
Software Requirements Specification

for

PropertyIQ

Version 1.0.5 approved

Prepared by Team 3.0

Nanyang Technological University

11 April 2023

Table of Contents

| | |
|--|-----------|
| 1. Introduction | 1 |
| 1.1 Purpose | 1 |
| 1.2 Document Conventions | 1 |
| 1.3 Intended Audience and Reading Suggestions | 1 |
| 1.4 Product Scope | 2 |
| 1.5 References | 2 |
| 2. Overall Description | 3 |
| 2.1 Product Perspective | 3 |
| 2.2 Product Functions | 3 |
| 2.3 User Classes and Characteristics | 4 |
| 2.4 Operating Environment | 4 |
| 2.5 Design and Implementation Constraints | 6 |
| 2.5.2 Design Standards | 6 |
| 2.5.3 Implementation Constraints | 7 |
| 2.6 Assumptions and Dependencies | 7 |
| 2.6.1 Assumptions | 7 |
| 2.6.2 Dependencies | 7 |
| 3. External Interface Requirements | 8 |
| 3.1 User Interfaces | 8 |
| 3.2 Hardware Interfaces | 21 |
| 3.3 Software Interfaces | 21 |
| 3.4 Communications Interfaces | 21 |
| 4. System Features | 22 |
| 4.1 User Management | 22 |
| 4.2 Search Query | 23 |
| 4.3 Property Details | 23 |
| 5. Other Nonfunctional Requirements | 25 |
| 5.1 Performance Requirements | 25 |
| 5.2 Maintainability Requirements | 25 |
| 5.3 Security Requirements | 25 |
| 5.4 Usability Requirements | 26 |
| 5.5 Reliability Requirements | 26 |
| 5.6 Scalability Requirements | 26 |
| 5.7 Correctness Requirements | 26 |
| Appendix A: Data Dictionary | 27 |
| Appendix B: Useful Links | 29 |
| Appendix C: Initial User Interfaces Mockup | 30 |

Revision History

| Name | Date | Reason For Changes | Version |
|-----------------------|------------|--|---------|
| Chong Wei Kang | 27/01/2023 | Initial Documentation | 1.0.0 |
| Pugalia Aditya | 02/02/2023 | Updated Functional & Non-functional Requirements | 1.0.1 |
| Nicholas Lim Jan Tuck | 03/02/2023 | Updated UI Mockup | 1.0.2 |
| Chong Wei Kang | 18/02/2023 | Updated Documentation | 1.0.3 |
| Don Lim Zhan Chen | 06/04/2023 | Updated Documentation | 1.0.4 |
| Chong Wei Kang | 11/04/2023 | Updated Documentation | 1.0.5 |

1. Introduction

1.1 Purpose

Team 3.0's mission is to empower individuals in Singapore with greater information transparency in the housing rental market through **PropertyIQ**. By developing a web application that organises and makes accessible relevant market data, Team 3.0 aims to support informed economic decision-making for its public users. PropertyIQ will be the go-to source for up-to-date information and trends in the Singapore housing rental market.

1.2 Document Conventions

Software Requirement Specification Format: This document follows IEEE standard. Priorities of higher level requirements are inherited by detailed level requirements.

Font: Times New Roman.

Main Header: Size 18, Bold.

Sub Header: Size 14, Bold.

Content: Size 12.

Line Spacing: 1

Further conventions on the problem domain terms used can be found at **Appendix A - Data Dictionary**.

1.3 Intended Audience and Reading Suggestions

This document is intended for all stakeholders involved in the PropertyIQ application, including users of the web application, developers, marketing staff, testers, and documentation writers.

The document provides a comprehensive overview of the various features of the web application, its intended purpose, and the rationale behind each function. Detailed descriptions are presented, accompanied by visual illustrations of the web application to facilitate understanding and visualisation.

For users, marketing staff, and testers, it is recommended to read the document in sequence. Software developers, on the other hand, should begin with the overall description, followed by an in-depth exploration of each system feature. Finally, developers should review the requirements for the web application to operate effectively, which include external interface requirements and non-functional requirements.

1.4 Product Scope

PropertyIQ is a web application designed to serve as the go-to resource for the latest information and trends in the Singapore housing rental market. Featuring an intuitive interface, the platform is user-friendly and easy to navigate. Among its numerous features are interactive maps for location-based property searches, detailed property profiles offering extensive information on rental properties, and price forecasts for both the property in question and nearby properties. This comprehensive approach empowers users to make optimal decisions. PropertyIQ's streamlined interface enables effortless browsing and comparison of similar properties, as well as the ability to filter results based on individual preferences and requirements. Its mobile-responsive design ensures accessibility for users on the go, providing a user-friendly and comprehensive resource for anyone seeking informed decisions in the Singapore housing rental market.

1.5 References

1. IEEE 830-1998 Template
2. HTTP Status Code - <https://developer.mozilla.org/en-US/docs/Web/HTTP>Status>
3. RESTful API - <https://developer.mozilla.org/en-US/docs/Glossary/REST>
4. Django Framework - <https://docs.djangoproject.com/en/4.1/>
5. Bootstrap Library - <https://getbootstrap.com/docs/4.1/getting-started/introduction/>
6. Stack Overflow - <https://stackoverflow.com/>

2. Overall Description

2.1 Product Perspective

PropertyIQ is an innovative initiative aimed at promoting transparency in the Singaporean housing market. Its purpose is to provide individuals with access to up-to-date, accurate information about rental properties in different locations and projects, enabling them to make informed decisions when searching for a home to rent. To achieve this, PropertyIQ retrieves up-to-date property information of rental flats from the URA API. Additionally, PropertyIQ leverages the power of the Google Maps API to offer users an easy-to-use interface for identifying nearby rental properties. Furthermore, the platform provides users with historical rental trends and insights for specific projects, empowering them to make informed decisions based on past performance. PropertyIQ also includes a recommendation feature that suggests similar rental properties that match the user's preferences and requirements, streamlining the search process and saving time. By offering users a range of tools and features designed to simplify the rental search process, PropertyIQ aims to help individuals find their ideal rental property in Singapore quickly and easily.

2.2 Product Functions

PropertyIQ's web application main system features include:

1. The website allows users to register and create an account.
2. The website allows users to login.
3. The website allows users to update their account details.
4. The website allows users to search for property rental prices.
5. The website allows users to filter rental housing using various parameters such as location, rent, etc.
6. The website shows all the property details to the user.
7. The website suggests relevant property recommendations according to the property the user is viewing.
8. The website shows Historical trends of the prices of the housing in the same project.
9. The website shows Nearby trends of the prices of houses near the selected flat.
10. The website allows users to Bookmark properties.
11. The website allows users to see their Recently Viewed properties.
12. The website allows the system admin to update the properties displayed when required.

2.3 User Classes and Characteristics

The PropertyIQ web application anticipates its demographic audience to be the following:

1. Individuals looking for a rental house in Singapore

| Attributes | Description |
|--------------------------|---|
| Frequency of use | High |
| Subset of functions used | All |
| Technical Expertise | Low |
| Characteristics | The PropertyIQ marketing team estimates that these are the users who will most frequently use the software to gain information regarding rental prices of houses in Singapore. The end user is allowed to search for properties and view available information. They are not allowed to directly access the database of the system and can only interact with it using the website's interface. The user only needs basic knowledge of navigating a website to use the product. |

2.4 Operating Environment

This section describes the setting of which the web application is put into operation.

| Setting | Description |
|--|--|
| HTML Support | PropertyIQ requires an internet browser which supports at least HTML5 or above. <i>HTML5 is the latest standard of HTML at the time of writing this documentation</i> |
| CSS Support | PropertyIQ requires an internet browser which supports at least CSS3 or above. <i>CSS3 is the latest standard of CSS at the time of writing this documentation.</i> |
| JavaScript Support | The web application requires an internet browser which supports JavaScript. |
| Front-end development using HTML, CSS, JavaScript, Bootstrap & Jinja Templating Language | Bootstrap is a popular open-source front-end framework maintained by Twitter. Jinja is a powerful templating engine for Python. Team |

| | |
|--|--|
| | <p>3.0 utilises Bootstrap and Jinja Templating Language to build all user interfaces of the web applications, as they offer reusable components and templates that significantly speed up the development process.</p> <p>Bootstrap enables a responsive and mobile-first design approach, making it easy to create consistent and visually appealing user interfaces. Jinja Templating Language allows for efficient generation of HTML, XML, or other markup formats based on dynamic data and reusable templates.</p> <p>Edition: Bootstrap (version 4.1.3) and Jinja (version 2)</p> |
| Back-end development using Django | <p>Django is an open-source, Python-based web framework maintained by the Django Software Foundation that follows the Model-View-Template (MVT) architectural pattern. Team 3.0 uses Django to build the web server and develop the back-end of the web application. The MVT architecture promotes a clear separation of concerns, making it easier to maintain and scale the application while encouraging reusable components.</p> <p>Edition: Django (version 4.1.7)</p> |
| Database Implementation using PostgreSQL | <p>PostgreSQL is a highly scalable, open-source relational database that is SQL-compliant and works seamlessly with the Django web framework.</p> <p>Edition: PostgreSQL (version 15.2)</p> |
| Application Hosting Using Localhost:8000 | <p>Localhost hosting, as employed in our development environment, involves hosting and accessing web applications on a personal computer or local server. By utilising a local server, the application is accessible only to the host machine. This approach facilitates testing and debugging within a secure and controlled environment, ensuring optimal performance before deployment.</p> |

2.5 Design and Implementation Constraints

2.5.1 Limitations

| Limitations | Details |
|---|---|
| Google Maps (JavaScript) API Limitations | The Google Maps (Javascript) API implemented in PropertyIQ employs a pay-as-you-go pricing structure. Although there's no daily cap on requests, the API enforces usage limits of 30,000 requests per minute overall and 300 requests per minute per IP address. |
| Urban Redevelopment Authority (URA) API Limitations | <p>The URA API implemented in PropertyIQ also has a few limitations as follows:</p> <ol style="list-style-type: none"> 1. The data provided is only for private residential units. HDB developments and State Properties are not included. 2. Residential units within Shophouse developments are not included. 3. The data provided is updated quarterly based on completed developments. |

2.5.2 Design Standards

| Design Standards | Details |
|--------------------------|--|
| Programming Standards | <p>All non-class variables must adopt the snake case naming conventions.</p> <p>All class variables must adopt the Pascal Case naming conventions.</p> |
| User Interface Standards | <p>All User Interface designs must adhere to the stakeholders' pre-approved colour scheme.</p> <p>All webpages must have the same navigation bar at the top and the footer at the bottom for consistency and better user experience.</p> |

2.5.3 Implementation Constraints

The application relies on the data fetched from the URA API, which populates the database. As a result, the information displayed in the application directly reflects the content available from the API.

2.6 Assumptions and Dependencies

2.6.1 Assumptions

1. We assume that users have a strong and stable Internet connection.
2. We assume that all data provided by the URA API is accurate and up-to-date.
3. We also assume that the information provided by the URA API encompasses all rental flats in Singapore.
4. We assume that our database which is supported by PostgreSQL will be up at all times.
5. We assume that Google Maps API will be up at all times.
6. We assume that Gmail will be up at all times to send timely updates of new properties to users.

2.6.2 Dependencies

1. Urban Redevelopment Authority (URA) API
2. Google Maps (JavaScript) API
3. Gmail (with app password) for email notifications

3. External Interface Requirements

3.1 User Interfaces

GUI Standards and Screen Layout Constraints:

1. The website will have a responsive layout that adapts to different screen sizes and resolutions, and will be optimised for mobile devices.
2. Standard buttons and functions, such as the navigation bar and footer, will be available on every screen for easy navigation and consistency.

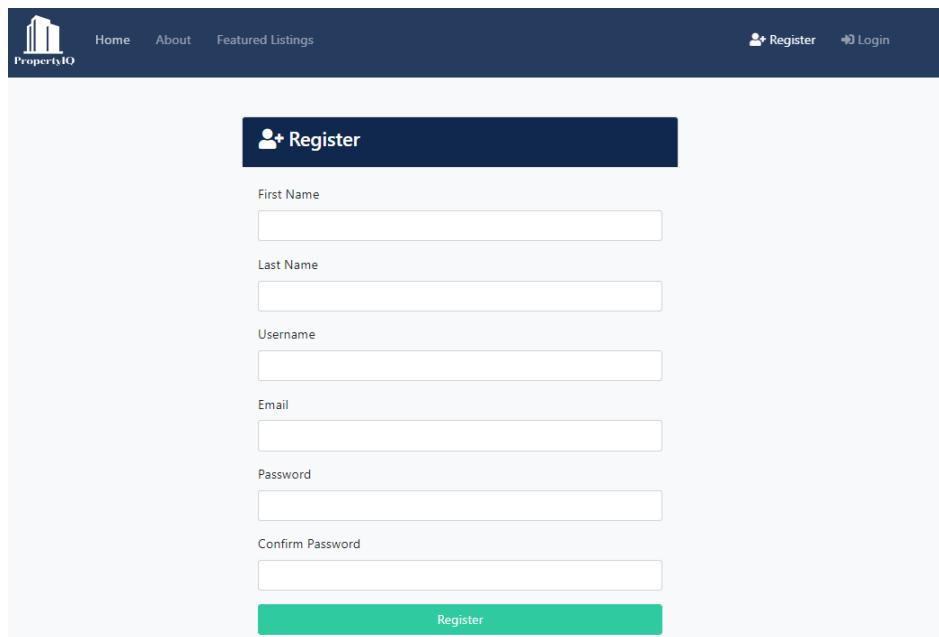
Keyboard Shortcuts:

1. Keyboard shortcuts will not be provided as they are not necessary for the type of user interaction that the website provides.

Error Message Display Standards:

1. Error messages will be displayed as a pop up in a consistent format and location and will provide clear and concise information on how to resolve the issue.
2. Error message pop ups will disappear after 3 seconds.

Sign Up



The screenshot shows the sign-up page for the PropertyIQ website. At the top, there is a dark blue header bar with the PropertyIQ logo on the left, followed by links for Home, About, and Featured Listings. On the right side of the header are links for Register and Login. Below the header, the main content area has a white background. A dark blue rectangular button at the top contains the text "Register" with a small user icon to its left. Below this button is a form with six input fields, each labeled with a placeholder text: "First Name", "Last Name", "Username", "Email", "Password", and "Confirm Password". Each input field is contained within a light gray rectangular box. At the bottom of the form is a large green rectangular button with the word "Register" in white text.

Sign Up Failed (Email is linked to an account)

The screenshot shows the PropertyIQ registration page. At the top, there is a dark blue header with the PropertyIQ logo, navigation links for Home, About, and Featured Listings, and buttons for Register and Login. The main content area has a dark blue header bar with the text "Register". Below it is a red error box containing the message "Error: Email is taken!". The form fields for First Name, Last Name, Username, Email, Password, and Confirm Password are present, each with its own input field. A green "Register" button is at the bottom.

Sign Up Failed (Passwords do not match)

The screenshot shows the PropertyIQ registration page. At the top, there is a dark blue header with the PropertyIQ logo, navigation links for Home, About, and Featured Listings, and buttons for Register and Login. The main content area has a dark blue header bar with the text "Register". Below it is a red error box containing the message "Error: Passwords do not match!". The form fields for First Name, Last Name, Username, Email, Password, and Confirm Password are present, each with its own input field. A green "Register" button is at the bottom.

Sign Up Failed (Passwords are not strong enough)

The screenshot shows the PropertyIQ registration interface. At the top, there is a dark header bar with the PropertyIQ logo, navigation links for Home, About, and Featured Listings, and user links for Register and Login. Below the header is a large button labeled "User Register". A red error box is displayed, containing the following text:

Error:

1. Password must at least be 8 characters long.
2. Password must at least have 1 digit.
3. Password must at least have 1 uppercase letter.
4. Password must at least have 1 symbol.
(!@#\$%^&*_)

Below the error box are input fields for First Name, Last Name, Username, Email, Password, and Confirm Password. A green "Register" button is located at the bottom of the form.

Sign Up Successful

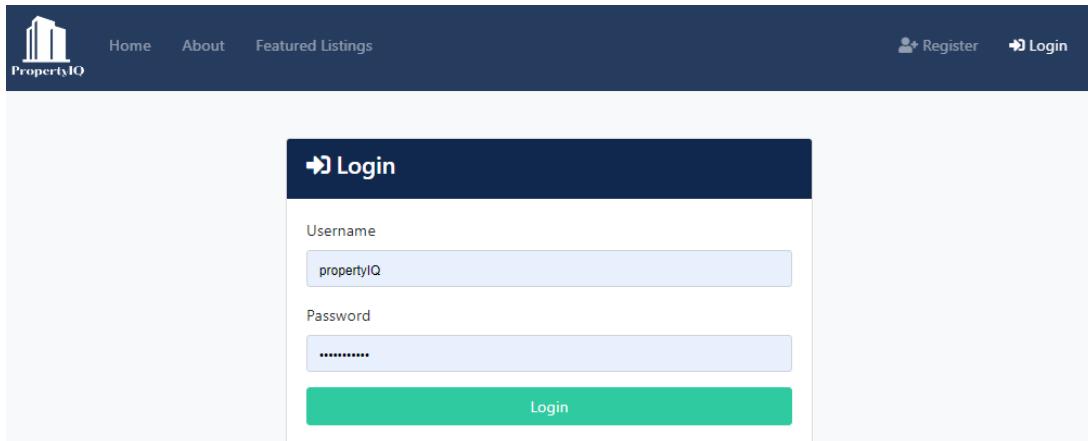
The screenshot shows the PropertyIQ login interface. At the top, there is a dark header bar with the PropertyIQ logo, navigation links for Home, About, and Featured Listings, and user links for Register and Login. Below the header is a large button labeled "User Login". A green success box is displayed, containing the text:

Success

You are now registered and can log in!

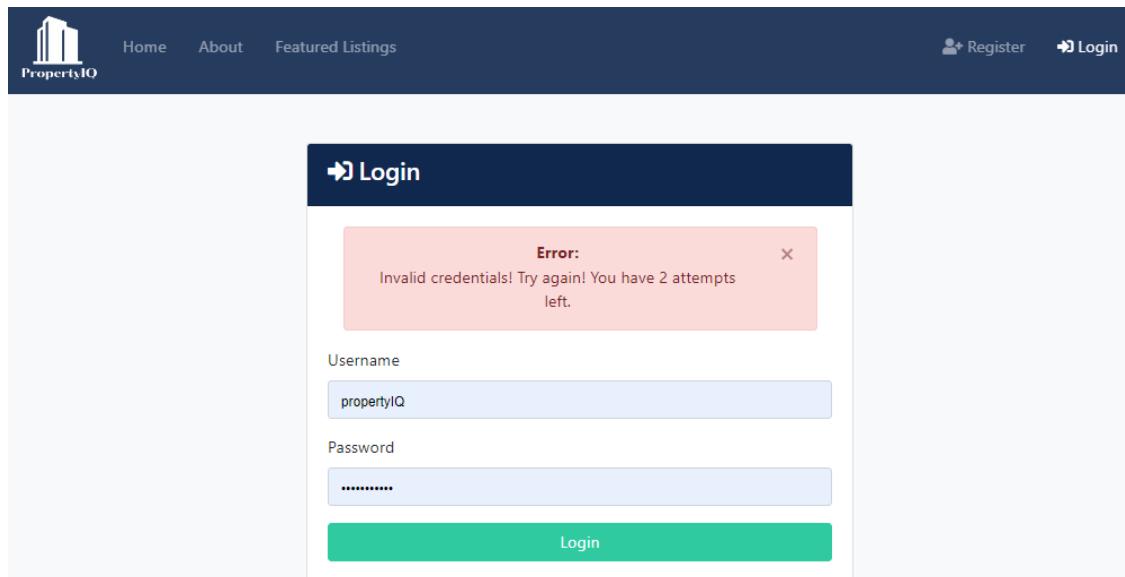
Below the success message are input fields for Username and Password. A green "Login" button is located at the bottom of the form.

Login



The screenshot shows the PropertyIQ login page. At the top, there is a dark blue header bar with the PropertyIQ logo on the left, followed by navigation links for "Home", "About", and "Featured Listings". On the right side of the header are "Register" and "Login" buttons. Below the header is a white login form. The form has a dark blue header with a right-pointing arrow icon and the word "Login". It contains two input fields: "Username" with the value "propertyIQ" and "Password" with several dots indicating the password. At the bottom of the form is a green "Login" button.

Login Failed (Invalid Credentials)

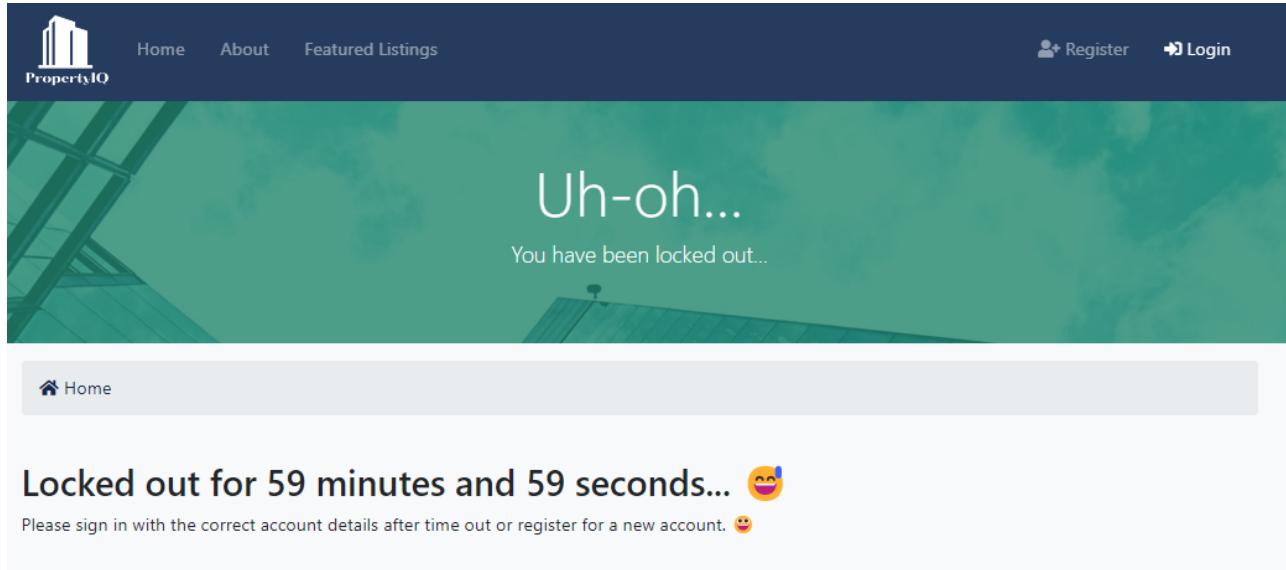


The screenshot shows the PropertyIQ login page after failed login attempts. The layout is identical to the previous screenshot, with the PropertyIQ logo, navigation links, and "Register" and "Login" buttons in the header. The main content area features a dark blue "Login" header with a right-pointing arrow icon. Below it is a red error message box containing the text "Error: Invalid credentials! Try again! You have 2 attempts left." At the bottom of the form are the "Username" field (containing "propertyIQ") and "Password" field (containing several dots), and a green "Login" button.

Login Failed (Unregistered User)

The screenshot shows the PropertyIQ registration form. At the top, there is a dark blue header with the PropertyIQ logo, "Home", "About", and "Featured Listings" links, as well as "Register" and "Login" buttons. Below the header is a "Register" button. A red error box contains the text "Error: Unregistered Account! Register with PropertyIQ instead?". The main form has fields for "First Name", "Last Name", "Username", "Email", "Password", and "Confirm Password", each with its own input field. A green "Register" button is at the bottom.

Login Failed 3 Times (Locked Out)



Update Account Info

First Name
Chong

Last Name
Wei Kang

Username
weikangg

Email
chongweikang2131@gmail.com

Password

Confirm Password

Update Account Details

Home Page

Greater Transparency for Smart Renting

Looking for a rental property in Singapore? PropertyIQ has got you covered. We provide the latest market data and trends, empowering you to make informed decisions. With PropertyIQ, finding your perfect rental has never been easier.

Keyword (Project Title, Street, etc)

Property Type

Bedrooms (Any)

Max Rental Price (All)

Max House Area (All)

Submit form

Latest Listings

\$6,000

\$4,600

\$6,200

Elliot At The East Coast

Elliot At The East Coast

Elliot At The East Coast

Copyright © 2023 PropertyIQ

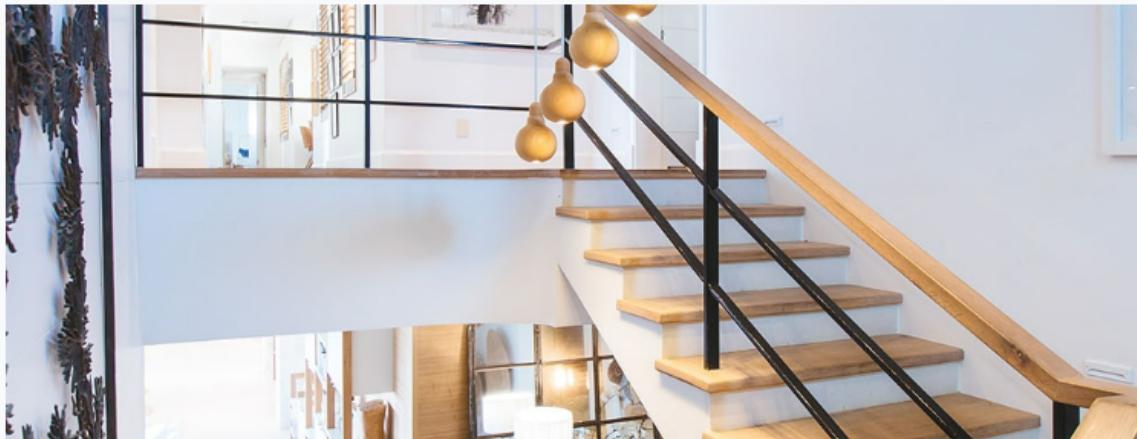
About Page

At PropertyIQ, we are dedicated to making the housing rental market in Singapore more transparent. We strive to provide relevant and accessible market data to empower individuals to make informed economic decisions.

[Home](#) / [About](#)

We Search For The Perfect Home

We provide a user-friendly and comprehensive resource for individuals looking to make informed decisions in the Singapore housing rental market. Our platform includes an intuitive interface that allows users to easily browse and compare similar properties, advanced filtering options based on individual preferences and requirements, interactive maps to easily search for rental properties based on location, and detailed property profiles that provide comprehensive information on available rental properties.



We strive to make the process of searching for the perfect home as easy and transparent as possible. Our team is dedicated to providing up-to-date information and trends in the Singapore housing rental market, empowering individuals to make informed decisions and find the best rental properties for their needs.

Our Team

— Proudly presenting Team 3.0



Aditya
CEO



Wei Kang
CTO



Don
Doc Master



John
Slides Ninja



Nicholas
Diagrams Guru

Account Dashboard (Admin)

User Dashboard

Manage your PropertyIQ account

Home / Dashboard

Welcome propertyIQ

Update Properties List Recently Viewed Properties

You have not bookmarked any properties before!

Account Dashboard (User)

User Dashboard

Manage your PropertyIQ account

Home / Dashboard

Welcome weikangg

Recently Viewed Properties

Here are the property listings that you have bookmarked before!

| Project Title | Street | Action |
|--------------------------|-----------------------|-------------------------------|
| The Daffodil | Upper East Coast Road | <button>View Listing</button> |
| Stratford Court | Bedok Ria Crescent | <button>View Listing</button> |
| The Summit | Upper East Coast Road | <button>View Listing</button> |
| Elliot At The East Coast | Elliot Road | <button>View Listing</button> |

Recently Viewed Properties Page

The screenshot shows the 'Recently Viewed Properties' page. At the top, there's a dark header bar with the PropertyIQ logo, navigation links for 'Home', 'About', and 'Featured Listings', and a user welcome message 'Welcome Weikangg' with a dropdown arrow and a 'Logout' link. Below the header is a large teal-colored banner with the title 'Recently Viewed Properties' and a subtitle 'See your recently viewed properties here!'. Underneath the banner, the main content area has a light gray header with a breadcrumb trail showing 'Home / Recently Viewed'. The main body starts with a 'Welcome weikangg' message. Below it are two green buttons: 'Dashboard' on the left and 'Clear History' on the right. A note says 'Here are the property listings that you have viewed recently!'. A table follows, listing four properties with columns for 'Project Title' and 'Street', and a 'View Listing' button for each. The properties listed are:

| Project Title | Street | |
|--------------------------|-----------------------|------------------------------|
| The Daffodil | Upper East Coast Road | View Listing |
| The Summit | Upper East Coast Road | View Listing |
| Stratford Court | Bedok Ria Crescent | View Listing |
| Elliot At The East Coast | Elliot Road | View Listing |

Search Page

The screenshot shows the PropertyIQ search interface. At the top, there's a navigation bar with the logo 'PropertyIQ', 'Home', 'About', 'Featured Listings', 'Welcome Weikangg' (with a dropdown arrow), and 'Logout'. Below the header is a large green banner with the text 'Browse Our Properties' and a subtext: 'Find your dream rental property among our extensive listings, tailored to meet your unique needs and preferences.' A search bar contains the text 'paya lebar'. Below the search bar are several dropdown filters: 'Non-landed Properties' (selected), '6' (in a dropdown menu), '< \$7,000' (in a dropdown menu), and '< 5000 Sqft' (in a dropdown menu). A teal button labeled 'Submit form' is located at the bottom of the filter section. Below this is a breadcrumb navigation: 'Home / Browse Listings / Search Results'. Three property listings are displayed in cards:

- Lotus At Paya Lebar (West Wing)**
\$5,000
Lorong 41 Geylang
Sqft: 1550 | Bedrooms: 3
- Tangerine Grove**
\$5,000
Paya Lebar Crescent
Sqft: 1550 | Bedrooms: 3
- Tangerine Grove**
\$4,200
Paya Lebar Crescent
Sqft: 1850 | Bedrooms: 3

At the bottom of the page is a dark footer bar with the text 'Copyright © 2023 PropertyIQ'.

All Listings Page (Catalogue)

Browse Our Properties

Find your dream rental property among our extensive listings, tailored to meet your unique needs and preferences.

Keyword (Project Title, Street, etc)

Property Type: Bedrooms (Any)

Max Rental Price (All): Max House Area (All)

Submit form

[Home](#) / [Browse Listings](#)



\$5,500

Thomson Rise Estate
Jalan Berjaya

Sqft: 1750 | Bedrooms: 3
Type: Detached House
3 months, 1 week

[More Info](#)



\$2,500

The Espira
Lorong L Telok Kurau

Sqft: 800 | Bedrooms: 1
Type: Non-landed Properties
3 months, 1 week

[More Info](#)



\$4,300

Hilbre28
Hillside Drive

Sqft: 1250 | Bedrooms: 3
Type: Non-landed Properties
3 months, 1 week

[More Info](#)



\$6,300

Artra
Alexandra View

Sqft: 1250 | Bedrooms: 2
Type: Non-landed Properties
3 months, 1 week

[More Info](#)



\$6,200

Artra
Alexandra View

Sqft: 1250 | Bedrooms: 3
Type: Non-landed Properties
3 months, 1 week

[More Info](#)



\$3,950

Burlington Square
Bencoolen Street

Sqft: 1250 | Bedrooms: 2
Type: Non-landed Properties
3 months, 1 week

[More Info](#)

* ... 19 20 21 22 23 24 25 26 27 ... >

Copyright © 2023 PropertyIQ

Individual Listing Page

 Home About Featured Listings Welcome PropertyIQ • Logout

Elliot At The East Coast

Elliot Road

[Home](#) / [Listings](#) / [Elliot At The East Coast](#)

[Back To Listings](#)



[Add Bookmark](#)



| | | | | | |
|--|---------------|---------|--|--------------|--------------|
| | Asking Price: | \$6,200 | | Square Feet: | 2150 SqFt |
| | Bedrooms: | 3 | | Lease Date: | Jan. 1, 2023 |

Recommendations

\$4,000

Riviera Residences
Riviera Drive
Sqft: 1700 Bedrooms: 3
Type: Non-landed Properties
3 months, 1 week
[More Info](#)

\$4,200

The Summit
Upper East Coast Road
Sqft: 1700 Bedrooms: 3
Type: Non-landed Properties
3 months, 1 week
[More Info](#)

\$5,400

Balcon East
Upper East Coast Road
Sqft: 2900 Bedrooms: 3
Type: Non-landed Properties
3 months, 1 week
[More Info](#)



3.2 Hardware Interfaces

Supported Device types and requirements:

1. Desktop Computer/Laptops: Windows 10 and above, MacOS Catalina and above
2. Mobile phones: Android 10 and above, IOS 10 and above
3. Recommended Ram: 4 GB and above
4. Web browsers which supports HTML, CSS and JavaScript
5. Internet connection capability to transmit and receive data from the server.

3.3 Software Interfaces

The PropertyIQ web application utilises a back-end server and a database to handle all the system features implementation. The back-end server is built and implemented using the Django framework. The PropertyIQ app development team adopts PostgreSQL as the database for the web application to store user and property information.

To provide users with accurate and up-to-date information on housing rentals, PropertyIQ will need to establish connections with two key APIs: the URA API and the Google Maps API.

The URA API will serve as the primary source of data on housing rentals, providing PropertyIQ with detailed information on rental properties, such as property type, location, and rental rates. PropertyIQ will use the URA API to fetch and display this data, ensuring that users have access to reliable and accurate information.

In addition, PropertyIQ will leverage the power of the Google Maps API to display the locations of available rental properties on an interactive map, making it easy for users to visualise the location of the property. The Google Maps API will allow users to interact with the map, zoom in and out, and explore different areas of interest.

3.4 Communications Interfaces

The PropertyIQ web application adheres to a client-server communication model, utilising a REST-styled API provided by the back-end server. HTTPS protocol ensures secure communications with the APIs, while the client-server interactions involve both GET and POST requests.

4. System Features

4.1 User Management

1. Guest users must be able to browse for property but will be limited on functionality without an Account.
 - 1.1. Guest users must not be able to bookmark properties.
 - 1.2. Guest users must not be able to save any recently viewed properties.
 - 1.3. Guest users must not be able to view any recently viewed properties.
 - 1.4. Guest users cannot modify account details without first registering for an account.
2. Users must be able to register for a new Account.
 - 2.1. System must create a new Account for the user.
 - 2.1.1. System must auto-generate a unique ID to uniquely identify each individual user.
 - 2.1.2. System must take First Name input.
 - 2.1.3. System must take Last Name input.
 - 2.1.4. System must take Username input.
 - 2.1.5. System must take Password input.
 - 2.1.6. System must take Email input.
 - 2.1.7. System must prompt the user to choose another username if the username is already taken.
 - 2.1.8. System must prompt the user to use another password if the password didn't adhere to the requirements.
 - 2.1.8.1. Passwords must contain at least 1 special character (!@#\$%^&*_).
 - 2.1.8.2. Passwords must contain at least 1 uppercase character.
 - 2.1.8.3. Passwords must contain at least 1 lowercase character.
 - 2.1.8.4. Passwords must contain at least 1 digit.
 - 2.1.8.5. Passwords must be at least 8 characters long.
 - 2.1.9. System must prompt the user to use another email if it is already taken.
 3. Users must be able to log in to their Account once validated.
 - 3.1. System must validate the user's Username.
 - 3.2. System must validate the user's password.
 4. Users must be able to manage their profiles.
 - 4.1. Users must be able to update their personal information.
 - 4.1.1. Users must be able to update their First Name.
 - 4.1.2. Users must be able to update their Last Name.
 - 4.1.3. Users must be able to update their Username.
 - 4.1.3.1. System must prompt the user to choose another username if the username is already taken.
 - 4.1.4. Users must be able to change their Password.
 - 4.1.5. Users must be able to change their Email.
 - 4.1.5.1. System must prompt the user to use another password if the new Password didn't adhere to the requirements.
 - 4.1.5.1.1. Passwords must contain at least 1 special character (!@#\$%^&*_).

- 4.1.5.1.2. Passwords must contain at least 1 uppercase character.
- 4.1.5.1.3. Passwords must contain at least 1 lowercase character.
- 4.1.5.1.4. Passwords must contain at least 1 digit.
- 4.1.5.1.5. Passwords must be at least 8 characters long.
- 4.1.6. Users must be able to update their email.
 - 4.1.6.1. System must prompt the user to use another email if it is already taken.
- 4.2. System must be able to manage the users' saved information.
 - 4.2.1. System must be able to store users' recently viewed properties.
 - 4.2.2. System must be able to delete all of the user's recently viewed properties.
 - 4.2.3. System must be able to store users' bookmarked properties.
 - 4.2.4. System must be able to delete users' bookmarked properties.
- 4.3. System must be able to display the users' saved information.
 - 4.3.1. System must be able to display users' recently viewed properties.
 - 4.3.2. System must be able to display users' bookmarked properties.

4.2 Search Query

- 1. System must be able to accept search queries from the user.
- 2. Users shall use the filter function to refine their query if required.
 - 2.1. System must be able to filter the Properties by Property Type.
 - 2.2. System must be able to filter the Properties by the Number of Bedrooms.
 - 2.3. System must be able to filter the Properties by Rental Price.
 - 2.4. System must be able to filter the Properties by Area.
 - 2.5. System must be able to filter the Properties by Keywords.
- 3. System must display relevant information from user queries and filters used

4.3 Property Details

- 1. System must retrieve all Property details from the URA API.
 - 1.1. System must only allow the Admin to update the list of properties displayed.
 - 1.2. System must update all users when new property listings are retrieved from the URA API through their registered email.
- 2. System must display relevant Property details.
 - 2.1. System must display the Property Title.
 - 2.2. System must display the Property Street.
 - 2.3. System must display the Property Type.
 - 2.4. System must display the Property Rental Price.
 - 2.5. System must display the number of bedrooms of the Property.
 - 2.6. System must display the Lease Date of the Property.
 - 2.7. System must display the Area of the Property.
 - 2.8. System must display Trends of the selected Property.
 - 2.8.1. System must display the Nearby Trend of nearby properties.
 - 2.8.2. System must display the Historical Trend of the project of that property.
 - 2.9. System must display Recommendations for alternative Properties with respect to the selected property to the user.

3. System must be able to display the location of Properties on a map.
 - 3.1. System must be able to display the location of each individual Property on the map.
 - 3.2. System must be able to display the location of the Recommended Properties on the map.
 - 3.3. System must be able to display relevant details of the Properties on the map.
 - 3.3.1. System must display the Property Title.
 - 3.3.2. System must display the Property Street.
 - 3.3.3. System must display the Property Rental Price.
4. System must display a Catalogue of the queried properties.

5. Other Nonfunctional Requirements

5.1 Performance Requirements

1. System admin must be able to update the list of properties with new data within 5 minutes.
2. System must have all other features loaded within 5 seconds.
 - 2.1. All links must open within 5 seconds.
 - 2.2. Recommendations must be calculated within 5 seconds.
 - 2.3. Nearby trends must be calculated within 5 seconds.
 - 2.4. Historical trends must be calculated within 5 seconds.
 - 2.5. The map must be displayed within 5 seconds.
 - 2.6. Pictures must be displayed within 5 seconds.
3. Personal user information must be updated in the database within 3 seconds.
4. Search query results should be displayed within 3 seconds.

5.2 Maintainability Requirements

1. After a system reboot, the full system functionality must be restored within 5 minutes.

5.3 Security Requirements

1. System must impose a timeout of 1 hour if the user enters the wrong password more than 3 times.
2. System must mask the password on the login page.
3. System shall handle exceptions.
 - 3.1. A pop-up message shall be displayed in the event of a Password mismatch when registering an Account.
 - 3.2. A pop-up message shall be displayed in the event of a Password mismatch when updating the password.
 - 3.3. A pop-up message shall be displayed in the event of a Username being unavailable.
 - 3.4. A pop-up message shall be displayed in the event of an Email being unavailable.
 - 3.5. A pop-up message shall be displayed in the event of an invalid Email.
4. System must not leak any user information.
 - 4.1. Users must only have access to personal account data.
5. System must make use of an encrypt hashing algorithm to encrypt the users' passwords.

5.4 Usability Requirements

1. A new user must be able to take less than 3 minutes to enter a simple search query.
2. System must have a responsive design and can be displayed on multiple screen sizes.

5.5 Reliability Requirements

1. System must have an uptime of 95% at all times.

5.6 Scalability Requirements

1. System must be able to accept 1000 concurrent user requests at any given time.
2. System must always be ready to accept new functionality.
3. System design should adopt the modular programming concept using the open-closed principle.

5.7 Correctness Requirements

1. System must ensure that the correct properties are displayed to the user based on the searched keywords.
2. System must ensure that the user's account information is always accurately displayed.
 - 2.1. System must accurately display the username registered by the user.

Appendix A: Data Dictionary

| Term | Definition |
|------------|---|
| System | The PropertyIQ web application. |
| PropertyIQ | The name of the web application that individuals can use to source for up-to-date information and trends in the Singapore housing rental market. |
| Guest | A person who does not have a registered account and is using the services provided by PropertyIQ. |
| Admin | A PropertyIQ employee with access to all website functionalities and the ability to manage user accounts and property data. This individual will also be able to update the property listings displayed on the web application when required. |
| User | A person who has a registered account and is using the services provided by PropertyIQ. |
| Account | The profile of the user in our system that contains the details (User ID, Name, Username, Email, Password) associated with them. |
| User ID | The identifier used to uniquely identify each user. The ID will automatically be generated by the system every time a new user is created. |
| First Name | The actual first name of the user. |
| Last Name | The actual last name of the user. |
| Username | A unique name that is associated with the user and chosen by the user for login purposes. |
| Password | A string of characters (letters, numbers, special symbols) that allow the user to access their account. The string must be a strong password and meet certain requirements. |
| Email | The email address of the user |
| Project | The name of the property project given by the URA API. |
| Catalogue | A list of all available rental properties including property details such as project title, street, number of bedrooms, rental price, etc. |
| Database | A structured collection of data stored in an organised manner, used to |

| | |
|------------------|--|
| | store user data and information of properties on PropertyIQ's backend. It allows for efficient retrieval and manipulation of information. |
| Property | A rental flat that is available for rent |
| Location | The geographic position of a Property based on its latitude and longitude coordinates. |
| Property Title | The title of the project of that particular property |
| Property Street | The street where the property is located |
| Property Type | The classified type of the real estate |
| Rental Price | The cost associated with renting a specific property |
| Lease Date | The lease commencement date of the rental flat. |
| Area | The floor area range of the rented property in square feet. |
| Keywords | A search term or phrases entered by users to find relevant properties based on the properties' project titles or street. |
| Historical Trend | A plot showing the past rental prices for the rental flat of a particular Project and the forecasted rental prices 4 quarters ahead. |
| Nearby Trend | A plot showing the past rental prices and forecasted rental prices 4 quarters ahead for similar properties located close to a specific Property. |
| Recommendations | The suggestions for alternative Properties near a specific flat, which are based on factors such as location and prices. |
| Map | A visual representation of a geographical area, showing the location of the selected Property and its nearby Properties. |
| Google Maps API | An interface that allows developers to access Google Maps' functionality within the application to view the locations of the different Properties. Google Maps is a web mapping platform and consumer application offered by Google. |
| URA API | URA API is an interface provided by the Urban Redevelopment Authority (URA) of Singapore, which allows developers to access and use URA data in their applications. This data includes information on property transactions, property prices, property locations, and other real estate information. |

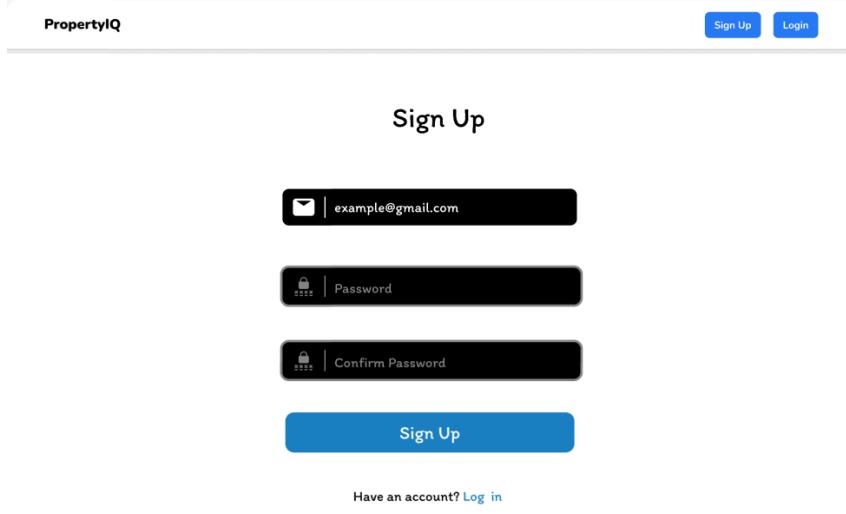
Appendix B: Useful Links

GitHub Source Code Link: <https://github.com/weikangg/PropertyIQ>

Youtube Demo Video Link: <https://www.youtube.com/watch?v=qG7PlrgPGpg>

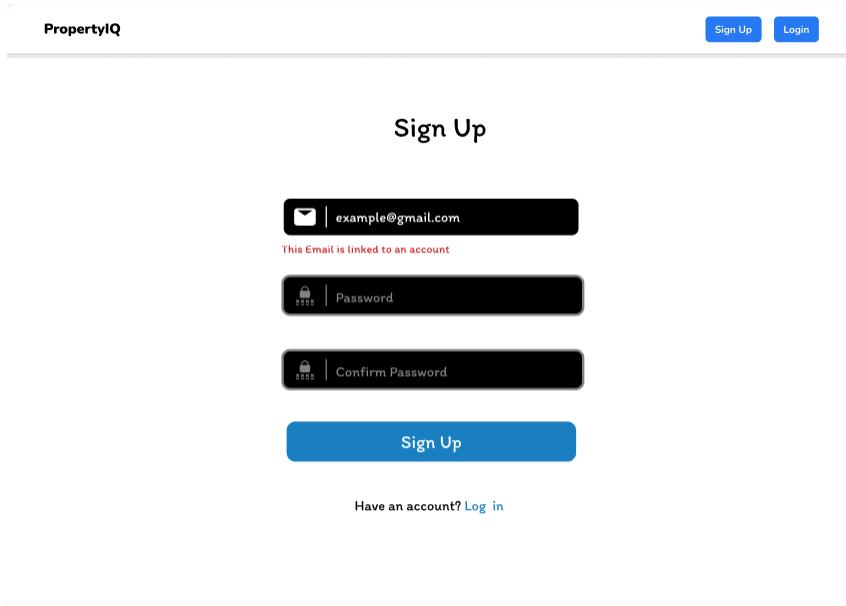
Appendix C: Initial User Interfaces Mockup

Sign Up



The mockup shows a sign-up form for the PropertyIQ platform. At the top left is the "PropertyIQ" logo. To the right are two blue buttons: "Sign Up" and "Login". The main form area has a title "Sign Up" centered above three input fields. Each field consists of a small icon followed by a text input box. The first field is for an email address, showing "example@gmail.com". The second is for a password, showing "*****". The third is for a confirm password, also showing "*****". Below these fields is a large blue "Sign Up" button. At the bottom of the form, a link reads "Have an account? [Log in](#)".

Sign Up Failed (Email is linked to an account)



This mockup shows the same sign-up form as the previous one, but with an error message. The "Sign Up" button is disabled and grayed out. A red error message "This Email is linked to an account" is displayed above the email input field. The rest of the form (password and confirm password fields) and the "Sign Up" button below it are visible but inactive.

Sign Up Failed (Passwords do not match)

The screenshot shows the 'Sign Up' page of the PropertyIQ website. At the top, there is a navigation bar with the 'PropertyIQ' logo, a 'Sign Up' button, and a 'Login' button. Below the navigation bar, the word 'Sign Up' is centered. There are three input fields: an email field containing 'example@gmail.com', a password field containing '12345678', and a confirm password field also containing '12345678'. Below the fields, a red error message reads 'Passwords do not match'. At the bottom is a large blue 'Sign Up' button, and below it, a link 'Have an account? Log in'.

Sign Up Failed (Passwords are not strong enough)

The screenshot shows the 'Sign Up' page of the PropertyIQ website. At the top, there is a navigation bar with the 'PropertyIQ' logo, a 'Sign Up' button, and a 'Login' button. Below the navigation bar, the word 'Sign Up' is centered. There are three input fields: an email field containing 'example@gmail.com', a password field containing '12345678', and a confirm password field also containing '12345678'. Below the fields, a red error message reads 'Password is not strong enough'. At the bottom is a large blue 'Sign Up' button, and below it, a link 'Have an account? Log in'.

Sign Up Failed (Password or Username is missing)

The screenshot shows a "Sign Up" form with three input fields. The first field has an envelope icon and contains "example@gmail.com". The second field has a lock icon and contains "Password". The third field has a lock icon and contains "Confirm Password". Below the fields, a red error message says "Missing Username/Password". At the bottom is a blue "Sign Up" button.

Sign Up

✉ | example@gmail.com

🔒 | Password

🔒 | Confirm Password

Missing Username/Password

Sign Up

Have an account? [Log in](#)

Sign Up (User Information)

The screenshot shows a "User Information" form with three input fields. The first field has a person icon and contains "First Name". The second field has a person icon and contains "Last Name". The third field has a person icon and contains "Username". At the bottom is a blue "Continue" button.

User Information

👤 | First Name

👤 | Last Name

👤 | Username

Continue

Sign Up (User Information - Username is taken)

The screenshot shows the 'User Information' section of the sign-up form. It includes fields for First Name, Last Name, and Username. A message 'Username is taken' is displayed below the Username field, and a 'Continue' button is present.

PropertyIQ

User Information

First Name

Last Name

Username

Username is taken

Continue

Login

The screenshot shows the 'Log In' section of the login form. It includes fields for Email and Password, and links for 'Forgot password?' and 'Don't have an account? Sign Up'.

PropertyIQ

Log In

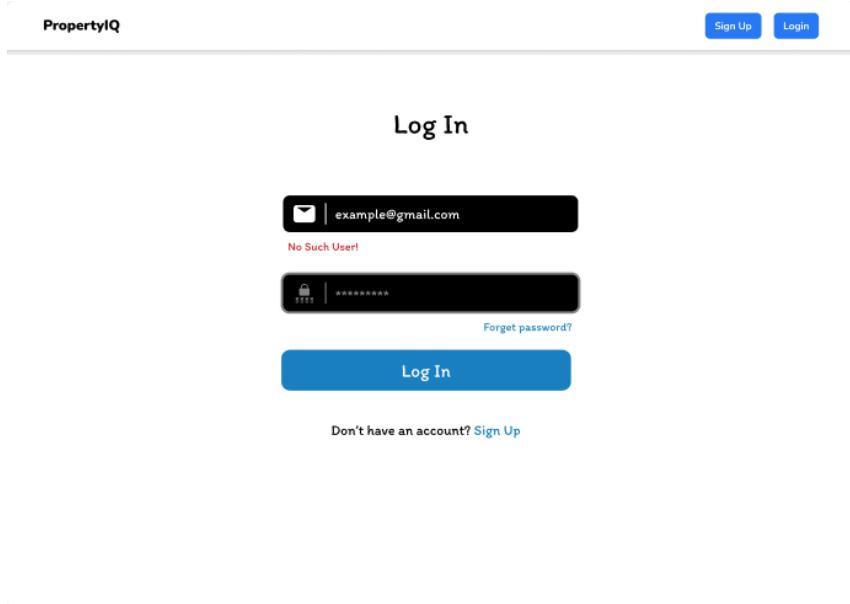
example@gmail.com

Forgot password?

Log In

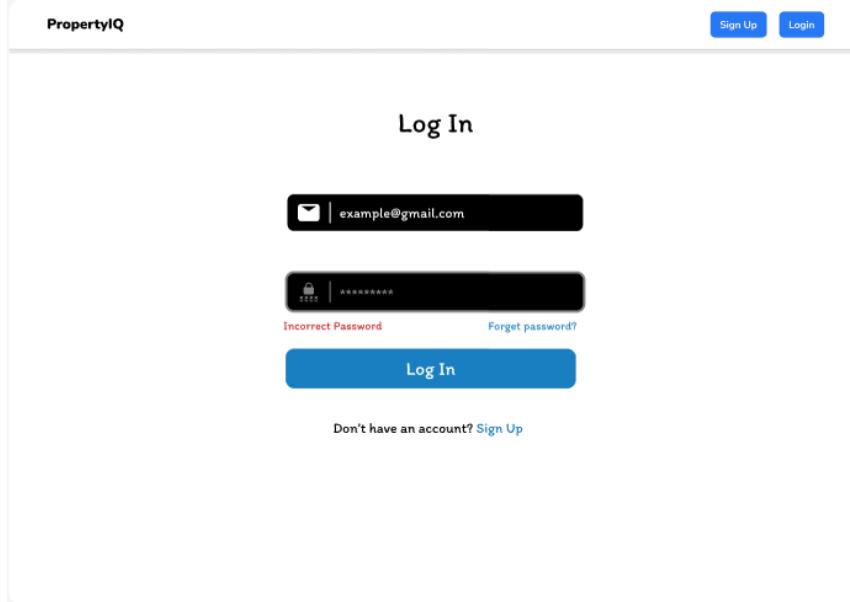
Don't have an account? [Sign Up](#)

Login Failed (No such user)



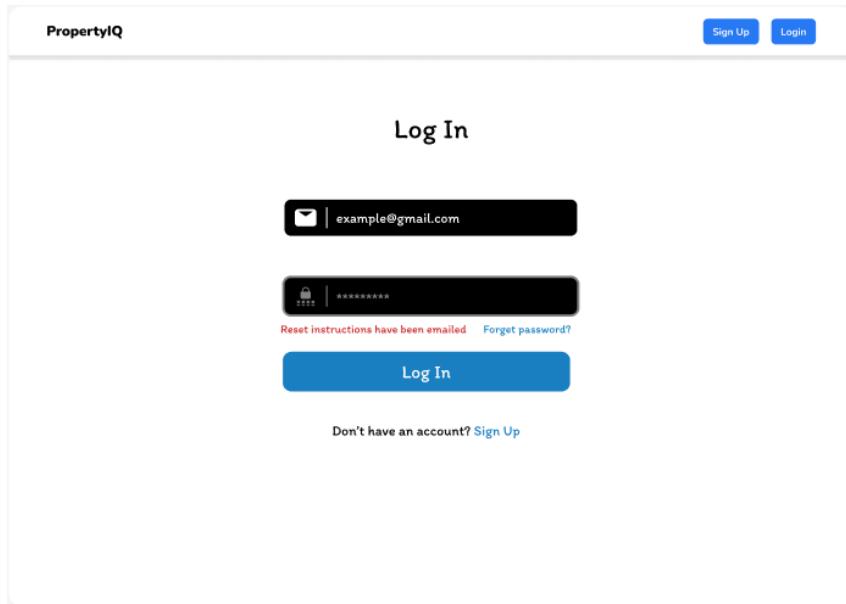
The screenshot shows a login page for 'PropertyIQ'. At the top, there are 'Sign Up' and 'Login' buttons. Below them is a 'Log In' button. The main area contains two input fields: one for email ('example@gmail.com') and one for password ('*****'). A red error message 'No Such User!' is displayed above the password field. Below the password field is a 'Forgot password?' link. At the bottom of the form is another 'Log In' button.

Login Failed (Incorrect Password)



The screenshot shows a login page for 'PropertyIQ'. At the top, there are 'Sign Up' and 'Login' buttons. Below them is a 'Log In' button. The main area contains two input fields: one for email ('example@gmail.com') and one for password ('*****'). A red error message 'Incorrect Password' is displayed above the password field. To the right of the password field is a 'Forgot password?' link. At the bottom of the form is another 'Log In' button.

Login Failed (Forgot Password)



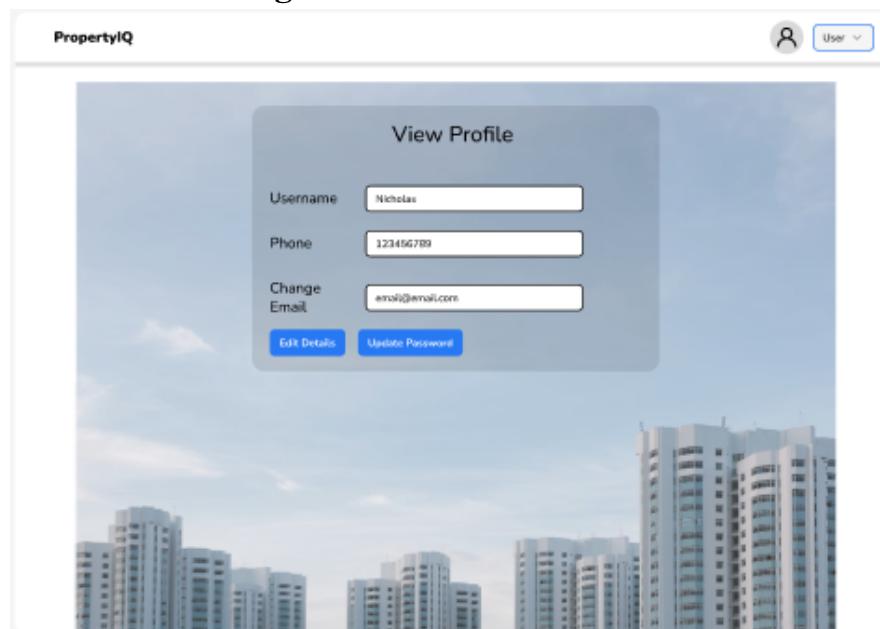
Landing Page (Guest / User access)

The image displays two versions of the PropertyIQ landing page. Both versions feature a large banner at the top with the text "Our aim is to provide housing data transparency" and a city skyline background.

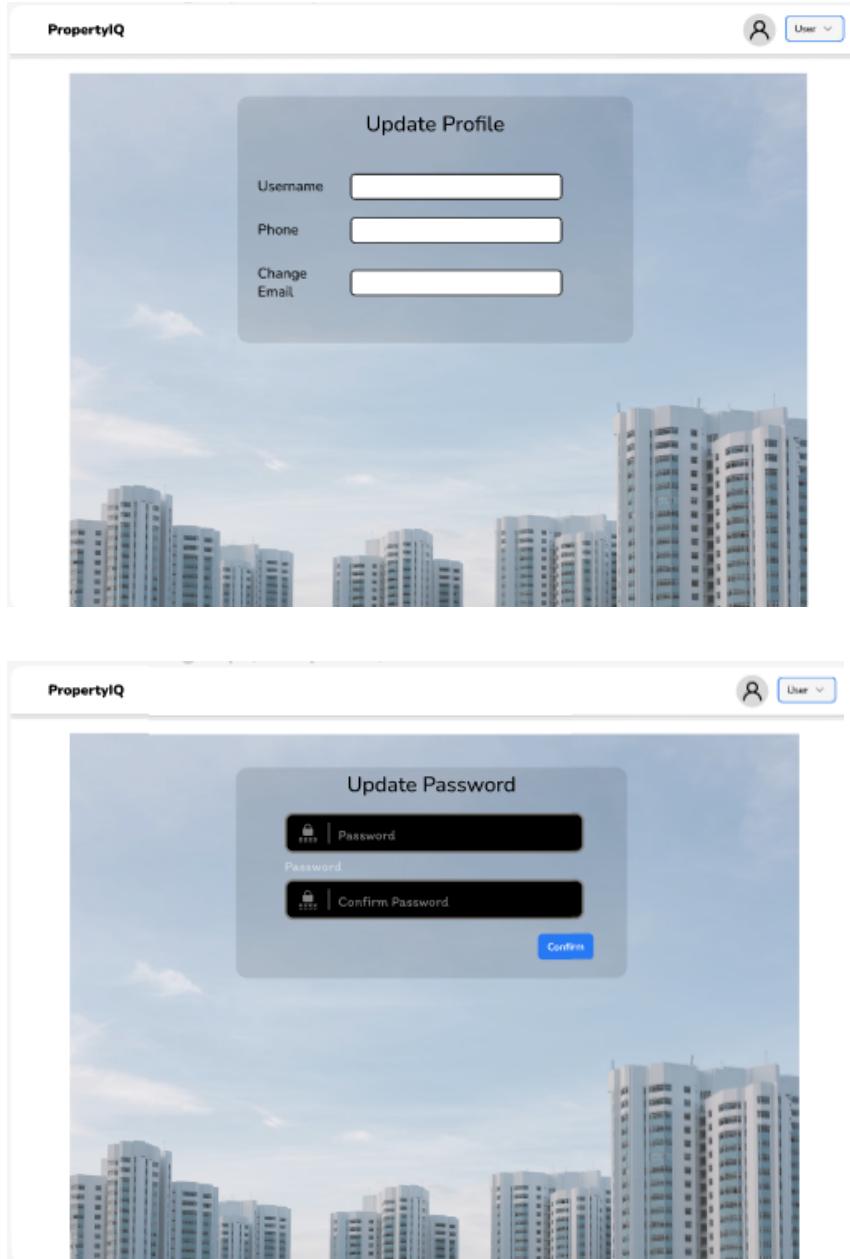
The top version is for "Guest" access. It shows a user profile icon for "Nicholas" with a dropdown menu containing "View Profile", "View Bookmarks", and "View Search History". Below the banner is a search bar labeled "Search Location" and a filter panel with dropdowns for "Location", "Distance", "Property Type", "Price", and "Area". A dropdown menu under "Location" lists "Ang mo kio", "Bukit batok", and "Choa Chu Kang", with "Ang mo kio" currently selected.

The bottom version is for "User" access. It shows a user profile icon for "User" with a dropdown menu containing "View Profile", "View Bookmarks", and "View Search History". Below the banner is a search bar labeled "Search Location" and a filter panel with dropdowns for "Location", "Distance", "Property Type", "Price", and "Area". A dropdown menu under "Location" lists "Ang mo kio", "Bukit batok", and "Choa Chu Kang", with "Ang mo kio" currently selected.

User Account Page



User Account Update (Profile / Password) Page



The image shows two screenshots of a web application interface for 'PropertyIQ'. Both screenshots feature a header with the 'PropertyIQ' logo, a user icon, and a 'User' dropdown menu. The background of both pages is a photograph of a city skyline with several high-rise residential or office buildings against a clear blue sky.

Update Profile

Username

Phone

Change Email

Update Password

| Password

Password

| Confirm Password

Confirm

Bookmark & History Page

The screenshot displays the 'Bookmark' section of the PropertyIQ application. At the top, there is a large button labeled 'Bookmark'. Below it, two property listings are shown in a grid format:

| Property Type | Price | Address | Bedrooms | Bathrooms | Area (Sqm) | Floor |
|---------------|-------------|---------------------|----------|-------------|------------|----------|
| HDB | \$950/month | Ang Mo Kio Avenue 4 | 1 Room | 1 Bathroom | 67 Sqm | Floor 12 |
| HDB | \$950/month | Ang Mo Kio Avenue 4 | 1 Room | 1 Bathrooms | 67 Sqm | Floor 12 |

Each listing includes a small thumbnail image of the interior, a green bookmark icon, and a 'View Details' button.

The screenshot displays the 'History' section of the PropertyIQ application. At the top, there is a large button labeled 'History'. Below it, two property listings are shown in a grid format, identical to the ones in the Bookmark section:

| Property Type | Price | Address | Bedrooms | Bathrooms | Area (Sqm) | Floor |
|---------------|-------------|---------------------|----------|-------------|------------|----------|
| HDB | \$950/month | Ang Mo Kio Avenue 4 | 1 Room | 1 Bathroom | 67 Sqm | Floor 12 |
| HDB | \$950/month | Ang Mo Kio Avenue 4 | 1 Room | 1 Bathrooms | 67 Sqm | Floor 12 |

Each listing includes a small thumbnail image of the interior, a green bookmark icon, and a 'View Details' button.

Search Query Page

PropertyIQ Location Distance Property Type Price Area Nicholas

Ang mo kio ✓
Bukit batok
Choa Chu Kang

HDB
\$950/month
Ang Mo Kio Avenue 4
1 Room 1 Bathroom 67 Sqm Floor 12

HDB
\$1350/month
Ang Mo Kio Avenue 4
1 Room 1 Bathroom 80 Sqm Floor 10

Detailed Query Page

PropertyIQ

Ang Mo Kio

348 Ang Mo Kio Avenue 4

Unit Details

| | |
|--------------------|--|
| Project | |
| Street | |
| Property Type | |
| District | |
| District | |
| Number of Bedrooms | |
| Rent | |
| Area (Square ft) | |
| Area (Square m) | |

Description

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Nunc id egestas quam, at egestas dolor. Duis vulputate nisi et facilisis interdum. Interdum et malesuada fames ac ante ipsum primis in faucibus. Praesent cursus nunc vitae leo lacinia venenatis. Aliquam commodo massa nec auctor sollicitudin. In hac habitasse platea dictumst. Sed rutrum iaculis ante, id vestibulum urna hendrerit eu. Integer sapien neque, consectetur nec suscipit nec, rutrum vitae augue.

Sed ut nunc quis leo dictum dignissim eu ac augue. Praesent in lectus facilisis, tristique lorem id, egestas quam. Sed aliquet orci id nulla accumsan gravida. Cras eget consectetur magna. Curabitur sit amet elementum elit.

Nearby Trends

Historical Trend

Recommendations Near You

Sort by:

| | |
|--|--|
|  HDB \$1350/month Ang Mo Kio Avenue 4 1 Room 1 Bathroom 60 Sqm |  HDB \$1358/month Ang Mo Kio Avenue 4 1 Room 1 Bathroom 60 Sqm |
|--|--|