Software Design Document

<Sydney Stayz>

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# System Vision

## Problem Background

Recently, the travel and hospitality industry had experienced transformations with the development of Airbnb, a platform which offers an array of accommodation options for individuals seeking alternatives to traditional hotels. The introduction of Airbnb has led to a rise in listings within Sydney, creating a need for comprehensive insights into the local market. As the number of Airbnb’s in Sydney continues to rise, the need for a user-friendly, data-driven solution becomes increasingly apparent, something which allows property owners, guests, and stakeholders to navigate the large amount of data available on the platform with ease.

The Sydney Stayz project strives to address this need by developing an intuitive data analysis tool tailored to the Sydney area. This tool is poised to leverage a graphical user interface to delve into data derived from the collection of Airbnb listings. The main goal is to allow users to make informed decisions by gaining insights into market questions, like pricing, customer opinions related to cleanliness and amenities, occupancy rates, and the popularity of stay options across various suburbs.

## System Overview

Suburb Explorer feature

The Suburb Explorer feature is an element of the Sydney Stayz Application data analysis and visualisation tool, tailored to give users insightful information about Airbnb listings within specific suburbs in Sydney. This feature allows users to make decisions by offering a understanding of metrics and trends seen with different localities.

Key Functionality:

* Selection Parameters: Users can input a period of dates and choose a suburb of interest. This selection allows users to see data for their desired timeframe and location.
* Metrics Presentation: Upon selection, the tool retrieves and presents metrics for the selected suburb. These metrics include the median price of listings, active listings, and the occupancy rate.
* Interactive Interface: The user-friendly interface allows users to explore different suburbs and timeframes, enabling seamless exploration of the Airbnb market in Sydney.

Price Distribution Chart Feature

The Price Distribution Chart tool is designed to offer users insights into the pricing of Airbnb listings across Sydney during specific timeframes. By presenting the distribution of property prices, this feature helps users to identify pricing trends, enabling them to make better informed booking decisions.

Key Functionality:

* Date Range Selection: Users can specify a period of dates for analysis, allowing them to focus on specific dates.
* Price Range: Users can specify a range of prices to focus on to narrow down the data to a specific price range of interest
* Visual Representation: The feature creates graphical representations of the distribution of property prices using a bar chart. These visualisations highlight the range of prices, providing users with clear understandings of the pricing.
* Decision Support: The insights gained from the price distribution chart can help guide users in identifying optimal booking times based on pricing.

Keyword Search Feature

The Keyword Search feature enables efficient property discovery based on specific amenities and features for users. Users can input keywords to filter listings during chosen timeframes.

Key Functionality:

* Keyword Input: Users can input keywords related to amenities they desire during their stay, like as "air-conditioning," "pool," or "pet."
* Listing Retrieval: The tool retrieves and presents listings which match the specified keywords.

Cleanliness Comment Analyser Feature

The Cleanliness Comment Analyser feature analyses user comments related to cleanliness from customer reviews. This feature provides insights into guest feelings regarding cleanliness, influencing to more informed decision-making for potential guests.

Key Functionality:

* Comment Analysis: The feature identifies customer reviews related to predefined cleanliness-related keywords, such as "clean," "tidy," and "hygienic."
* Insight Generation: Property owners can use this data to improve property cleanliness standards, while guests can determine the cleanliness before booking.

Top Rated Suburbs and Property Type Feature

The Top-Rated Suburbs and Properties feature gives insights by the most highly rated suburbs and properties. This analysis gives both guests and property owners information about popular areas and accommodations in Sydney.

Key Functionality:

* Rating Analysis: The tool analyses user ratings to find the top-rated suburbs and properties during the chosen period.
* Decision Guidance: Guests gain insights into highly sought-after locations and properties, whilst property owners can adjust their accommodations based on user preferences.

## Potential Benefits

The Sydney Stayz tool offers potential benefits within the Sydney Airbnb market. These benefits stem from the tool's features which provide insights into the current short-term rental market:

More Informed Decision-Making:

* Suburb Explorer: Users can make informed decisions based on metrics about specific suburbs, this helps them choose the most suitable accommodation or helps to optimise their property listings.
* Price Distribution Chart: Users can identify price trends, allowing them to plan trips during cheaper periods of the year.
* Keyword Search: Users can find properties that have their desired amenities, improving their booking experience.

Enhanced Guest Experience:

* Keyword Search: Users can discover properties that align with their preferences more easily, leading to a better holiday experience.
* Top Rated Suburbs and Property Type: Users can choose highly rated locations and accommodations, making it easier to find areas more people find appealing.

Strategic Insights:

* Top Rated Suburbs and Property Type: Property owners can identify stay trends and preferences, guiding their investment strategies.
* Price Distribution Chart: Property owners can adapt pricing strategies based on trends, maximising their potential revenue.

Time Saving:

* Suburb Explorer: Users can quickly access metrics for specific suburbs and timeframes, saving time when trying to find a property to stay at.
* Keyword Search: Users can find properties with their desired amenities, making the search process easier.

Competitive Advantage:

* Property owners can gain a competitive advantage by positioning their offerings with guest preferences and current market trends.

# Requirements

## User Requirements

For the unique folks who make up our audience – be it the passionate Airbnb property owners in Sydney, the eager travellers searching for their next Airbnb adventure, or the analytical stakeholders exploring the Airbnb Sydney market – we have sketched out the following expectations:

1. **Property Owners**:

* An interactive map of Sydney's vibrant neighbourhoods to keep an eye on local trends and tailor their offerings accordingly.
* A candid mirror to their property's cleanliness, reflecting guest reviews.
* A glimpse into the most-loved suburbs and accommodations, guiding their next steps.
* Insights into the heartbeat of Sydney's Airbnb pricing, helping them strike the right balance.

1. **Guests**:

* A toolbox to find properties fitting their unique desires, whether it's a Jacuzzi or a sunlit reading nook.
* A virtual tour guide sharing the ins and outs of Sydney's suburbs, helping them choose the perfect stay.
* A crystal ball revealing the highs and lows of Sydney's Airbnb prices.
* A compass pointing to the crème de la crème of suburbs and properties.

1. **Stakeholders**:

* A treasure trove of data offering a panoramic view of Sydney's Airbnb landscape.
* A detective's toolkit to sift through the numbers and unveil actionable narratives about the market.

## Software Requirements

R1. **Suburb Explorer Feature**:

- R1.1 The tool shall allow users to input a period of dates.

- R1.2 The tool shall enable users to select a suburb of interest.

- R1.3 The tool shall retrieve metrics like median price, active listings, and occupancy rate for the selected suburb.

R2. **Price Distribution Chart Feature**:

- R2.1 The tool shall provide a date range selection functionality.

- R2.2 The feature shall graphically represent the distribution of property prices.

R3. **Keyword Search Feature**:

- R3.1 The tool shall accept keyword input from users.

- R3.2 The tool shall display listings matching the specified keywords.

R4. **Cleanliness Comment Analyser Feature**:

- R4.1 The feature shall identify customer reviews using predefined cleanliness-related keywords.

- R4.2 The tool shall provide insights based on the analysis.

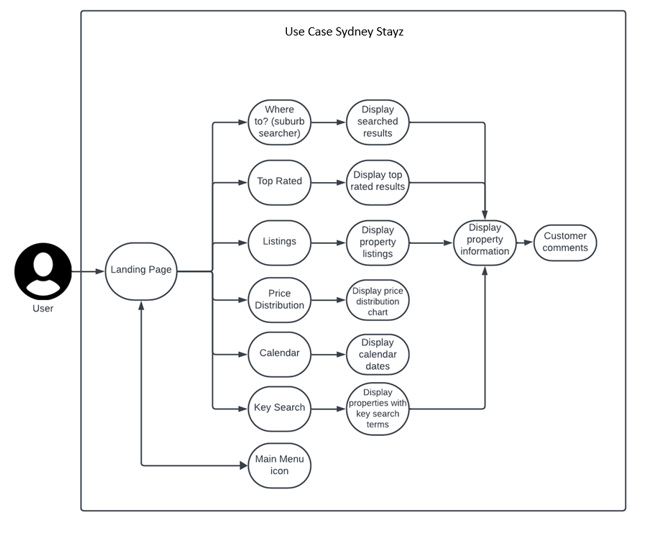
R5. **Top Rated Suburbs and Property Type Feature**:

- R5.1 The tool shall analyse user ratings to identify top-rated suburbs and properties.

- R5.2 The tool shall provide insights based on the rating analysis.

## Use Cases & Use Case Diagrams

Use case for Sydney Stayz



**Use Cases Diagram:**

Visualize a diagram with the following interactions:

* **Guest (Actor)**:
* Search for Airbnb Properties Using Keywords
* Explore Suburbs with the Suburb Explorer
* View Price Distribution Chart for a Date Range
* **Property Owner (Actor)**:
* Analyse Property Cleanliness Feedback
* Explore Top Rated Suburbs and Property Types
* Analyse Price Distribution for a Date Range

**Detailed Use Cases:**

**Use Case ID:** UC-001  
**Use Case Name:** Search for Airbnb Properties Using Keywords  
**Brief Description:** Guests can input keywords to find specific Airbnb properties that match their requirements.  
**Actors:** Guest  
**Flow of Events:**

1. Guest opens the tool.
2. Uses the keyword search feature to input specific amenities or property features.
3. A list of properties that match the keywords is displayed.
4. Guests can select a property to view detailed information.

**Triggers:** Guest's intent to find a property based on specific amenities/features.

**Preconditions:**  
Listings with the desired keywords are available.

**Postconditions:**  
Guest is presented with a list of properties that match the keywords.

**Alternate Flow:**  
If no properties match the keywords, a message is displayed suggesting alternative keywords or properties.

**Use Case ID:** UC-002  
**Use Case Name:** Explore Suburbs with the Suburb Explorer  
**Brief Description:** Guests can explore different suburbs to get a feel for the amenities, attractions, and properties available.  
**Actors:** Guest  
**Flow of Events:**

1. Guest accesses the Suburb Explorer feature.
2. The tool presents a map or list of suburbs with relevant data such as amenities, attractions, and top properties.
3. Guest can select a suburb to delve deeper into what it offers.
4. Listings, attractions, and any relevant data about the selected suburb are displayed.

**Triggers:** Guest's intent to familiarize themselves with various suburbs.  
**Preconditions:**  
Database contains data regarding different suburbs.

**Postconditions:**  
Guest has a better understanding of what each suburb offers.

**Alternate Flow:**  
If data for the selected suburb is unavailable, a message informs the guest and suggests exploring other suburbs.

**Use Case ID:** UC-003  
**Use Case Name:** View Price Distribution Chart for a Date Range  
**Brief Description:** Guests can view a chart that displays the distribution of property prices for a specific date range.  
**Actors:** Guest  
**Flow of Events:**

1. Guest selects the date range they are interested in.
2. Tool fetches and displays a distribution chart showing the range of property prices for the selected date range.
3. Guests can interact with the chart, possibly hovering over data points for detailed information.

**Triggers:** Guest's intent to understand property pricing for their planned stay dates.  
**Preconditions:**

The tool has access to pricing data for the selected date range.  
**Postconditions:**  
Guest gains insights into property pricing for the selected dates.  
**Alternate Flow:**  
If pricing data for the selected dates is unavailable, the tool notifies the guest and suggests alternate date ranges.

**Use Case ID:** UC-004  
**Use Case Name:** Analyse Property Cleanliness Feedback  
**Brief Description:** Property owners can analyse guest feedback related to the cleanliness of their properties.  
**Actors:** Property Owner  
**Flow of Events:**

1. Property owner logs into the tool.
2. Navigates to the Cleanliness Comment Analyser.
3. Tool displays feedback related to cleanliness for the owner's properties.
4. Property owner reviews feedback to identify areas of improvement.

**Triggers:** Property owner's desire to understand guest feedback on cleanliness.  
**Preconditions:**  
There are reviews for the property owner's listings.

**Postconditions:**  
Property owner has clarity on cleanliness feedback.  
**Alternate Flow:**  
If there are no cleanliness-related reviews for the properties, a message informs the property owner.

**Use Case ID:** UC-005  
**Use Case Name:** Explore Top Rated Suburbs and Property Types  
**Brief Description:** Property owners and guests can view the top-rated suburbs and property types based on user ratings.  
**Actors:** Property Owner, Guest  
**Flow of Events:**

1. User accesses the Top-Rated Suburbs and Property Type feature.
2. Tool displays a ranked list of suburbs and property types based on user ratings.
3. User can select a suburb or property type for more detailed insights.

**Triggers:** User's intent to discover popular suburbs and property types.

**Preconditions:**  
There are sufficient user ratings to rank suburbs and property types.  
**Postconditions:**  
User gains insights into the most highly rated suburbs and properties.  
**Alternate Flow:**  
If there aren't enough ratings, a message informs the user and suggests alternate suburbs or properties.

**Use Case ID:** UC-006  
**Use Case Name:** Analyse Price Distribution for a Date Range  
**Brief Description:** Property owners can view and analyse how their property's price compares to others in the market for a specific date range.  
 **Actors:** Property Owner  
 **Flow of Events:**

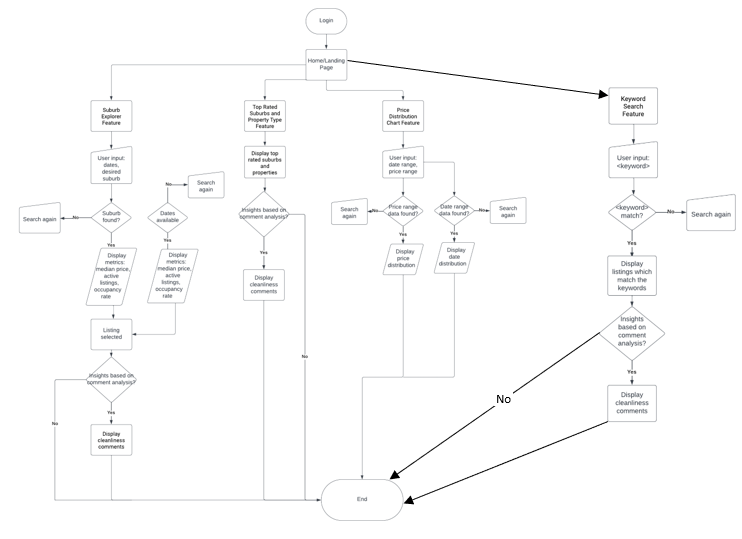
1. Property owner selects the date range they want to analyse.
2. The tool fetches and presents a distribution chart showing property prices, highlighting where the owner's property stands.
3. Property owners can interact with the chart to understand market trends and adjust their pricing strategy.

**Triggers:** Property owner's intent to understand their property's pricing position in the market.  
**Preconditions:**  
The tool has access to pricing data, including that of the property owner's listing, for the selected date range.  
**Postconditions:**  
Property owner gains insights into the market pricing and can adjust their pricing strategy if needed.  
**Alternate Flow:**  
If pricing data for the selected date range is unavailable, the tool notifies the property owner and may suggest an alternate date range.

# Software Design and System Components

## Software Design

Lucidchart has a limit on shapes per page, please excuse the markup that was necessary to complete this flowchart.



## System Components

### Functions

**load\_listing\_data:**

* Description: Loads Airbnb listing data from the data source.
* Input Parameters: None.
* Side Effects: Loads data into memory.
* Return Value: List of listing objects.

**load\_review\_data**

* Description: Loads Airbnb review data from the data source.
* Input Parameters: None.
* Side Effects: Loads data into memory.
* Return Value: List of review objects.

**calculate\_median\_price**

* Description: Calculates the median price for a list of properties.
* Input Parameters: List of property objects.
* Side Effects: None.
* Return Value: Median price (float).

**calculate\_occupancy\_rate**

* Description: Calculates the occupancy rate for a list of properties.
* Input Parameters: property objects, date range (start and end dates).
* Side Effects: None.
* Return Value: Occupancy rate (float).

**generate\_price\_distribution\_chart**

* Description: Generates a chart showingthe distribution of property prices.
* Input Parameters: property objects, date range.
* Side Effects: None.
* Return Value: Chart image (data).

**filter\_listings\_by\_keyword**

* Description: Filters listings based on specified input keywords.
* Input Parameters: keyword(s).
* Side Effects: None.
* Return Value: Filtered list of listing objects.

**cleanliness\_comments\_analyser**

* Description: Analyses user review comments for cleanliness-related keywords.
* Input Parameters: List of review objects.
* Side Effects: None.
* Return Value: list of comments containing cleanliness-related keywords.

**top\_rated\_suburbs\_and\_types**

* Description: Identifies top-rated suburbs and property types.
* Input Parameters: List of review objects, date range, property occupancy rate.
* Side Effects: None.
* Return Value: Dictionary of top-rated suburbs and property types.

### Data Structures / Data Sources

**Data Structure: List (Array)**

* Description: Lists are used to store collections of objects like property listings and reviews.
* Data Members: List of property objects, list of review objects.
* Functions Using It: Many functions like load\_listing\_data, load\_review\_data, calculate\_median\_price, calculate\_occupancy\_rate, etc.

**Data Structure: Dictionary**

* Description: Dictionaries are used to store key-value pairs, such as “top-rated suburbs and property types”.
* Data Members: Dictionary of top-rated suburbs and property types.
* Functions Using It: identify\_top\_rated\_suburbs\_and\_types.

**Data Structure: Chart Data**

* Description: Data structure to store information for generating charts.
* Data Members: Data points for x and y axis values, chart type.
* Functions Using It: generate\_price\_distribution\_chart.

**External Data Source: Airbnb Listing Data**

* Description: External data source which contains information about the Airbnb listings.
* Data Members: Listing ID, property details, amenities, price, occupancy rate.
* Functions Using It: load\_listing\_data, calculate\_median\_price, calculate\_occupancy\_rate, filter\_listings\_by\_keyword, generate\_price\_distribution\_chart, identify\_top\_rated\_suburbs\_and\_types.

**External Data Source: Airbnb Review Data**

* Description: External data source containing customer reviews of Airbnb listings.
* Data Members: Listing ID, review details, cleanliness feedback, rating.
* Functions Using It: load\_review\_data, analyse\_cleanliness\_comments, identify\_top\_rated\_suburbs\_and\_types.

### Detailed Design

**Algorithm: Calculate Median Price**

* This algorithm calculates the median price of a list of property listings.
* first it sorts all the listings by price, low to high.
* If the total number of listings is odd, it will return the price of the middle listing.
* If the total number of listings is even, it will calculate the average of the prices of the two middle listings and return a value.

**Algorithm: Calculate Occupancy Rate**

* This algorithm calculates the occupancy rate for list of property listings within a specified date range.
* It initialises a counter for the total number of nights and the total number of occupied nights within the range.
* The occupancy rate is then calculated as the ratio of occupied nights to total nights, multiplied by 100.

**Algorithm: Analyse Cleanliness Comments**

* This algorithm analyses user reviews to highlight cleanliness-related comments.
* It creates a dictionary to store number of counts of specific keywords.
* For each review, it iterates through the list of cleanliness keywords to check if any of those keywords appear in the reviewer's comment.
* If a keyword is found, the algorithm the count increments for that keyword in the dictionary.
* The result is a dictionary that shows how many times each keyword appears in the reviews and showcases each of those reviews for users to read.

**Algorithm: Identify Top Rated Suburbs and Property Types**

* This algorithm identifies the top-rated suburbs and properties based on reviews within a specified date range.
* It initialises dictionaries to store ratings for each suburb and property.
* For each review within the date range, it adds the review's rating to the suburbs and property rating in the dictionaries.
* it then sorts the suburb ratings and property's ratings in descending order.
* It selects the top-rated suburbs and properties based on the sorted results and returns these lists to view.

# User Interface Design

For the user interface design for the Airbnb analysis software, the use of Lucidchart was employed, a popular diagramming tool. The Lucidchart program allowed the creation of visual representations of the Sydney Stayz user interface and to show how it will be interacted with between its various components. The design stage aims to outline the application layout, showcase feature design, and highlight the flow of the application in a clear and intuitive manner.

During the design process, several key findings influenced our interface design decisions:

* **User-Centric Approach:** We focused on the creation of a user-friendly interface that caters to all users. Intuitive navigation, clear and easy to read data presentation, and interactive features were prioritised to enhance the user experience.
* **Data Visualisation:** Given the nature of the software, effective and easy to read data visualisation was essential. We aimed to present insights through charts, making complex data easy to understand for all users.
* **Functional Clarity:** Each feature's purpose was defined and placed prominently in the interface. It was crucial to convey the functionalities of each clearly.
* **Input Flexibility:** The interface design allows users to input dates, suburbs and keywords flexibly.
* **Consistency and Navigation:** Consistent design elements ensure that users can switch between different features while maintaining consistency with the interface.

## Structural Design

The structural design of the Airbnb analysis software revolves around creating an intuitive and organized user experience that facilitates efficient navigation, easy information access, and clear interaction. The design choices aim to enhance usability, provide a logical hierarchy, and ensure a seamless flow of user interactions.

**Interface Structure and Hierarchy:**

**Top Navigation Bar:**

The top navigation bar contains the "Where To?" box, allowing users to specify their search location. This is a prominent and familiar starting point for users to define their preferences.

**Main Icons Section:**

The main icons, including Top Rated, Listings, Price Distribution, and Calendar, are positioned immediately below the "Where To?" box. These bold and distinct icons guide users to core functionalities related to property search and analysis.

**Property Listing Display:**

The central area of the interface is dedicated to showcasing the property image. Placing the property image prominently captures users' attention and makes the listings visually appealing.

**Property Information:**

Directly below the property image, users find detailed information about the selected property. This arrangement offers a natural progression from visual to informational content.

**User Comments Section:**

Below the property information, the dropdown section presents comments from previous visitors. This segregated placement allows users to access reviews without overwhelming the main content area.

**Sub Icons Section:**

At the bottom of the interface, sub icons are grouped to facilitate additional functionalities:

**Keywords Navigation:** Enables users to search using keywords.

**Favorites Icon:** Provides quick access to saved listings.

**Support Chat Icon:** Allows easy initiation of customer support interactions.

**Profile Icon:** Grants users' access to their personal profile.

**Information Grouping and Navigation:**

**Hierarchical Listing Information:** Property information and comments are structured hierarchically, with property details providing core information, followed by user comments for deeper insights.

**Logical Flow:** The progression from "Where To?" to main icons to property details follows a logical user flow, guiding users through the process of locating, evaluating, and learning more about listings.

**Keyword Navigation:** The keywords navigation icon enables users to customize their search experience, grouping relevant listings based on their preferences.

**User-Centric Focus:** Grouping user-specific actions like favourites, support, and profile under the sub icons section keeps the main content area dedicated to listings and their information.

**Justification of Design Choices:**

**User-Friendly Interaction:** The bold main icons provide a clear visual cue, guiding users to the most critical features of property search and analysis.

**Visual Emphasis:** Placing the property image centrally draws immediate attention, as images are a vital part of property evaluation.

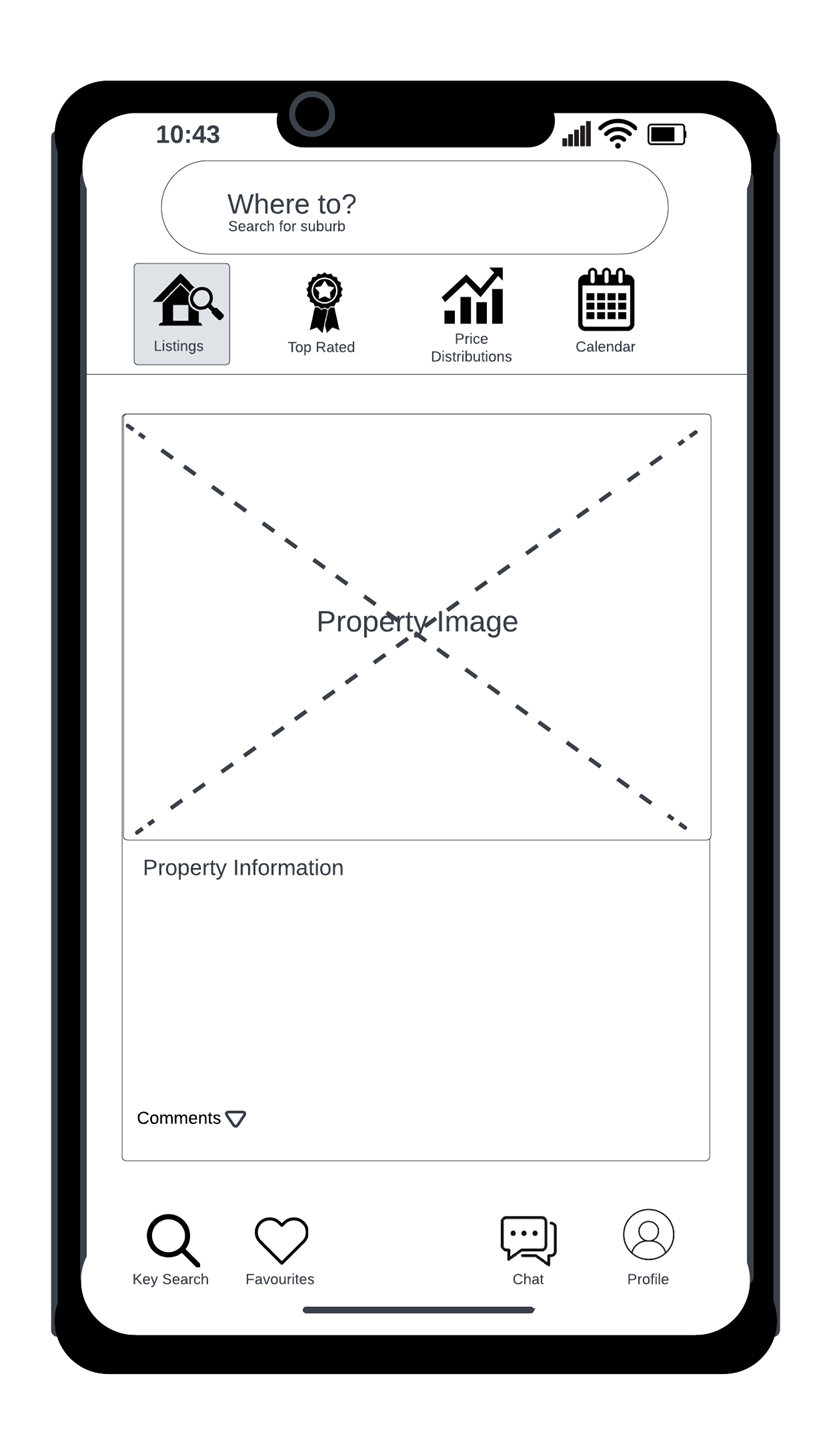
**Easy Information Access:** Segregating user comments prevents information overload and ensures easy access to visitor experiences.

**Efficient Navigation:** Grouping sub icons allows users to access secondary actions without disrupting the main user flow.

**Logical Hierarchy:** Hierarchical arrangement of property details and comments helps users focus on essential information before diving deeper.

## Visual Design

Wireframe for Main Menu screen



**Main Menu Screen Structure:**

**"Where To?" Box:** At the top and centre of the screen there is a horizontal rectangular "Where To?" Box with rounded edges. This box is designed to capture user input for location, helping users find specific listings based on their desired destination.

**Main Icons Section:** Positioned below the "Where To?" box, there are four main icons. These icons are bolder and more prominent compared to the other icons, indicating their significance:

**Top Rated Icon:** Represents listings with high ratings and positive feedback.

**Listings Icon:** Represents general property listings available for users to explore.

**Price Distribution Icon:** Provides insights into the distribution of prices for different listings.

**Calendar Icon:** Indicates the availability and booking dates for listings.

**Property Listing Display:** In the centre of the main menu screen, there is a space dedicated to displaying the image of a property listing. This image is accompanied by essential information about the property.

**Property Information:** Directly below the property image, there is detailed information about the property. This could include details like property type, location, amenities, and more.

**User Comments Section:** Below the property information, there is a dropdown section where users can access comments and reviews from previous visitors who have stayed at the property. This helps potential guests gain insights from others' experiences.

**Sub Icons Section:** Positioned at the bottom of the main menu screen, there are additional sub icons for various functions:

**Keywords Navigation:** Allows users to search for listings using keywords.

**Favourites Icon:** Lets users save their favourite listings for quick access.

**Support Chat Icon:** Allows users to initiate a chat with customer support.

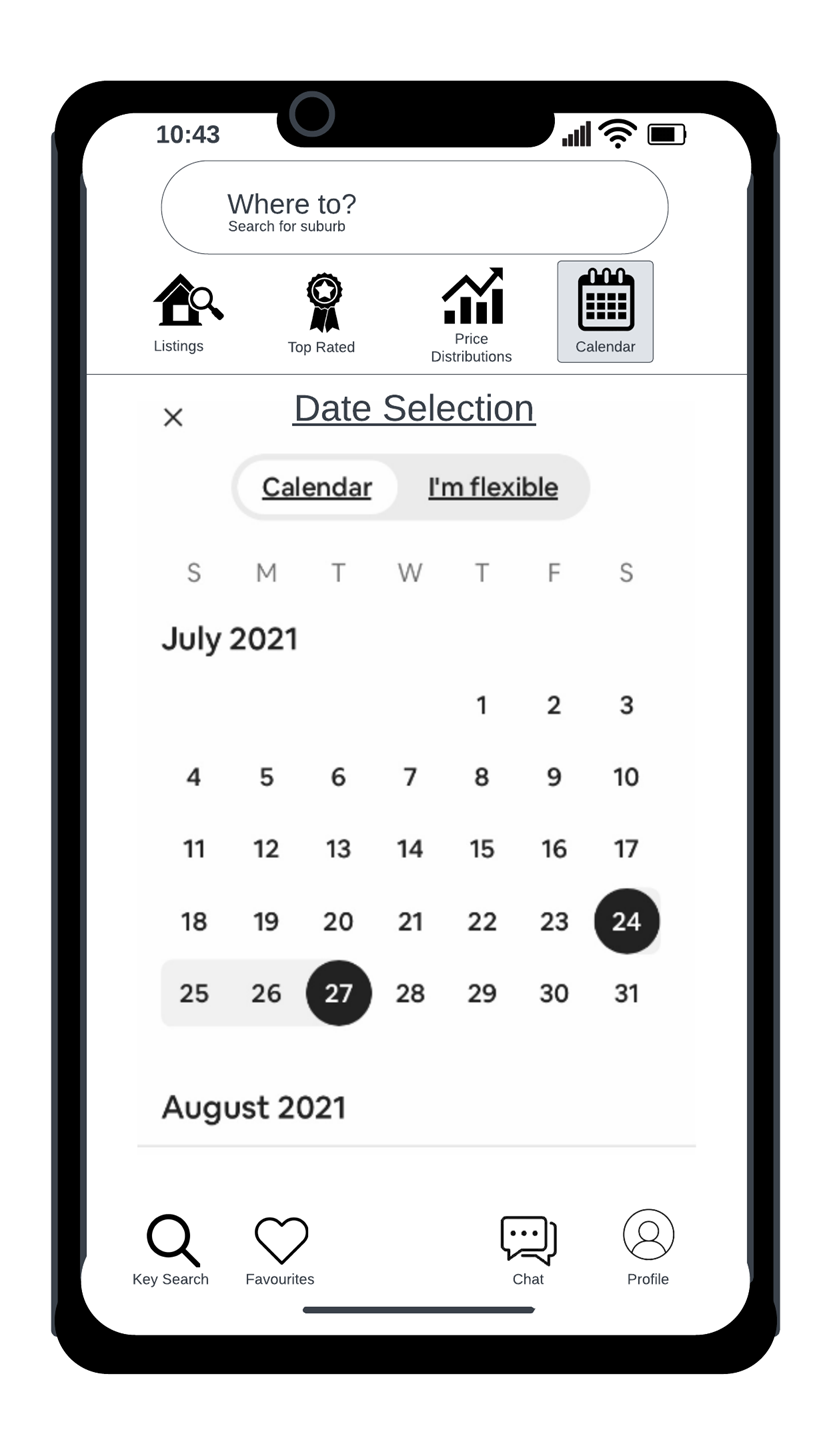
**Profile Icon:** Gives users access to their personal profile information.

**Design Philosophy / Justification:**

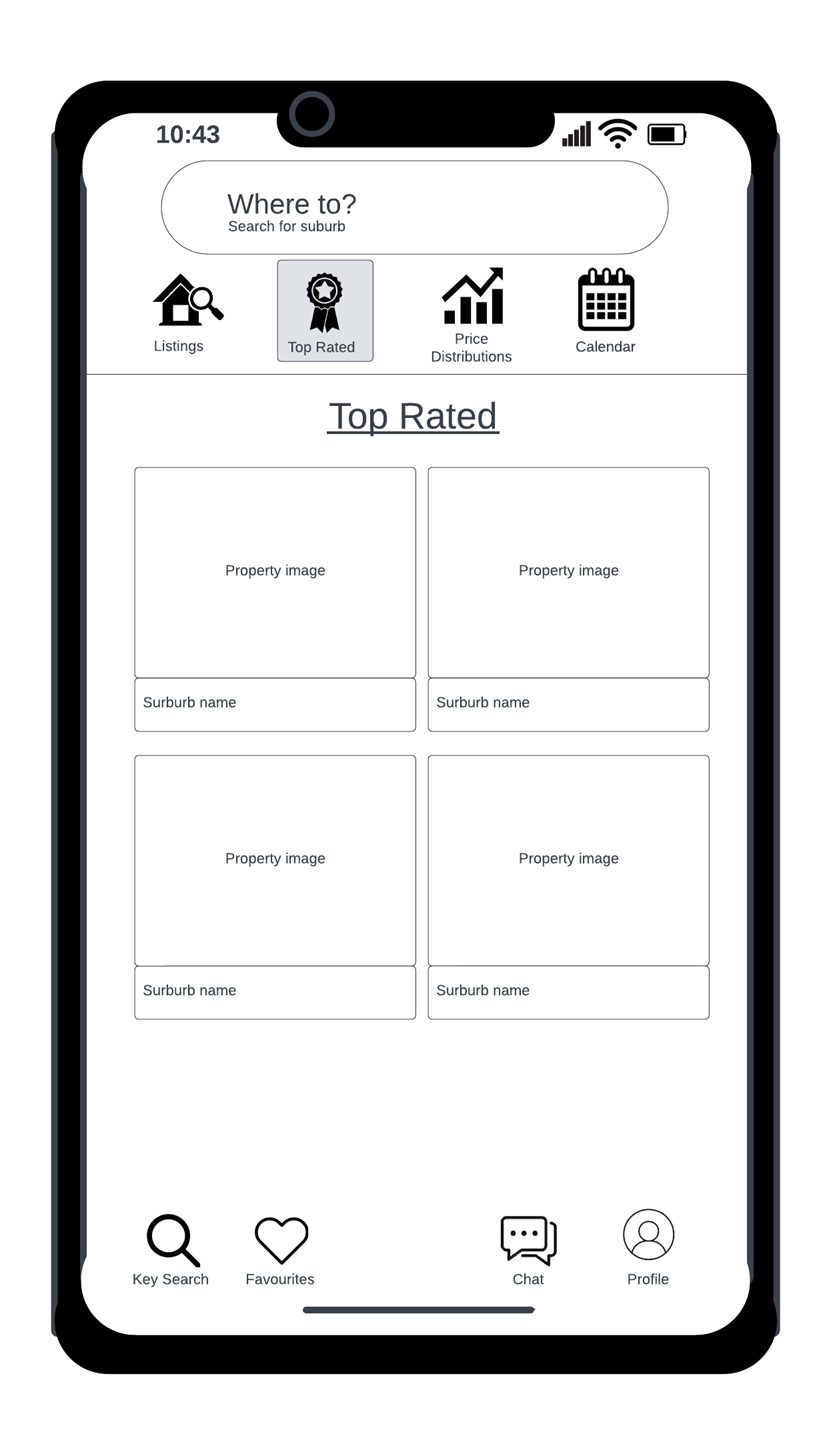
The main menu screen is intentionally designed to be user-friendly and intuitive. The use of universally recognizable icons helps users quickly identify and understand the main features. Bold and prominent icons differentiate key features, guiding users toward the most important functionalities. The central placement of the property image, information, and comments ensures a clear focus on individual listings, while the lower sub icons offer convenient navigation and interaction options.

**User-Centric Approach:**

The layout and design of the main menu screen prioritize user needs and interactions, creating an efficient and enjoyable experience for users seeking property listings, information, and engagement with the platform.

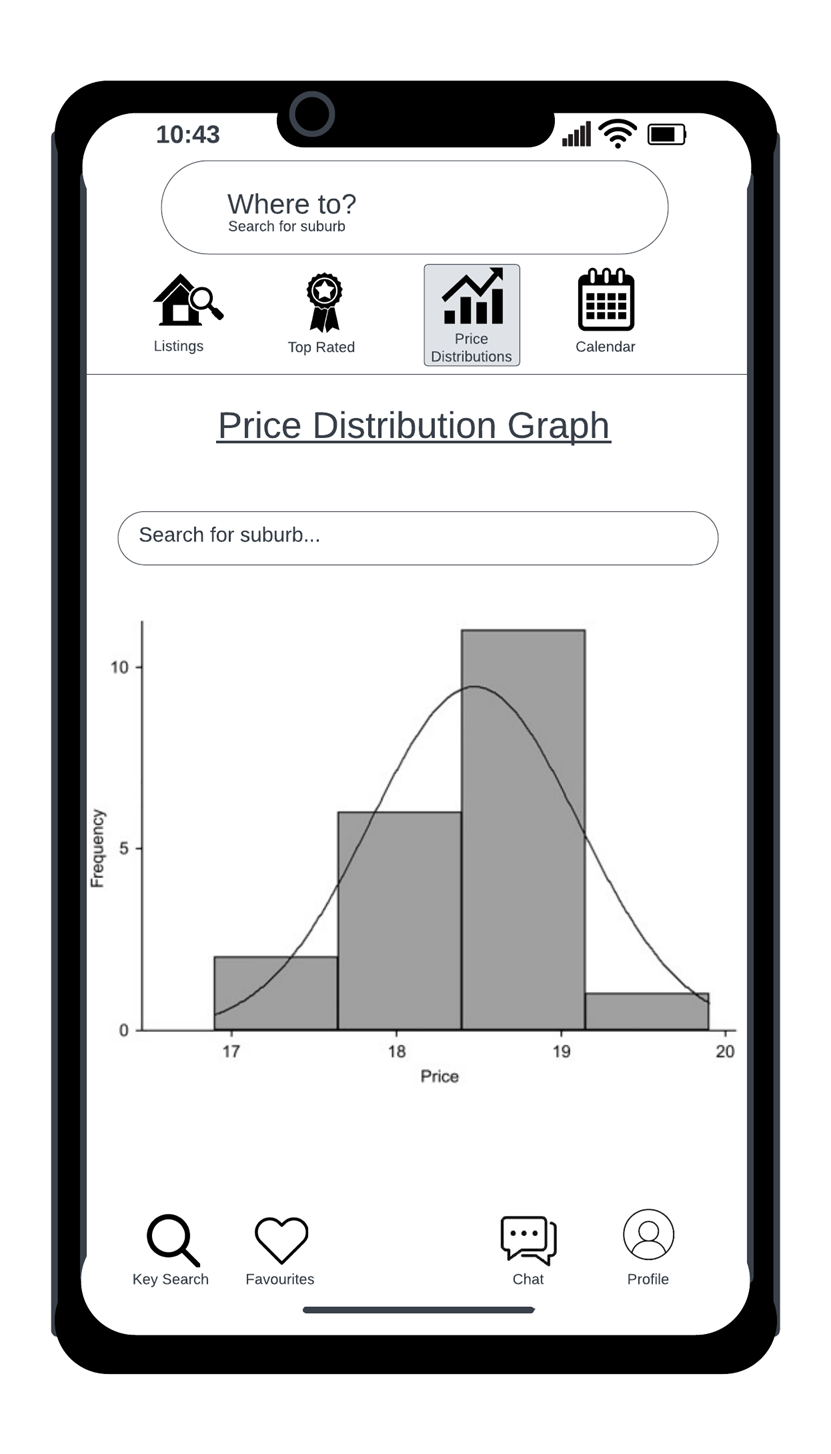


When users click on the Calendar option, it becomes highlighted, ensuring clarity that they are currently within this selection. When the calendar is selected, users are presented with a visual representation of a calendar. This interactive interface allows users to effortlessly choose their desired check-in and check-out dates by simply clicking on the corresponding dates. This intuitive interaction design ensures that users can easily navigate through different months and years, making date selection both quick and convenient.



When the Top Rated feature is selected, users are presented with a 2x2 grid layout. This layout format arranges the top rated properties into a grid, displaying four properties at once. Each property is represented by an image and key information, allowing users to visually assess the options available.

The 2x2 grid layout optimizes screen real estate, providing a balanced presentation of property options while maintaining a clean and organized visual appearance. Users can easily navigate through the grid by scrolling or swiping, making it effortless to explore additional top rated properties.

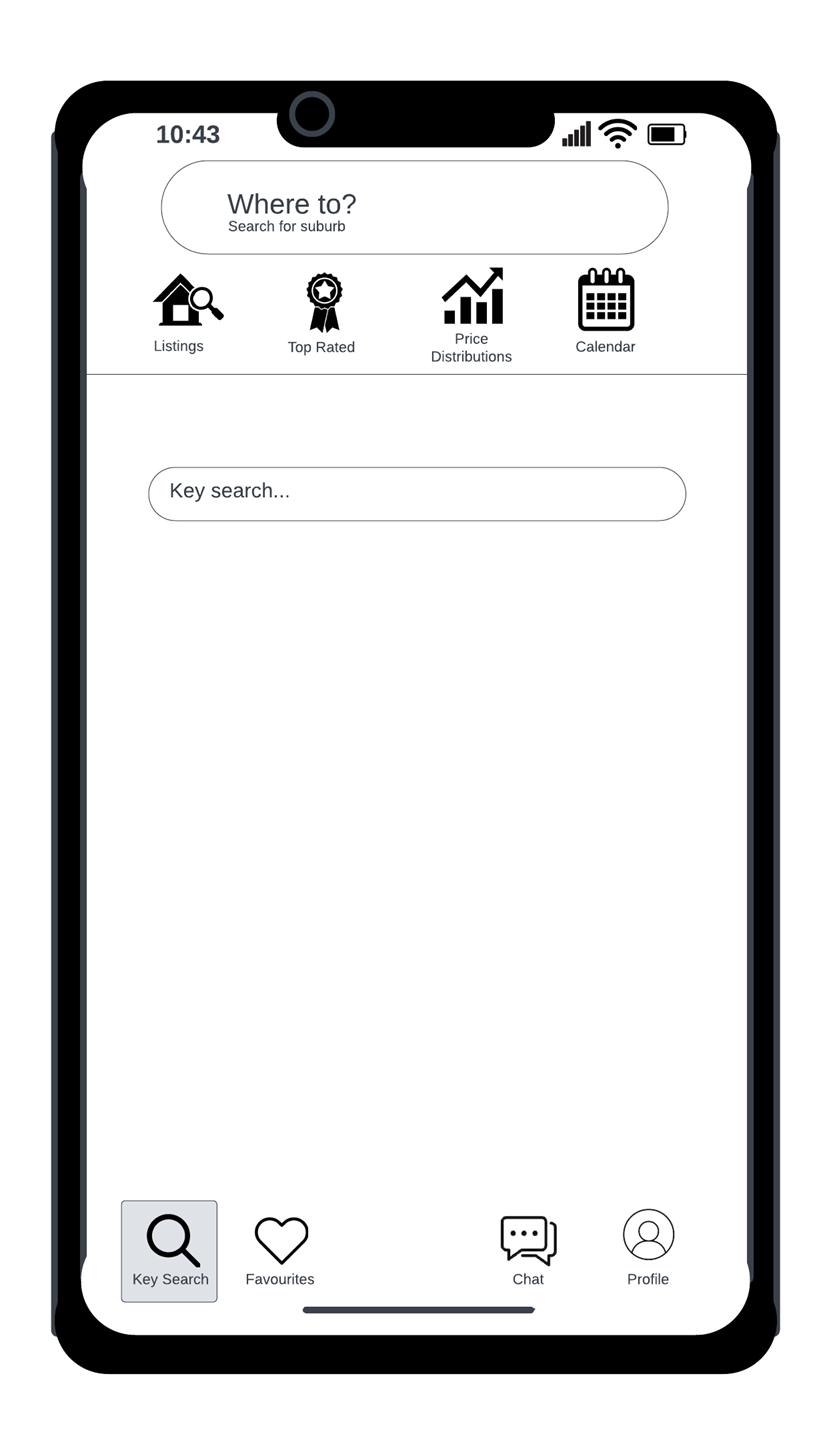


**Suburb Explorer:**

When user clicks the Price Distribution Chart feature, users are prompted to input the suburbs they wish to explore. This interactive Suburb Explorer allows users to specify one or more suburbs in Sydney for which they want to analyse price distributions. This tailored input enhances the relevance and specificity of the data presented.

**Bar Chart Visualization:**

After users input their chosen suburbs, the software generates a bar chart to visualize the price distribution data. The bar chart is selected for its high recognition and intuitive interpretation.



When users select the Keyword Search feature, this provides users with a simple and efficient way to search for properties using specific keywords. This streamlined feature focuses on user convenience and ease of use.