



PROJECT REPORT

IT5007: SOFTWARE ENGINEERING ON APPLICATION ARCHITECTURE

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IT5007 PROJECT REPORT

Problem Statement

As of 2021, there are 1.7 million households in Singapore¹. Homeowners and landlords rely on web searches, blogs, or contacts from friends to identify reliable, skilled professionals for home services. New homeowners are also assembling freelance contractors for renovation work as an alternative to engaging renovation companies or interior designers.

In addition, a vibrant rental market serves Singaporeans, permanent residents, foreigners working or studying there, and expats. Before renting out the area to new renters, the homeowners may need home improvements and repairs due to the dynamic rental market where home rental contracts are routinely renewed.

Homeowners will always require professionals to handle home repairs, whether it be for a simple installation or big overhauls. We determined the following difficulties a homeowner has when looking for dependable and knowledgeable specialists for home services based on semi-structure interviews with 7 individuals (see **Annex A** for details):

1. **Lack of centralised information:** It is time-consuming and difficult for homeowners to find thorough and trustworthy information about qualified professionals since they frequently need to visit many websites or rely on fragmented information from other sources, such as blogs or recommendations from friends.
2. **Limited transparency and verification:** It may be challenging for homeowners to evaluate professionals' qualifications, credentials, and employment history due to a lack of transparency in these areas. There may be a risk in using unqualified or dishonest service providers because it might be difficult to confirm the authenticity of the information that professionals supply.
3. **Varied service offerings:** Home services encompass various professions, including renovation contractors, interior designers, plumbers, electricians, and more. Each profession may have different requirements, certifications, and qualifications, making it complex for homeowners to understand and evaluate the skills and expertise of professionals in each field.
4. **Inconsistent reviews and ratings:** It might be difficult for homeowners to base their decisions simply on online evaluations and ratings because they can be subjective, inconsistent, or prejudiced. Confusion and doubt may result from the time required to sift through the mass of information and separate valid feedback from unreliable ones.
5. **Risk of unsatisfactory workmanship and frauds:** Engaging skilled professionals for home services comes with inherent risks, such as poor workmanship, delays in service delivery, or potential fraud. Homeowners may face difficulties in assessing the reliability and trustworthiness of professionals, leading to potential disappointments, financial losses, or legal issues. For instance, 1,300 complaints against house renovation/repair services were made in 2021, according to the Singapore Consumers Association of Singapore (Case).

Solution

Given that the demand for home repair services will exist for the next 10 years, we aim to create a user-friendly and reliable platform that simplifies finding, evaluating, and engaging skilled professionals for home services. By centralising information, providing reviews, and offering DIY resources, we aim to

streamline the decision-making process for homeowners, ensuring that they can confidently engage service providers for their home service needs.

How will the homeowners benefit from our application?

- **Quick Search and Engage Professional Services**. With the use of our web application, homeowners will have an easy way to identify service providers who meet their unique needs, such as service type, budget, and timeline. This will save homeowners the hassle of visiting multiple websites or relying on scattered information from various sources. Our platform will offer a curated list of service providers, ensuring homeowners can access reliable, qualified professionals.
- **Review and Rating of Listed Service Providers**. Additionally, our website application will feature an extensive review and rating system that enables homeowners to read testimonials and feedback from other clients who have used the listed service providers' services. Homeowners will be better equipped to choose service providers because they will be able to make knowledgeable decisions based on the experiences of prior clients.
- **Do-It-Yourself Information and Quick Fixes**. Furthermore, our platform will provide homeowners access to do-it-yourself (DIY) information and quick fixes for common home issues. This will enable homeowners to tackle minor repairs or maintenance tasks independently, saving time and money.

How will the service providers/professionals benefit from our application?

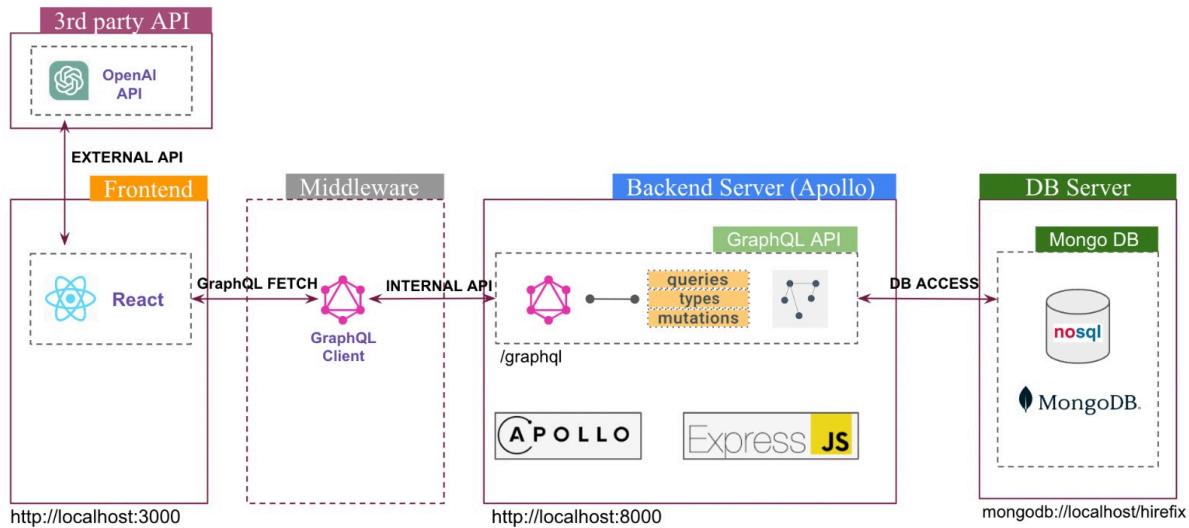
- **Advertise Skills**. Our web application will give established businesses and independent contractors who perform repair services a platform to advertise their expert skills. On our platform, service providers can register and submit comprehensive information about their services, such as their professional credentials, service lead-time (such as availability 24/7), and estimated price range for standard services. This will enable service providers to promote their abilities and credentials, drawing in potential clients.
- **Track Details**. The application will provide end-to-end management for professionals in terms of listing services, tracking transactions, repair schedules, and receive payments. This reduces their effort to track the transactions.
- **Ease of Contact**. Our website will give professionals an easy way to contact property owners and schedule repair services, improving their visibility and clientele.

Overall, our web application aims to create a seamless and efficient marketplace for homeowners and service providers in Singapore, facilitating the process of finding reliable and skilled professionals for home repair services while enhancing transparency, trust, and convenience for both parties.

Solution Architecture

The solution architecture considered the homeowners' and professionals' experience in using our web application. See **Annex B** for the envisioned application flow in the form of Figma illustrations. Our web application has implemented the User's perspective. The system architecture is as provided in **Figure 1** below and the information architecture is elaborated in **Annex C**.

Figure 1: System Architecture



Legal / Other Aspects

Currently, **no open-source code is used for this application**. The team will consider adapting the "OpenBazaar" application - a decentralised, open-source e-commerce platform enabling users to buy and sell goods without a centralised authority. The software can be used, copied, modified, and distributed without many limitations according to the MIT license, a permissive open-source license.

Retention of Users/ Professionals. It is important to build a loyal user base through effective user engagement and retention strategies. At the initial stages of application roll-out, the users will be incentivised through in-app credits and vouchers to provide reviews of the service they received and refer the application to other users. This will increase switching costs for users and professional service providers to move to other platforms/ services.

Trademark and Copyright. The team will explore trademarking the "HireFix" logo and tagline to prevent usage and copyright the web application's source code based on the processes indicated by the Intellectual Property Office of Singapore¹.

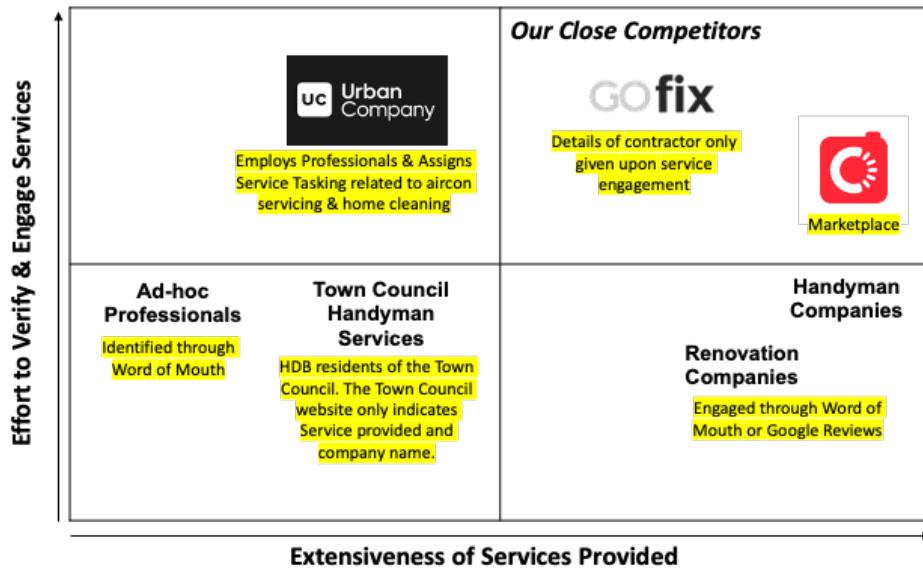
Competitor Analysis

A google search to find a handyman in Singapore will generate 10,600,000 results. We reviewed what are the services available currently and plotted the services on the matrix in **Figure 2** below based on (1) the effort required from the users to verify and engage services, and (2) the extensiveness of services provided by the respective companies/ platforms. The renovation/ interior design companies rely on their websites to state their services or focus on niche service provisions, e.g., carpentry, painting, electrical, and aircon servicing. This led to more effort from the users to verify and engage their services. The Town Council² lists some company names and details for specific services. However, the Town Council does not validate the proficiency and requires users to do their own research before engaging the services.

¹ <https://www.ipos.gov.sg/docs/default-source/resources-library/copyright/copyright-act-factsheet.pdf>

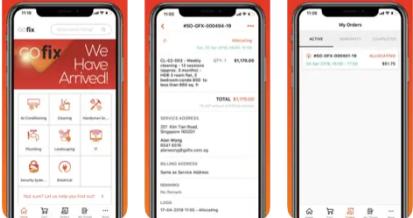
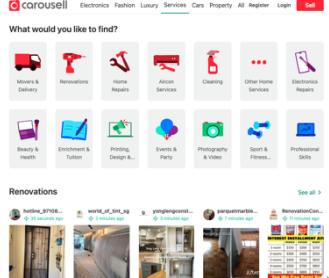
² Town Councils control, manage, maintain, and improve the common property of the residential and commercial properties within their towns, to ensure they are in good condition and benefit residents. The Town Council acts only as a referral body for the companies. The Town Council shall not be responsible or liable for any act or omission on the part of the contractors for any loss, damage or injury caused in or as a result of the performance or non-performance of the works contracted for or as a result of any willful conduct or negligence on the part of the contractors.

Figure 2: Competitor Identification Matrix



Based on the matrix above, we identified that GoFix and Carousell as our closest competitors that provide listings of home repair service providers on a single platform. We assessed the competitors further based on the criteria given Table 1 below. Based on the assessment, we recognise that there is a lack of solutioning to meet the users' needs adequately. This gap in the market presents an opportunity for our web application to provide homeowners with a more comprehensive and user-friendly solution in seeking reliable repair services. With user-centric and thoughtful execution, we are confident that our web application can capture a share of the market.

Table 1: Review of GoFix and Carousell Home Repair Services.

Criterion	GoFix ³	Carousell-Home Repair Services ⁴
Details of Service	 <p>One-stop, on-demand property services– from household repairs and maintenance works to property services and Facilities Management support in commercial organisations.</p>	 <p>Allows established companies and individual freelancers to list their home repair services</p>
User Awareness of such listing	Limited Awareness <ul style="list-style-type: none"> This application was identified through searches on HDB website. Only 10K downloads on Playstore 	Popular Marketplace but Limited Awareness <ul style="list-style-type: none"> A popular online marketplace in Singapore with a large user base can provide a wide reach for home

³ <https://www.gofix.com.sg/>

⁴ <https://www.carousell.sg/home-services/h-1708/?t-source=homepage>

Criterion	GoFix ³	Carousell-Home Repair Services ⁴
		<p>repair service providers to connect with potential customers.</p> <ul style="list-style-type: none"> • However, there is limited awareness amongst users on the availability of listing on home repair services.
User Friendliness	<p>Not User Friendly</p> <ul style="list-style-type: none"> • Playstore review indicated app malfunctioning and not been able to log-in or use the services since mid-2021. 	<p>Slightly User-friendly</p> <ul style="list-style-type: none"> • Users can filter services needed by categories. However, no filter based on prices or ratings. Users need to review all the listings in the page to identify a suitable vendor.
Verification of Service Providers	<p>Nil</p> <ul style="list-style-type: none"> • The service is provided by GoFix as the main company with their own professionals. Therefore, there is no verification details provided. 	<p>Nil</p> <ul style="list-style-type: none"> • Carousell lacks verification of service providers, which could pose a risk to users regarding the reliability and quality of service offered. Users need to exercise caution and do their due diligence to research and verify the service providers independently.
Extensiveness of Information provided	<p>Limited</p> <ul style="list-style-type: none"> • The listing only provided what service is provided without details of lead-time and etc. There were no images or reviews on their past repairs. 	<p>Limited</p> <ul style="list-style-type: none"> • Most listings provided limited information about service providers, such as certifications/licensing, service lead-time and pricing. This makes it challenging for users to thoroughly evaluate and compare different service providers. • While there are 976 listings on the page, there is no consistency in information provided across all listings. Hence, there is some effort required from user to make clarifications with the service providers.
Tracking of Transactions	<ul style="list-style-type: none"> • There is an add cart function in the application. However, it was stated the quotations are given on-site for some of the services while straight forward services were provided pricing. 	<p>Limited</p> <ul style="list-style-type: none"> • The transactions for service provision are tracked outside of the Carousell platform. This means that users may face challenges in establishing a comprehensive audit trail for contracts established with

Criterion	GoFix ³	Carousell-Home Repair Services ⁴
		service providers and seeking recourse in case of any issues or disputes. The lack of an integrated transaction tracking system on Carousell may pose risks to users regarding accountability, transparency, and protection of consumer rights.
Does the application provide DIY repairs?	Nil <ul style="list-style-type: none"> While the website had a section for DIY repairs, there was no information presented within the website. 	Nil

Project Schedule

The project schedule is as given below in **Figure 3**.

Figure 3: Project Schedule

Task	Jan	Feb	Mar	Apr
Research				
Develop Concept				
Define App Features				
Prototyping & Design (UI)				
Iteration of App Features				
App Development (Front End & Back-End)				
Final Project Report				

Implemented Features and Novelty

The implemented features are as listed in Table 2 below.

Table 2: Features

Features	Novel Features
Front-End Features: <ul style="list-style-type: none"> User sign up (Registration) User login & logout View the listing of available services View InProgress, Completed and Terminated Transactions View / Edit User Profile details Book a service Form Validation (for login and sign-up pages) Filter & Search available listing 	<ul style="list-style-type: none"> AI chat bot powered by ChatGPT Multi-page application using react-routers

Features	Novel Features
<ul style="list-style-type: none"> ● Multi-page application using react routers ● AI chat bot powered by ChatGPT ● Maintaining User Session Across Pages 	
<p>Back-end server covers the following features:</p> <ul style="list-style-type: none"> ● User authentication (email & password) ● Get information (user id, user information, services) ● Register information (user, professional) ● Data Storage (Access to MongoDB) 	<ul style="list-style-type: none"> ● User Image - The uploaded profile image is encoded based on "base64" and stored in the database.

ANNEX A: USER NEED ANALYSIS

We performed semi-structured interviews with seven users who recently engaged repair services.

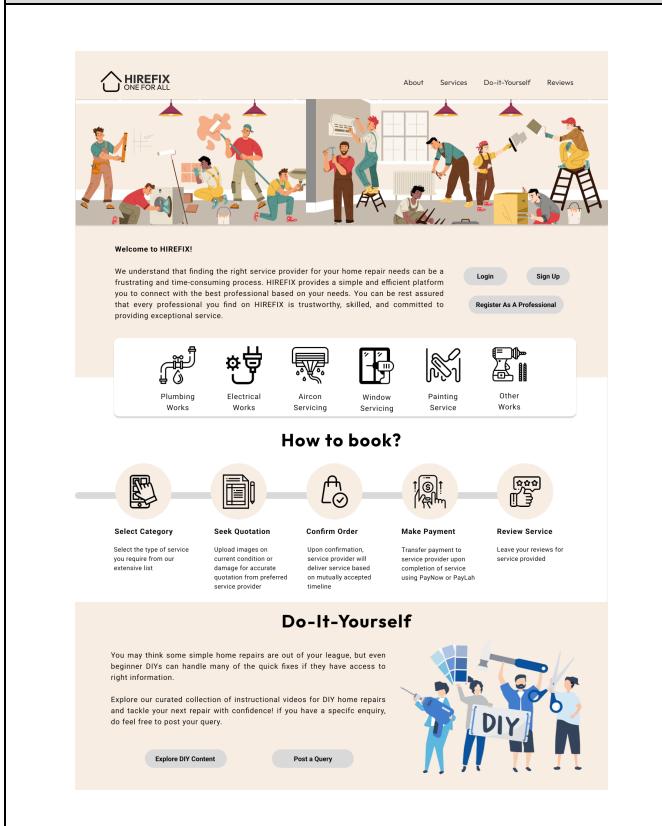
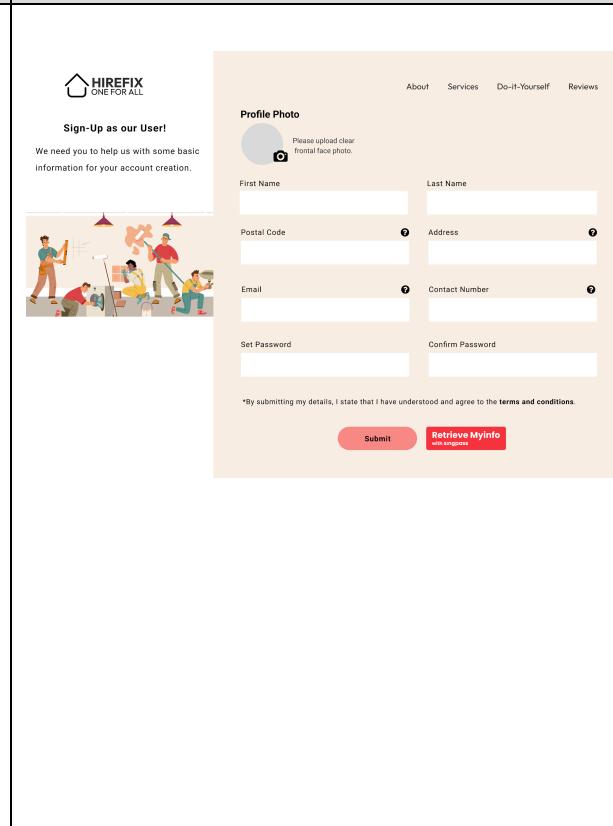
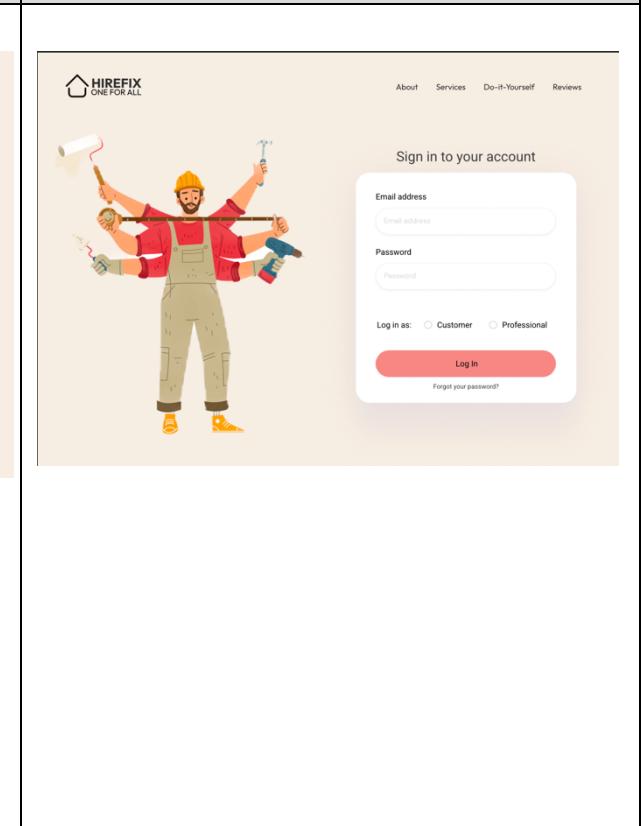
Feedback	User Needs
<p><i>"When I look for handyman service, I go for quality and don't really care about price. It is sometimes troublesome to look through all the services on Carousell. No proper details for some of the contractors. I don't even know if they are properly licensed." – Kevinn Bok</i></p>	Qualification of the Service Provider
<p><i>"I usually ask around my friends or relatives for contacts of good handyman. These guys are migrant workers who work in the construction field and I could not reach them during weekdays. They do a good job but sometimes I wonder if it is illegal to engage them this way. What if they get injured during repair? Will I be in trouble? – Siliin Tan</i></p>	Fear of Legal Issues in Engaging Ad-hoc professionals
<p><i>"Paid a package for 4x Aircon Servicing with XXXXXXXX Company Singapore. Had trouble redeeming the subsequent services. Customer Service keep saying they need time to process and it been 4 days. There is no direct hotline to call. The app is slow and is poorly designed. The only way to raise a concern is via the help chat which is hidden deep in the app." – Chua Zhiqun</i></p>	Reliability of service provider, dispute resolution
<p><i>"Wondering if all the 5 star review he received is real or fake. The service was so bad. Attitude was bad. Block people in whatsapp once he couldnt do what he promise! – Jeremy Yeo</i></p>	Reliability of reviews provided on google.
<p><i>"They were very unresponsive when we needed their service, unfortunate. Waited for hours and they did not respond and left us hanging. The whole point of a handyman business is to be responsive when needed and they really didn't fulfil that expectation." – Lester Lim</i></p>	Responsiveness of Service Provider
<p><i>"The contractor came down for a consult for a glass sliding door and painting of a 4-room flat, and advised a metal structure and partition of the sliding door while quoting me 150% more than the original quote. I accepted it because he seemed to know what he was talking about.</i></p> <p>In the end, the painting was so bad, I had to have them come back 3 times within 5 days to touch up the parts they screwed up. They also painted into the door frames, skirting, built-in furniture. Worse, I had specifically asked and paid for the painting of the main door frame and pipes, and they denied that I did and refused to do it. I had to show them the invoice before they headed out to buy the paint to do it. Overall, extremely horrible experience and it was quite a bit of work for us to clean the paint off our things.</p> <p>As for the glass sliding door and partition, it was actually alright. But when I requested the additional partition box-up, it was quoted 110% higher than the industry rate. Look, I'm not looking for a discounted place because I was already paying. I just wanted to pay the acceptable industry rate. Only after getting quotes from other contractors did he agree to meet the price." – Wilbur Lim</p>	Effort to get Quotation, Verification of proficiency
<p><i>"Approached XXXXXXXX Company upon reading the good reviews on google. Needed to solve a power supply that caused trip. Unfortunately experience not quite on par with expectation. Service and response time was ok, until we realised some issue with installation as the \$120 new power socket will affect the plywood backing that was meant to hide the clutter behind.</i></p>	Reliability of Reviews. Ability to provide clear requirements to get accurate quotes.

Feedback	User Needs
<p>Requested some modification, or some solution at a later date as it was Sat 7pm already. However, the technician was worried about not being paid and threatened to cut all my wires!!!! Said it wasn't his issue/ problem. We were very appalled at his reaction and very drastic threat. Attitude aside, this technician needed to check with back office for every quote, that was time consuming, we were just standing waiting and listening to stories while waiting." - Ramesh</p>	

ANNEX B: FIGMA ILLUSTRATIONS

USER PERSPECTIVE (IMPLEMENTED IN CODE)

1. Setting Up Account

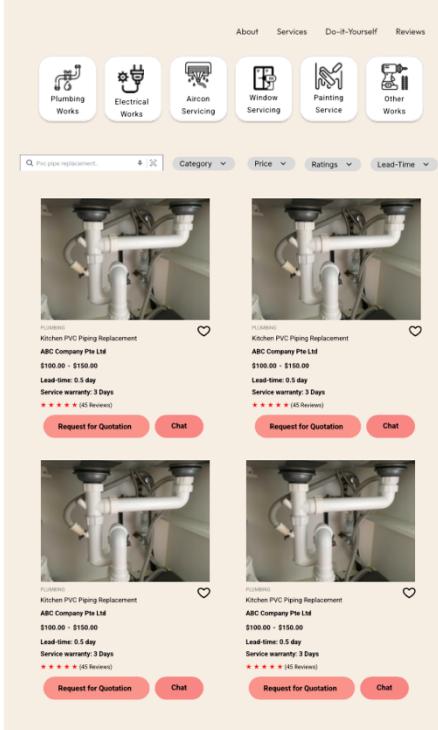
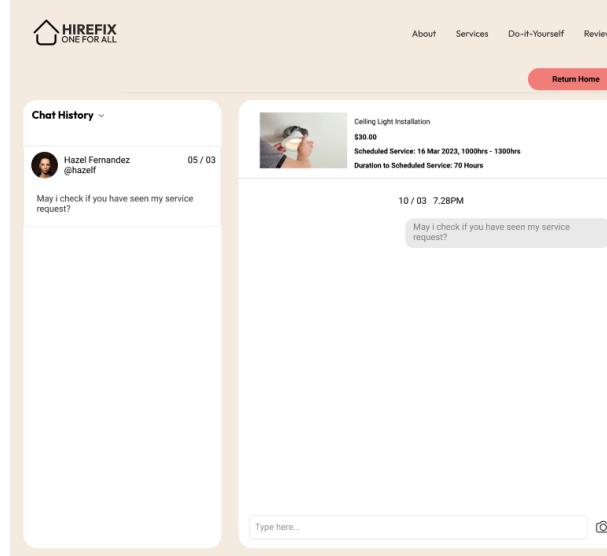
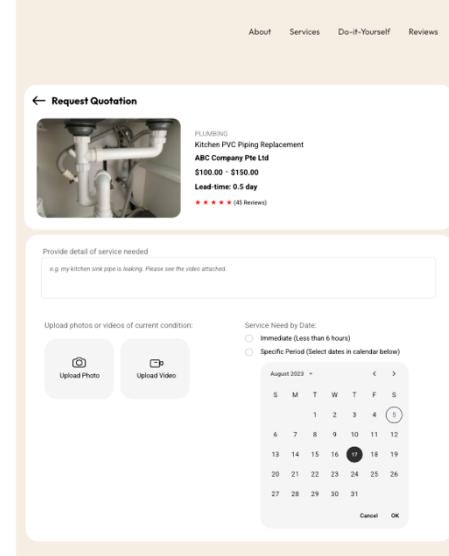
1. Home Page	2. Select Sign-Up	3. Sign-In after Account Established
 <p>The home page features a top banner showing various professionals working on different projects like painting, electrical work, and plumbing. Below this is a section titled 'How to book?' with five steps: Select Category, Seek Quotation, Confirm Order, Make Payment, and Review Service. A 'Do-It-Yourself' section follows, encouraging users to explore DIY content or post queries.</p>	 <p>This sign-up page asks users to provide basic information: First Name, Last Name, Postal Code, Address, Email, Contact Number, Set Password, and Confirm Password. It includes a placeholder for a profile photo and a link to terms and conditions.</p>	 <p>A unified sign-in page for both users and professionals. It includes fields for Email address, Password, and Log in as (Customer or Professional). There's also a 'Forgot your password?' link.</p>

The home page will indicate the icons to the various categories services as well as access to DIY repairs.

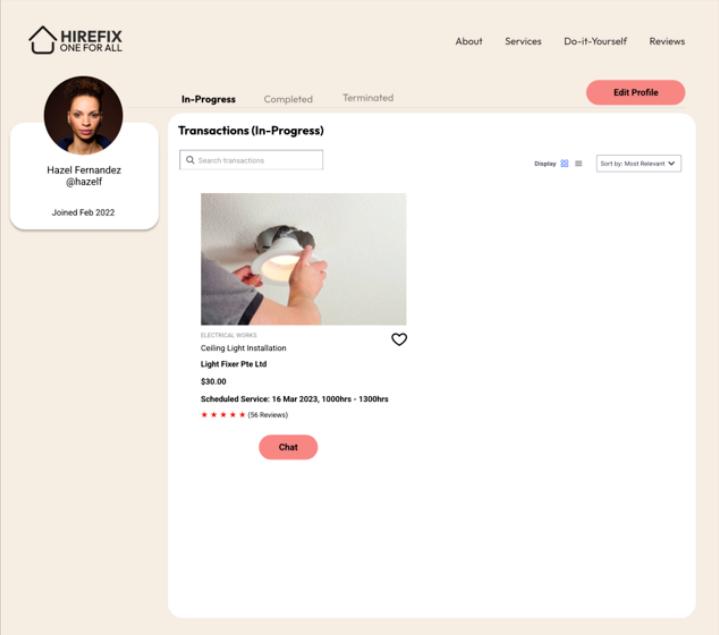
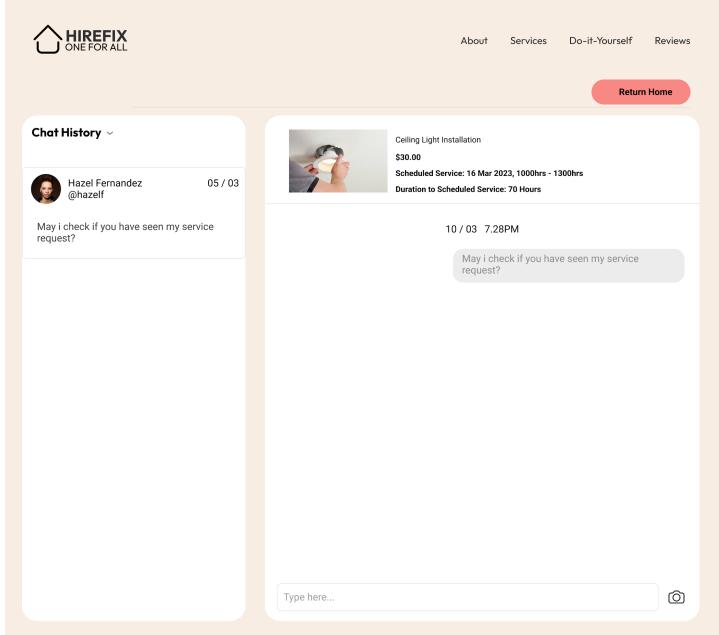
The users are to provide the necessary details to sign-up.

This is a unified sign-in page for both users and professionals. User will select log-in as user after keying in details.

2. Exploring & Engaging Services

1. Viewing & Filtering Services	2. Chat with Preferred Service Provider	3. Book a Service
		
<p>After Log in, User can view all services, select categories through icons given at the top of the page or use filters.</p>	<p>The user can chat with the service provider if they require details prior to officially requesting for a quotation.</p>	<p>Users can provide details of service needed, upload videos/images of the current issue they are facing and indicate the service need-by-date.</p>

3. Tracking Transactions & Editing Profile

1. In-Progress Transactions	2. Chat with Professional/ Service Provider
	
<p>In progress transaction would show details of when the service is scheduled. The User can chat with contractor if any further follow-ups are required.</p> <p>User is not allowed to terminate in-progress transactions from their end. If they wish to terminate, they need to request the professionals to terminate the service at their end. This is to ensure that users do not abuse the transaction system.</p>	<p>The user and professional could verify details through the in app chat function.</p>

Completed Transactions & Review for Completed Transactions

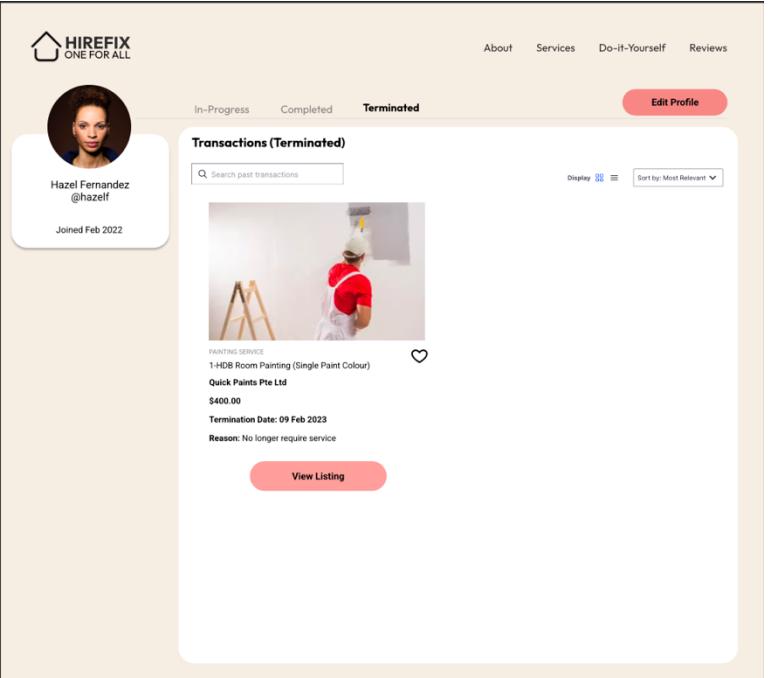
The image consists of two side-by-side screenshots of a mobile application interface for 'HIREFIX ONE FOR ALL'.
The left screenshot shows a user profile for 'Hazel Fernandez @Razelf' who joined in Feb 2022. Below the profile, there is a section titled 'Transactions (Completed)' showing two completed aircon servicing tasks. Each task has a thumbnail image of a technician working on an aircon unit, the service name 'AIRCON SERVICING', the provider 'Aircon General Servicing ABC Company Pte Ltd', the cost '\$20.00', and the completion date 'Completed: 10 Feb 2022'. Each task also has a 'Review' button.
The right screenshot shows a 'Write Review' page for the same completed transaction. It displays the service details again. On the right, there is a 'Overall Rating' section with four red stars. Below it, there are three rating categories: 'Proficiency', 'Quality of Service', and 'Responsiveness', each with a five-star rating scale. At the bottom of the page is a large red 'Submit' button.

Users can view details of when the transactions were completed and provide their review by clicking on the review button.

Users are to rate the professionals based on the following and upload images/ videos of the service provided.

- Proficiency
- Quality of Service
- Responsiveness

Terminated Transactions



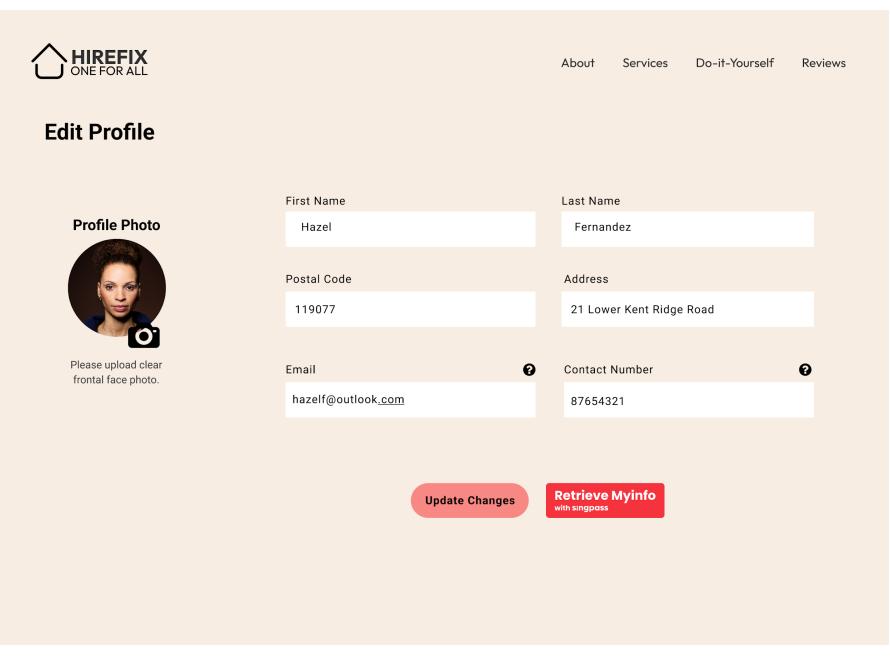
This screenshot shows the 'Terminated' tab of the HIREFIX user profile. It displays a single transaction entry for a painting service. The transaction details are as follows:

- Service Type:** PAINTING SERVICE
- Provider:** 1-HDB Room Painting (Single Paint Colour)
- Company:** Quick Paints Pte Ltd
- Cost:** \$400.00
- Termination Date:** 09 Feb 2023
- Reason:** No longer require service

A 'View Listing' button is located at the bottom right of the transaction card.

This will show details of the terminated transactions and the reason for termination. The user will be able to view the service listing, if necessary.

Editing Profile



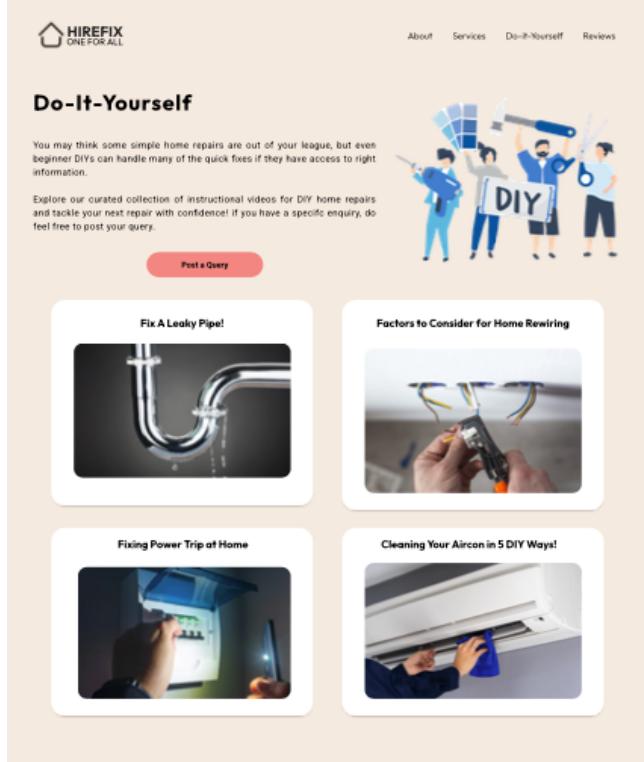
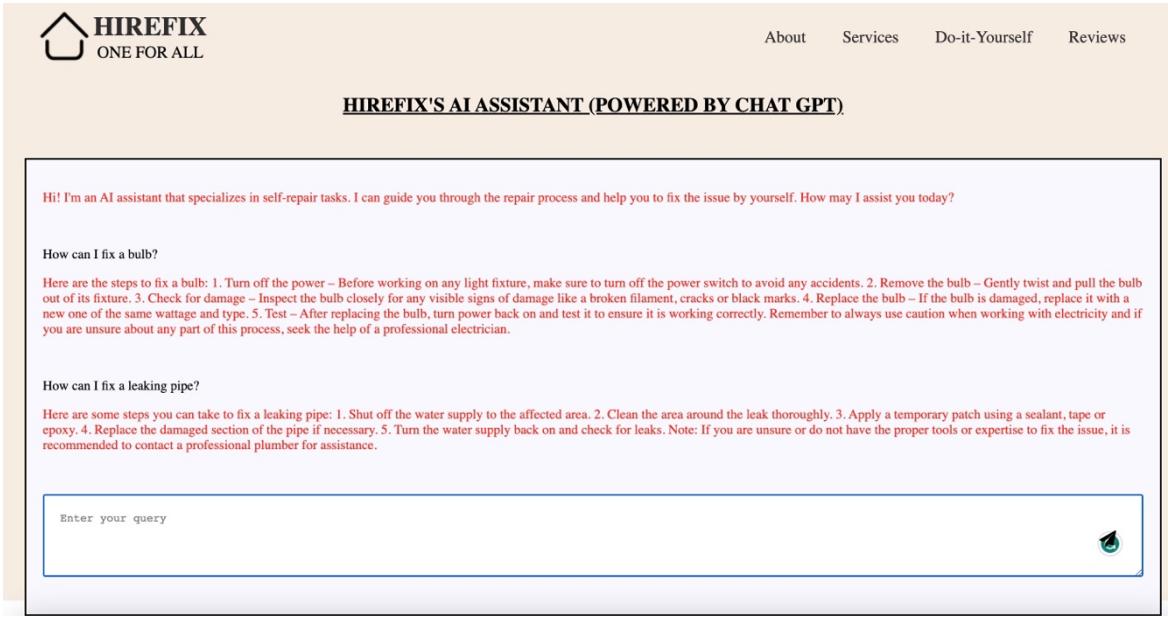
This screenshot shows the 'Edit Profile' section of the HIREFIX platform. It includes fields for personal information:

First Name	Hazel	Last Name	Fernandez
Postal Code	119077	Address	21 Lower Kent Ridge Road
Email	hazelf@outlook.com	Contact Number	87654321

Below the form, there are buttons for 'Update Changes' and 'Retrieve Myinfo with singpass'.

The user can also edit his/ her profile to update changes to home addresses or contact numbers.

4. Do-It Yourself Repairs

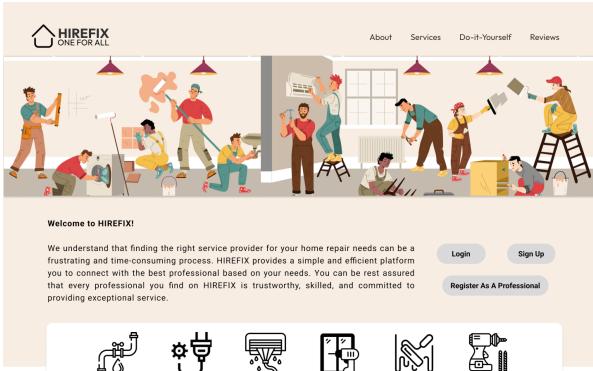
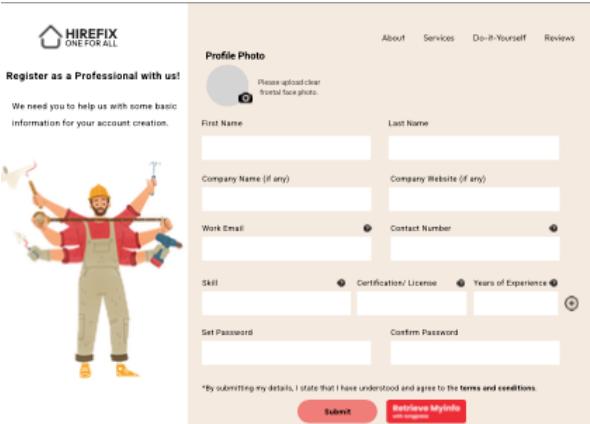
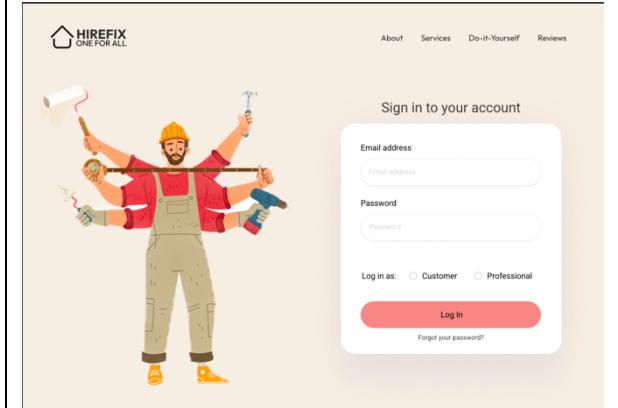
DIY Main Page	DIY AI Assistant
 <p>Do-It-Yourself</p> <p>You may think some simple home repairs are out of your league, but even beginner DIYs can handle many of the quick fixes if they have access to right information.</p> <p>Explore our curated collection of instructional videos for DIY home repairs and tackle your next repair with confidence! If you have a specific enquiry, do feel free to post your query.</p> <p>Post a Query</p>	 <p>HIREFIX ONE FOR ALL</p> <p>HIREFIX'S AI ASSISTANT (POWERED BY CHAT GPT)</p> <p>Hi! I'm an AI assistant that specializes in self-repair tasks. I can guide you through the repair process and help you to fix the issue by yourself. How may I assist you today?</p> <p>How can I fix a bulb?</p> <p>Here are the steps to fix a bulb: 1. Turn off the power – Before working on any light fixture, make sure to turn off the power switch to avoid any accidents. 2. Remove the bulb – Gently twist and pull the bulb out of its fixture. 3. Check for damage – Inspect the bulb closely for any visible signs of damage like a broken filament, cracks or black marks. 4. Replace the bulb – If the bulb is damaged, replace it with a new one of the same wattage and type. 5. Test – After replacing the bulb, turn power back on and test it to ensure it is working correctly. Remember to always use caution when working with electricity and if you are unsure about any part of this process, seek the help of a professional electrician.</p> <p>How can I fix a leaking pipe?</p> <p>Here are some steps you can take to fix a leaking pipe: 1. Shut off the water supply to the affected area. 2. Clean the area around the leak thoroughly. 3. Apply a temporary patch using a sealant, tape or epoxy. 4. Replace the damaged section of the pipe if necessary. 5. Turn the water supply back on and check for leaks. Note: If you are unsure or do not have the proper tools or expertise to fix the issue, it is recommended to contact a professional plumber for assistance.</p> <p>Enter your query </p>

The DIY page will provide details of common DIY repairs that homeowners can do or factors to consider for specific repairs.

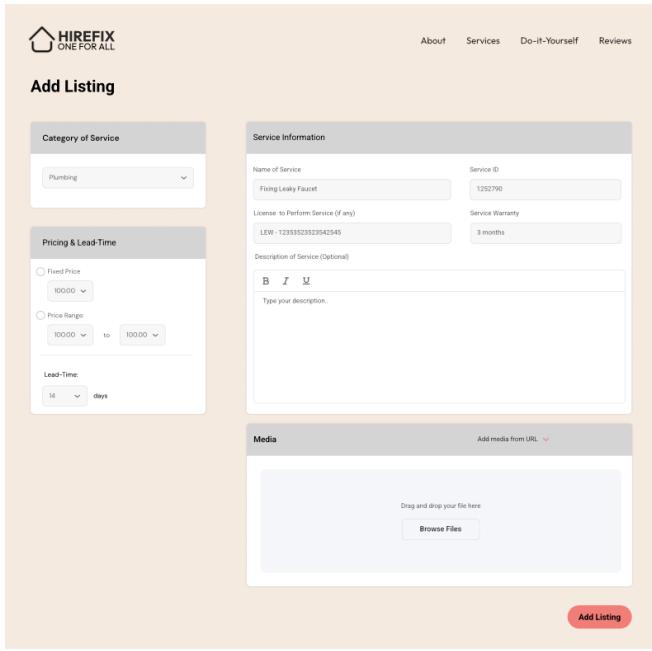
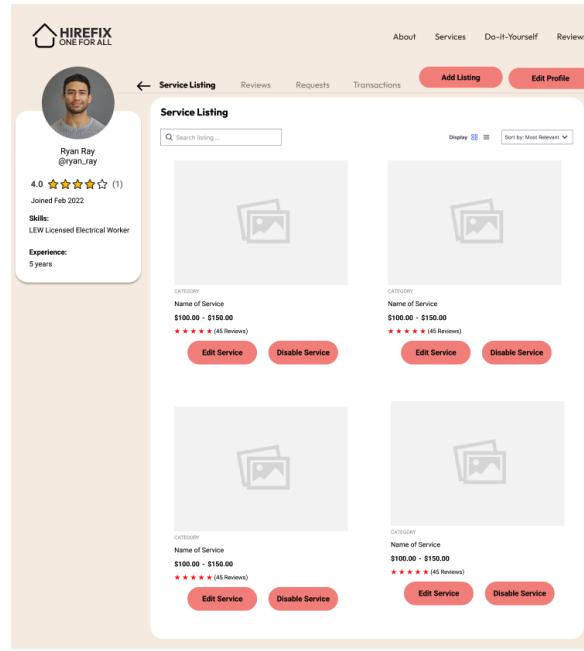
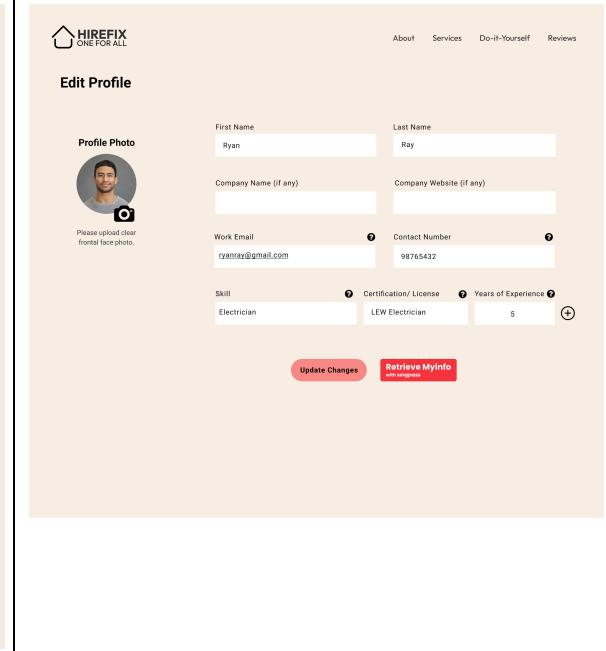
A ChatGPT powered AI assistant will be used for users of HireFix web application to post their queries pertaining to home fixes and obtain useful tips on fixing home issues.

PROFESSIONAL PERSPECTIVE (UNIMPLEMENTED)

1. Setting Up Account

1. Home Page	2. Select Sign-Up	3. Sign-In after Account Established
 <p>Welcome to HIREFIX!</p> <p>We understand that finding the right service provider for your home repair needs can be a frustrating and time-consuming process. HIREFIX provides a simple and efficient platform for you to connect with the best professional based on your needs. You can be rest assured that every professional you find on HIREFIX is trustworthy, skilled, and committed to providing exceptional service.</p> <p>How to book?</p> <ul style="list-style-type: none"> Select Category Seek Quotation Confirm Order Make Payment Review Service <p>Do-It-Yourself</p> <p>You may think some simple home repairs are out of your league, but even beginner DIYs can handle many of the quick fixes if they have access to right information.</p> <p>Explore our curated collection of instructional videos for DIY home repairs and tackle your next repair with confidence! If you have a specific enquiry, do feel free to post your query.</p> <p>Explore DIY Content Post a Query</p>	 <p>Register as a Professional with us!</p> <p>We need you to help us with some basic information for your account creation.</p> <p>Profile Photo</p> <p>Please upload clear frontal face photo.</p> <p>Form Fields:</p> <ul style="list-style-type: none"> First Name Last Name Company Name (if any) Company Website (if any) Work Email Contact Number Skill Certification/ License Years of Experience Set Password Confirm Password <p><small>*By submitting my details, I state that I have understood and agree to the Terms and Conditions.</small></p> <p>Submit Forgot My Info</p>	 <p>Sign in to your account</p> <p>Email address</p> <p>Password</p> <p>Log in as: <input type="radio"/> Customer <input type="radio"/> Professional</p> <p>Log In</p> <p>Forgot your password?</p>
	<p><i>The professional will be required to insert details of professional certification, licenses, and years of experience.</i></p>	

2. Setting Up and Managing Service Listing

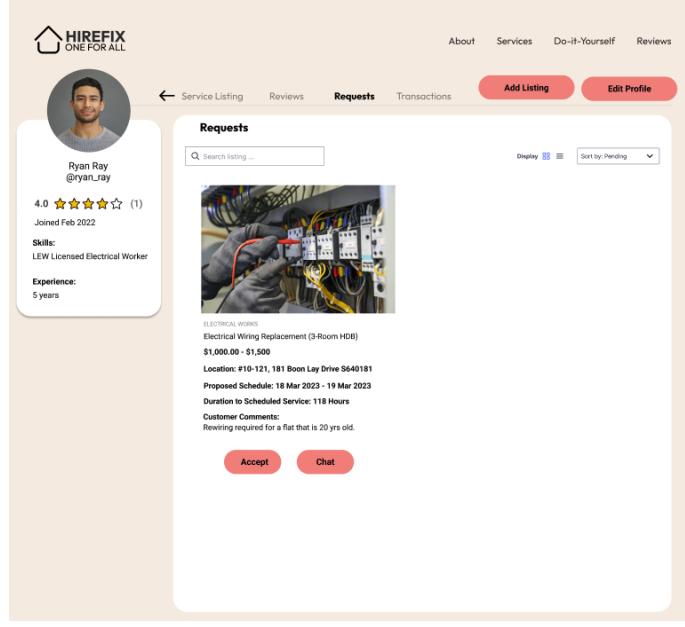
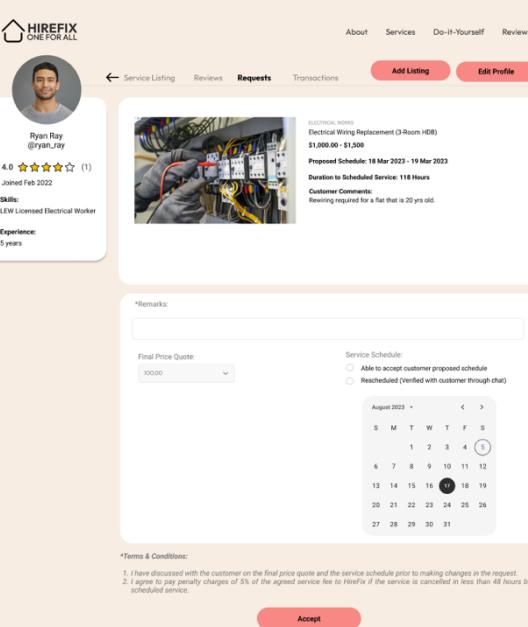
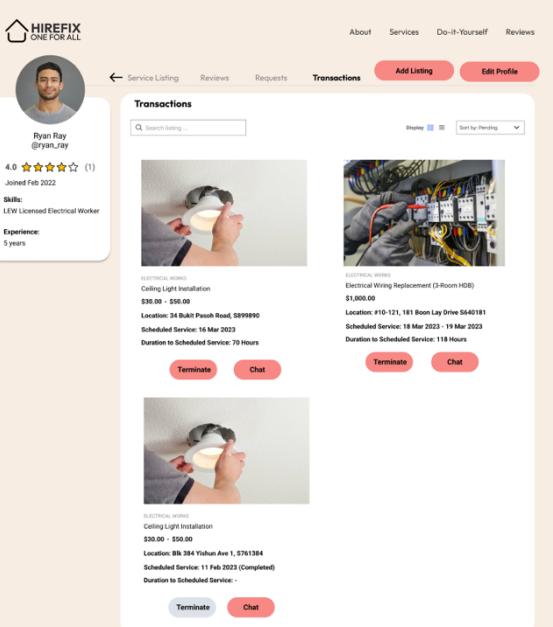
Adding Listing Template	View All Service Listing	Edits to Profile
 <p>Add Listing</p> <p>Category of Service Plumbing</p> <p>Pricing & Lead-Time <input type="radio"/> Fixed Price: \$100.00 <input type="radio"/> Price Range: \$100.00 to \$100.00 Lead-Time: 14 days</p> <p>Media Drag and drop your file here Browse Files</p> <p>Add Listing</p>	 <p>Service Listing</p> <p>Ryan Ray (ryan.Ray) Joined Feb 2022 Skills: LEW Licensed Electrical Worker Experience: 5 years</p> <p>CATEGORY Name of Service: \$100.00 - \$150.00 (45 Reviews) CATEGORY Name of Service: \$100.00 - \$150.00 (45 Reviews)</p> <p>Edit Service Disable Service Edit Service Disable Service</p>	 <p>Edit Profile</p> <p>Profile Photo Please upload clear frontal face photo.</p> <p>First Name: Ryan Last Name: Ray</p> <p>Company Name (if any) Company Website (if any)</p> <p>Work Email: rynrny@gmail.com Contact Number: 98765432</p> <p>Skill: Electrician Certification/ License: LEW Electrician Years of Experience: 5</p> <p>Update Changes Retrieve MyInfo</p>

Professional can indicate details of service – name of service, lead-time, estimated prices and include images of past repairs, if necessary.

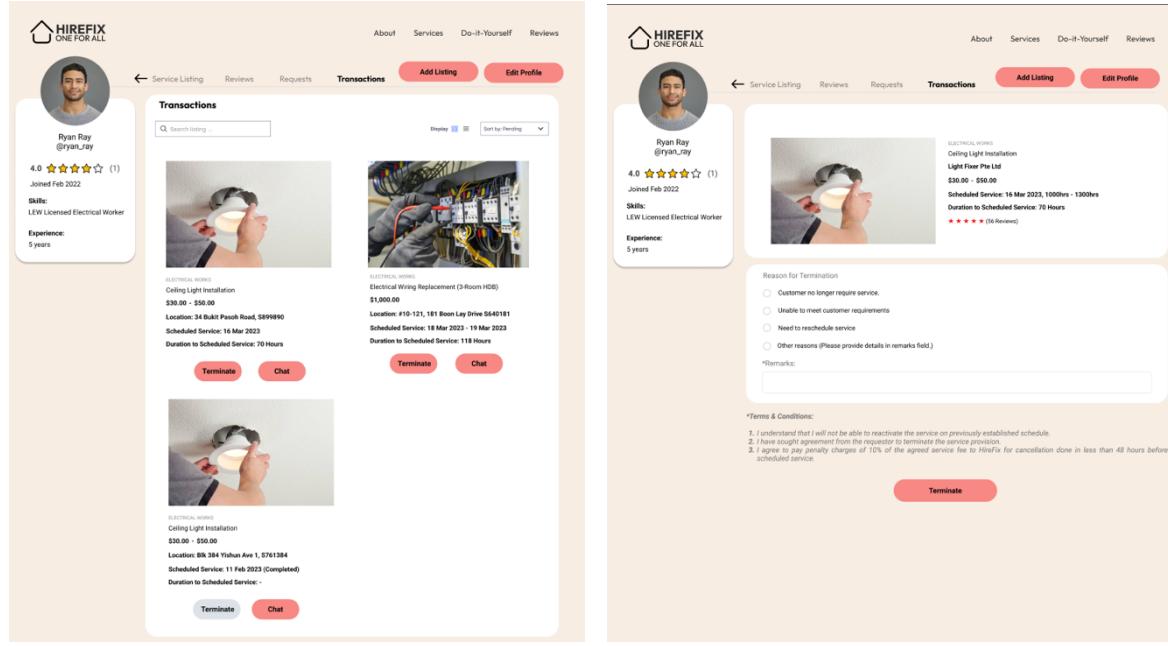
Professional will be able to view all services they have listed. The professional may edit or disable the service (i.e. make it invisible to users).

Professionals will be able to edit their profile details to update contact or

3. Managing Users Requests and Transactions

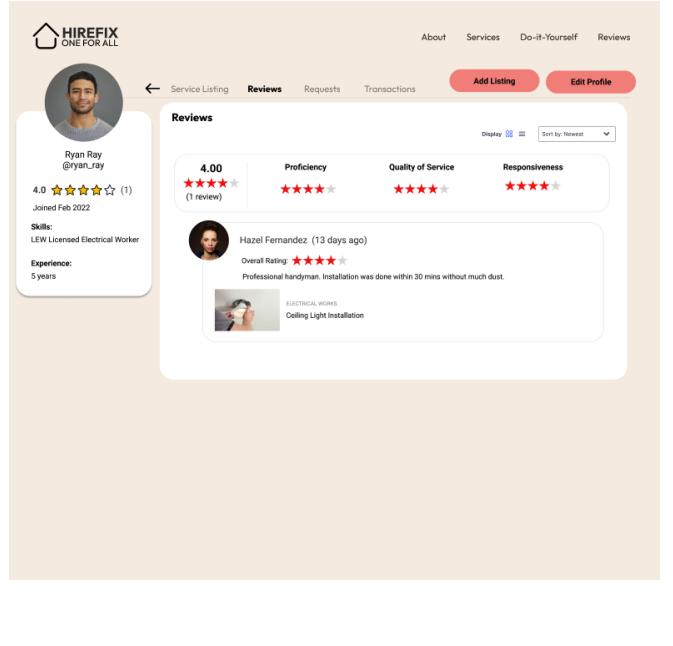
View Requests	Accept Requests	View Transactions
		
<p>Professional will be able to view the requests he has received. The professional can either accept or chat with the user to get more details or to reject request.</p>	<p>The professional can amend the price quoted based on user needs and reschedule the service. The professional is to seek agreement via chat prior to making these amendments and accepting the service.</p>	<p>Upon acceptance of requests, the request will be saved to transactions page for the professional to manage the transactions.</p> <p>The transactions page will also track duration to scheduled service. Professional will not be able to terminate transactions that has been completed.</p>

Terminate Transactions



Professional will be able to terminate requests by providing valid reasons and with agreement from the requestor.

View Reviews



Professional will be able to view all the reviews he/ she has received as well as the overall reviews received.

ANNEX C: INFORMATION DATA FLOW

As for this system, we will demonstrate how information is generated and transitions through the implemented features as follows.

1. User Data Creation & Login Authentication

When users finish registering information, new data for each user is created. Regarding the profile image, users need to upload their profile image in "UserProfilePage.jsx". The uploaded profile image is then encoded based on "base64" and stored in the database. As for login authentication, once users have registered, they are granted access to log in by entering their email address and password (basic authentication).

2. Professional User Data Creation (Mock Data)

The creation of professional user data is also realized through the sign-up process, similar to the regular user data creation in the previous part. Although we didn't have time to implement the console or UI screens for professional users, the backend has been designed to be completed in the same sign-up screen. This means that there will be some additional input fields for professional user sign-up, but a checkbox on the UI screen will determine user type. In the case of professional users, besides the standard User Data Creation, the additional data will be created as Professional Data, serving as a differentiation from the regular user data.

3. QuoteRequest Data Creation

Quote requests are an essential feature for users to request for quotation against professional users after selecting the desired service. When users request a quote from the User Interface screen ("RequestQuotationPage.jsx"), QuoteRequest data is created. Then, professional users can review the quote request and choose to accept or decline it (although the UI for this is not implemented). Assuming the request is accepted, the QuoteRequest status is updated from Created(0) to Approved(1), and the target Service status is updated from Created(0) to InProgress(1). The user ID is also associated, enabling users to view the service from the Transaction Page for the first time.

4. Service Data Creation (Mock Data)

In the current design, services and users are linked in a 1:1 relationship, meaning that even for the same service, professional users are expected to duplicate the service for each user. While this was sufficient for the prototype, a potential issue in the future is the creation of a large amount of data as the service scales. It might be necessary to enable multiple users to request quotes and coordinate for the same service from the listing. For example, service instances are currently managed by the transaction id, and once the transaction id proceed to "1"(InProgress), the user listing will not be displayed, which means the professional must create a new service again. However, it would be also possible to dare keep the service only for listing (since it can always be used) and provision a new service for transactions.

5. Review Data Creation (Mock Data)

Review data is a concept linked to the service. Essentially, after the service has been provided, users can evaluate the service through the User Interface, and review data is created. Although this feature is only available with mock data and not actually used this time, it was created to display the cumulative number of reviews for a specific service. As a future challenge, it is also possible to implement a feature that calculates and measures the total review score for each professional user based on the services they have provided.

6. Reservation Data Creation (Mock Data)

Reservation instances are stored as an ID array within the service. The usability of the reservation feature is super important for enhancing the credibility of professional users in this service. This is because one of the purposes of using this service is to help professional users manage their repair schedules correctly and earn money efficiently. Therefore, although only mock data is provided for the

reservation data structure, it allows multiple reservations to be made in one-hour increments on the same day.