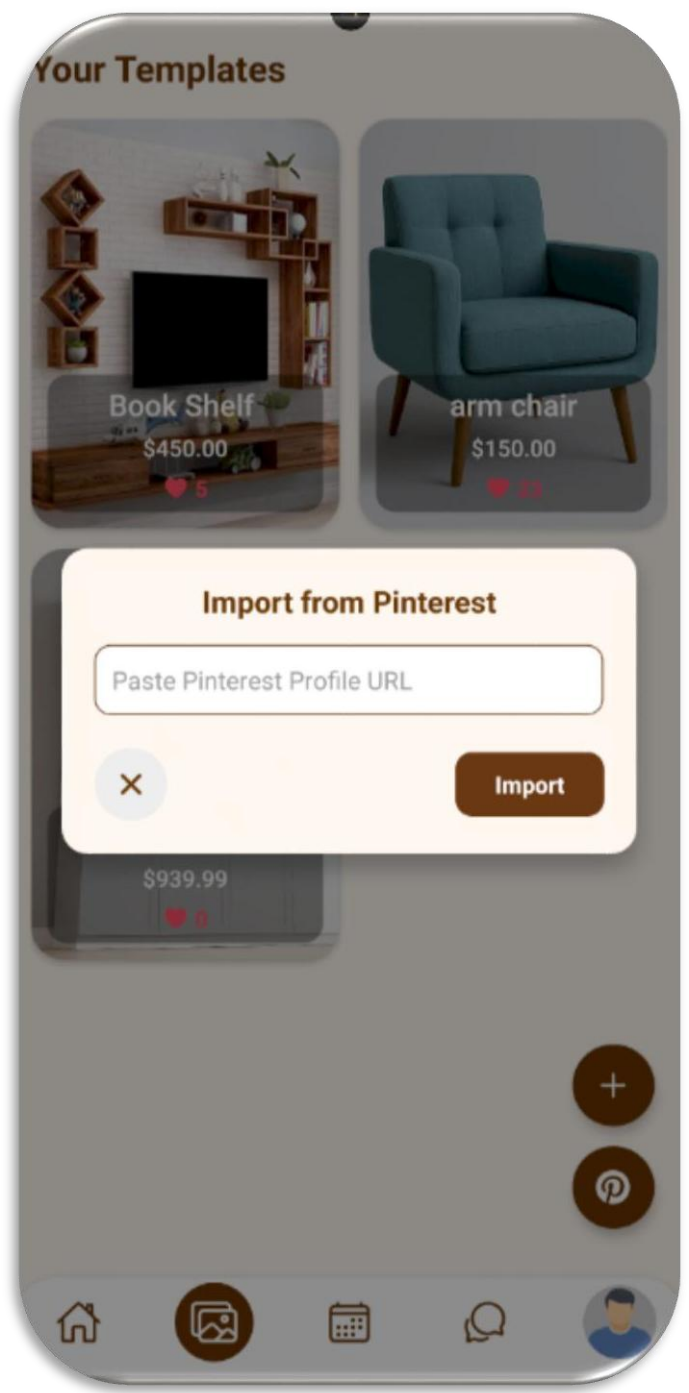


Figure 8-8: Mobile F8

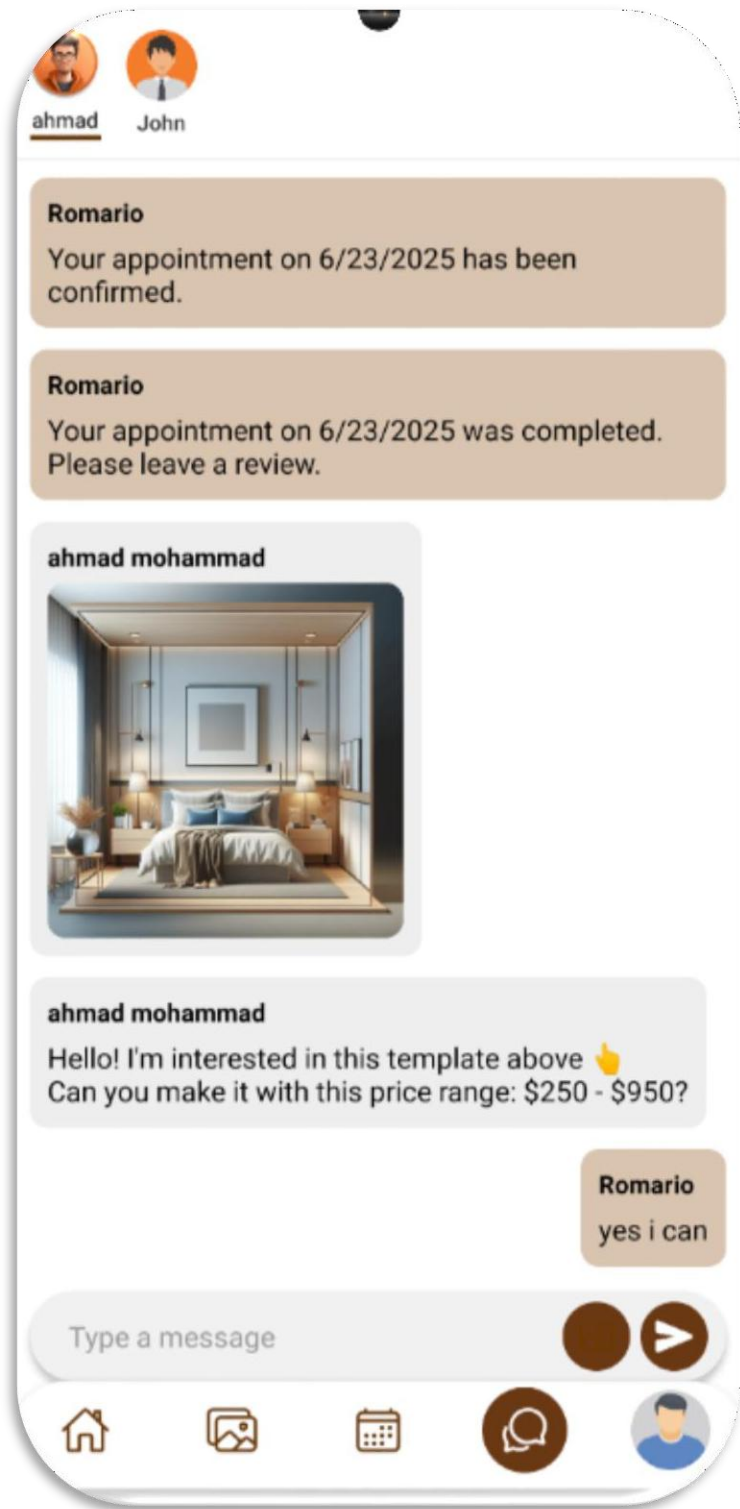


Figure 8-9: Mobile F9

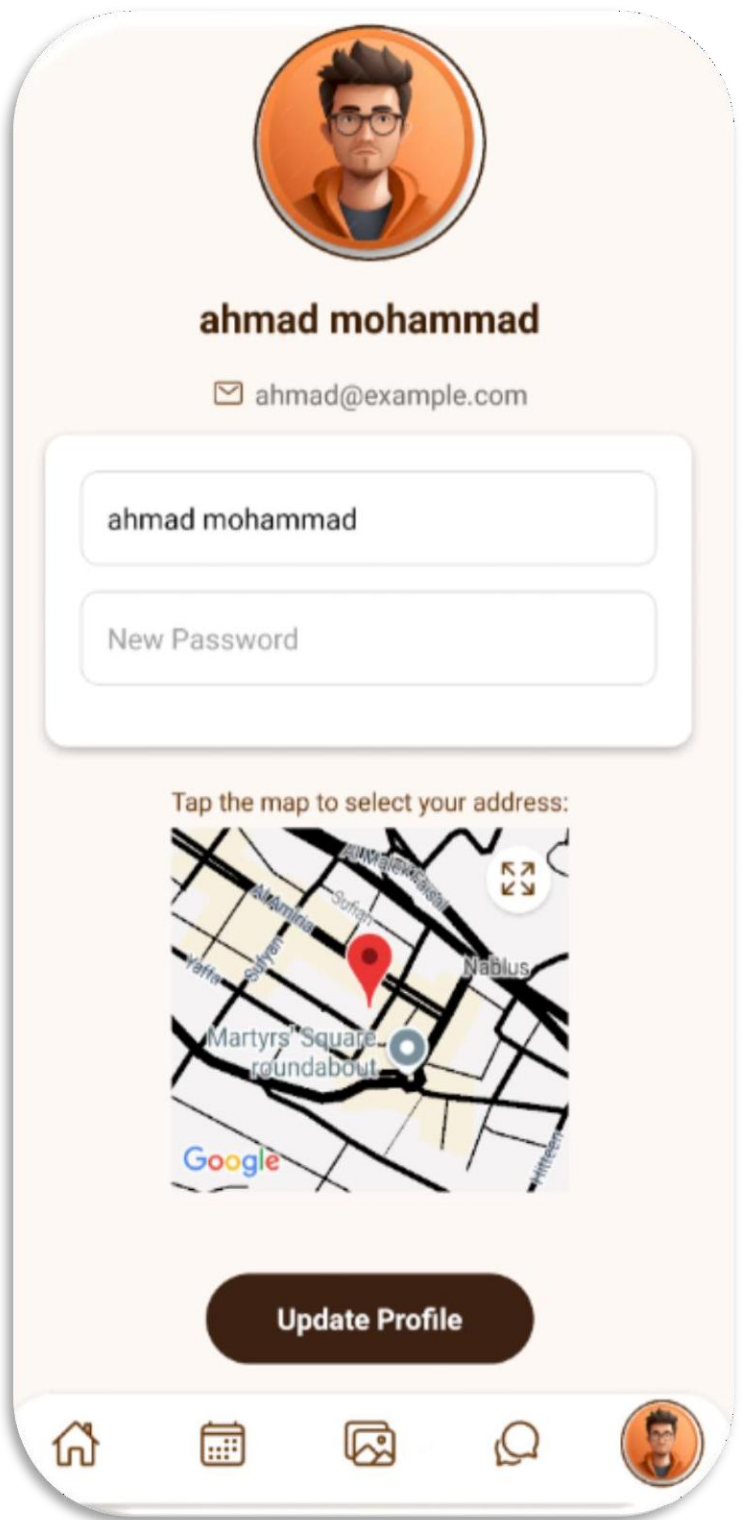


Figure 8-10: Mobile F10

# Chapter 9 Conclusion and Future Work

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## 9.1 Conclusion

Craftopia is a community project that aims to benefit the society by acting as a mediator between the customers and the crafters to save both parties times and effort. It offers a pool of services that are well designed, reliable, and convenient.

## 9.2 Future Work

- **Stripe Integration:** integration with the third party payment system for production environment to provide a secure way to pay online.
- **Content Analyzer:** inspects the templates images and description for content that doesn't respect our policies.

# References

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