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Cleaning Service Mobile Application

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Abstract

EasyClean addresses the growing demand for efficient and community-centric cleaning services in Parit Raja. Recognizing the challenges in traditional service models, EasyClean aims to streamline and innovate the cleaning service sector through a mobile application. The project's objective focuses on designing and developing an Android-based mobile application using object-oriented methodology, catering exclusively to Parit Raja residents. The app encompasses cleaning service booking processes, cleaning supplies rental and sharing modules, and integrates a unique, cleaner recruitment component. All tests in the test plan passed except for two, bookings and renting cleaning supplies test, which failed due to payment and banking API issues. While all users in the user acceptance testing found admin functions easy to use, 12.5% reported difficulty navigating the app and accessing income information. Although there are some limitations, EasyClean demonstrates significant potential in enhancing the efficiency and accessibility of cleaning services within the community.

1. Introduction

The service industry has recently transformed significantly due to the convergence of technology and traditional services [1]. Consequently, the global value of the cleaning services industry is growing annually [2]. With this in mind, the project launched to serve the residents of Parit Raja has a dual focus: providing tailored cleaning services and creating part-time job opportunities for residents as cleaners. This aligns with our definition of the service-oriented industry, which encompasses businesses offering intangible products or services to customers, playing a vital role in the global economy [3]. Specifically, in our context, it centers on cleaning services, underscoring the significance of cleanliness and hygiene in Parit Raja environments and other spaces accessible to its residents.

The development of the "Cleaning Services Mobile Application" is driven by a recognition of substantial challenges in the residential cleaning industry. The project addresses the gap between the desire for a clean living space and the practical challenges of finding time for regular or deep cleaning, exacerbated by the demands of contemporary lifestyles. The impact of the COVID-19 pandemic has further emphasized the need for reliable and efficient cleaning solutions to meet heightened sanitary requirements. The application aims to provide essential assistance, particularly for individuals dealing with sickness or aging, for whom access to a reliable cleaning service is crucial.

The application comprises seven modules developed using Android Studio with Java and XML. The "Booking Module" facilitates service requests, enabling users to choose a cleaning service provider based on comprehensive information, including ratings, comments, contact details, business descriptions, and hourly rates. The "Payments Module" allows users to pay for their booked cleaning service and rental cleaning supplies. This module supports two payment methods with a 2% service fee. The "Recruitment Module" empowers users

to apply for a business account within the mobile application. The "Cleaning Equipment Rental" module provides a catalog for renting cleaning equipment, and the user can also share cleaning supplies for rent. Additional modules include "Customer Service," "Customer Profile Management," user registration, login and forgot password.

The objectives of this project are to design and develop a cleaning service mobile application using object-oriented methodology and the Java programming language. Functional testing and user acceptance testing will be conducted with the target users.

2. Related Work

2.1 Cleaning Service

An economic upturn drives increased acceptance of cleaning services, boosted discretionary income, and the rise of dual-income households, fueling the growth of the cleaning services market [4]. Cleaning services, crucial for eliminating dirt and contaminants, are pivotal in maintaining overall residential cleanliness and well-being [5]. The "Cleaning Services Mobile Application" offers a personalized cleaning experience, allowing users to select service providers autonomously for tasks like air duct cleaning and furniture cleaning. The user-friendly platform enhances the quality of residential spaces, aligning with the dynamic growth of the cleaning services market driven by increased hygiene awareness. The application meets the rising demand for efficient and accessible residential cleaning services as families prioritize cleanliness and well-being.

2.2 Recruitment

The evolution of e-recruitment in the 1990s revolutionized human resource management by leveraging technology, particularly the Internet, for a comprehensive approach to hiring [6]. A survey of human resource management personnel in China revealed the widespread adoption of online recruitment within companies [7]. E-recruitment systems automate workflow tasks, offering advantages such as cost-effectiveness, transparent communication, and access to an expanded talent pool. In the context of the "Cleaning Services Mobile Application" project, e-recruitment will play a vital role in hiring cleaners, aligning with the project's goal of providing high-quality cleaning services to residents of Parit Raja. The digital recruitment strategy aims to create an efficient and user-friendly experience, fostering community-centric innovation and economic growth. Despite the widespread adoption of online recruitment, challenges like false information, resume verification complexities, and screening difficulties persist, underscoring the need for ongoing refinement and innovative solutions in hiring suitable cleaners.

2.3 Comparison between the existing systems and the proposed system

This section presents a comparative analysis of features between existing systems, namely "Cleanster.com," "Getcleaner," and "Recommend.my," and the proposed system, "EasyClean." The comparison is organized in Table 1.

Table 1 *Comparison of existing systems with the system*

Characteristic / Application	Cleanster.com: Cleaning App	Getcleaner: Cleaning Services	Recommend.my Home Services	EasyClean
Regular Home Cleaning	✓	✓	✓	✓
Deep Cleaning	✓	✓	✓	✓
Office Cleaning	✓	✓	✓	✓
Rate Cleaners	✓	✓	✓	✓
Cleaning Supplies Rental	**X**	**X**	**X**	✓
Other Home Services like renovation, plumber, etc.	**X**	**X**	✓	**X**
Property management system (PMS) integration	✓	**X**	**X**	**X**

Legend: ✓ = Have; **X** = Do not have;

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Table 1: (cont)

Characteristic / Application	Cleanster.com: Cleaning App	Getcleaner: Cleaning Services	Recommend.my Home Services	EasyClean
Number of Apps	**2**	**2**	**2**	**1**
Cleaner Recruitment Process	Through another app, "CleansterPro: For Pro Cleaners"	Through another app, "GetCleaner Pro: For Cleaners" app	Through another app, "Recommend.my Service Providers"	Integrated this process into "EasyClean" app
Market Presence	US, UK, Canada	Israel	Malaysia, Indonesia	Parit Raja (Malaysia)
Platform Compatibility	Website, iOS, Android	Website, iOS, Android	Website, iOS, Android	Android

Based on the table 1, Cleanster.com, Getcleaner, and Recommend.my are established platforms offering cleaning and related services, each with its own unique characteristics. Cleanster.com, accessible through a website and mobile apps, provides regular and deep cleaning and office cleaning and integrates with a property management system (PMS). Getcleaner, operating in Israel, covers regular and deep cleaning for homes, offices, and Airbnb. Recommend.my, serving Malaysia and Indonesia, extends its services to encompass various home services, including home cleaning, plumbing, renovations, refrigerator repairs, and more. All apps allow users to rate cleaners and make online payments. In contrast, EasyClean, uniquely available in Parit Raja (Malaysia), distinguishes itself with an integrated cleaner recruitment process within the app. It offers services for regular cleaning, deep cleaning, and office cleaning, exclusively operating on the Android platform.

3. Methodology

3.1 Object-Oriented Methodology

Object-oriented methodology involves phases: system conception, analysis, system design, class design, and implementation. Table 2 is a summary of the phases of the object-oriented methodology.

Table 2 *Summary of phases of object-oriented methodology*

Phases	Activities	Output
System Conception	1. Determine project background, project score, and project significance. 2. Determine the problem statement, objective and expected result of the project.	1. Project background, problem statement and objective are identified. 2. Project score, expected result and project significance are determined. Project proposal is done.
Analysis	1. Searching information from previous relevant research 2. Comparing the existing system 3. Plan the schedule of the project 4. Determine functional and non-functional requirements	1. Literature review is done. 2. Comparison between existing systems is made. 3. Gantt chart is done. 4. Functional and non-functional requirements are determined.

Table 2: (cont)

Phases	Activities	Output
Analysis	5. Determine hardware and software requirements	5. Hardware and software requirements are determined.
System Design	1. Designing a use case diagram and sequence diagrams	1. A use case diagram and sequence diagrams are made.
Class Design	1. Designing class diagram 2. Designing user interfaces and database tables	1. A class diagram is made. 2. User interface design and database tables are made.
Implementation	1. Start coding the proposed application 2. Conduct functional testing and user acceptance testing 3. Identify errors and bugs	1. Source code is done. 2. The proposed application is developed. 3. Functional testing and user acceptance testing are conducted. Errors and bugs are identified and corrected.

3.2 Project Planning

The EasyClean project's Gantt charts, outlined in Appendices A and B, detail a comprehensive timeline for the project's development phases. The PSM 1 Gantt chart covers 70 days, starting from October 2, 2023, and ending on January 5, 2024, and includes five phases: system conception (21 days), analysis (20 days), system design (9 days), class design (8 days), and implementation (12 days). Each phase addresses specific tasks, from project background and problem statement formulation to coding the EasyClean mobile application. The PSM 2 Gantt chart focuses on the implementation phase, detailing the development timelines for the mobile app, admin website, and system testing. Mobile app development occurs over 37 days from March 18 to May 7, 2024, followed by the admin website development over 20 days from May 8 to June 4, 2024. The final testing phase spans 13 days, from June 5 to June 21, 2024. Dependencies, milestones, and progress tracking ensure a coordinated and efficient project completion.

4. Analysis and Design

Fig. 1 shows the system architecture, which displays the system's functional module based on the user roles: administrator, user, and cleaner. Each module is connected to the database located at the center, and the data is displayed to the user via the user interface after the user login into the EasyClean application.

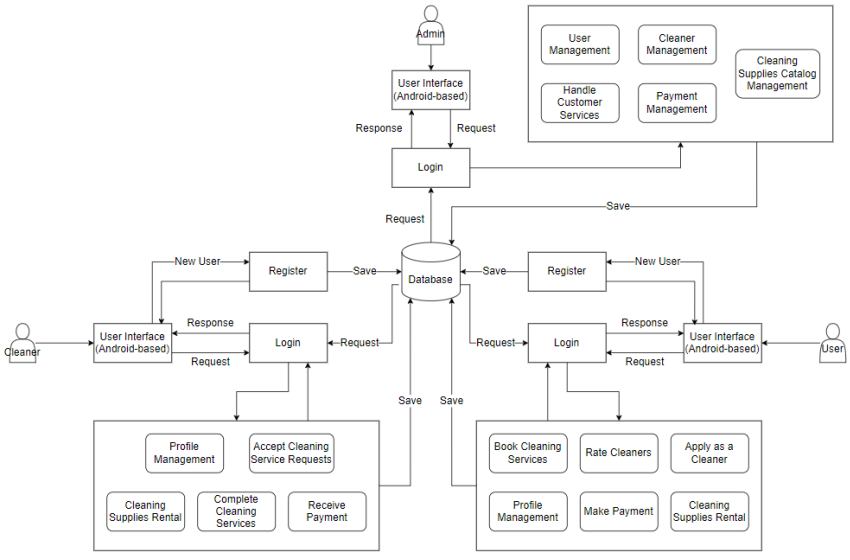


Fig. 1 *System architecture*

4.1 Functional Requirement

Functional requirement analysis is explained in Table 3, and administrator is the short form of "admin".

Table 3 *Functional requirement for system EasyClean*

Module	Functionalities	User
Registration	• All new users should be able to register a new account. • The application can notify users of any invalid input. • The application should be able to save the user's registration information in the database.	Customer, Cleaner,
Login and Logout	• Only a valid username and password will allow a successful login. • The application allows users to logout. • The application can notify users of any invalid input.	Customer, Cleaner, Admin
Cleaning Supplies Rental	• Users can rent a specific cleaning supply by filling in the required information and making payment. • Users can view the status of their rental items. The status includes "Waiting", "Rented", "Returned", and "Cancelled" • Users can share their cleaning supplies for rent by filling in the required information and publishing the information under the cleaning supplies rental section.	Customer, Cleaner
Review	• After the completion of the cleaning service, customers can provide ratings and comments for their booked service. • After returning the rental cleaning supplies, customers can rate and comment on the rental items.	Customer, Cleaner
Payment	• Users can view the payment information about their cleaning services or cleaning supplies rental.	Customer, Cleaner
Booking Cleaning Service	• Customers can book a cleaning service using the EasyClean application by filling in the required information. • Customers can track the cleaning service status. • Customers can view the cleaning checklists checked off by cleaners.	Customer
Recruitment	• Customers who operate a cleaning company and want to register a cleaner business account on the application can upload their company documents for validation and registration.	Customer
Accept Cleaning Request	• Cleaners can view and accept the cleaning requests made by customers. • Cleaners can change the cleaning services status, including "start cleaning" and "completed." • Cleaners must follow the checklist provided and check off checklist items when completed.	Cleaner
Reject Cleaning Request	• Cleaners can choose to reject a cleaning request from a customer. • In response, the admin will assign another cleaning company to fulfil the customer's request. • Alternatively, if a replacement cleaner is unavailable, the customer's request will be cancelled, and the payment will be refunded to the customer.	Cleaner, Admin

4.2 Functional Requirement

Non-functional requirements are explained in Table 4.

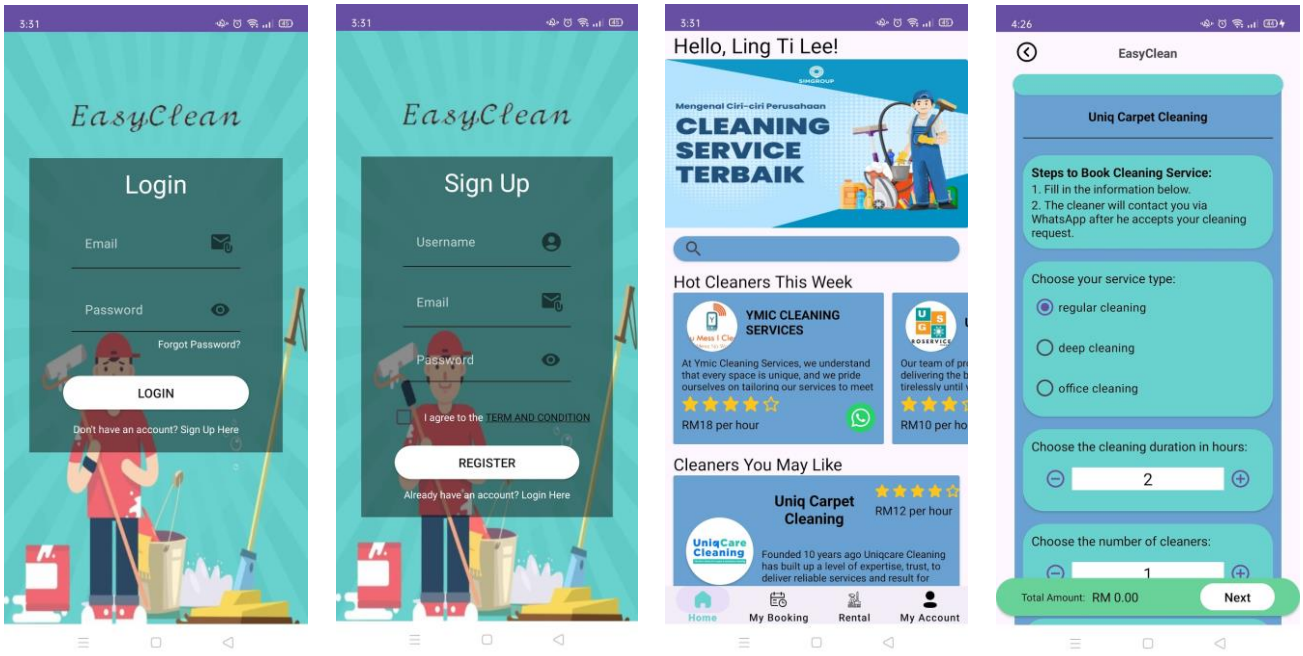
Table 4 *Non-functional requirement for the proposed application "EasyClean"*

Requirement	Description
Performance	• The application should respond promptly to user interactions. • Application features should load efficiently, with a maximum 3-second response time.
Usability	• The application should have an intuitive and user-friendly interface. • Navigation within the app should be straightforward for users.
Security	• User passwords should be encrypted to ensure privacy. • Only authorized users can access the database's information. • Only users with a registered email and password can log in to the application.
Scalability	• The application should handle increasing users and data efficiently.
Operational	• The application only works in an internet-connected environment on any Android device. • All data should be stored in the database.

5. Implementation and Testing

5.1 Implementation

The login page is shown in Fig. 2 (a). If the user does not have an account, users may click on "Sign Up Here" to go to the registration page, as shown in Fig. 2 (b). Fig. 2 (c) shows the homepage of the EasyClean application. Fig. 2 (d) shows the booking page for booking a cleaning service.



(a) **(b)** **(c)** **(d)**

Fig. 2 *(a) Login interface; (b) Sign-up interface; (c) Customer's homepage; (d) Booking form*

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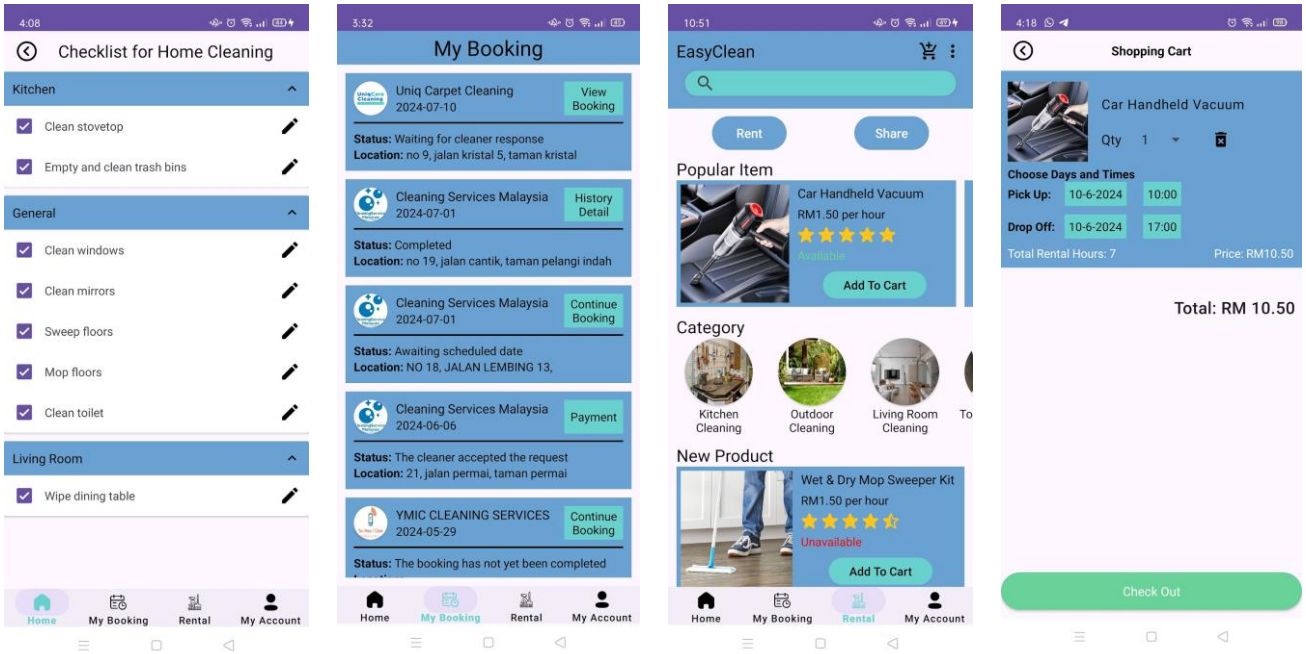
The cleaning service booking form used the code segment in Fig. 3. It is used to adjust the available dates in the datePicker, preventing users from selecting a cleaning service date before or on the current date.

```
long currentTime = System.currentTimeMillis();
// Get the Calendar instance to add one day to the current time
Calendar tomorrow = Calendar.getInstance();
tomorrow.setTimeInMillis(currentTime);
tomorrow.add(Calendar.DAY_OF_YEAR,  amount: 1);

// Set the minimum date to tomorrow
datePicker.setMinDate(tomorrow.getTimeInMillis());

// Set up OnDateChangedListener
datePicker.init(tomorrow.get(Calendar.YEAR), tomorrow.get(Calendar.MONTH), tomorrow.get(Calendar.DAY_OF_MONTH), new DatePicker.OnDateCh
    no usages
    @Override
    public void onDateChanged(DatePicker view, int year, int monthOfYear, int dayOfMonth) {
        // Get the selected date
        Calendar selectedDate = Calendar.getInstance();
        selectedDate.set(year, monthOfYear, dayOfMonth);

        // Format the selected date to display or store elsewhere
        SimpleDateFormat sdf = new SimpleDateFormat( pattern: "yyyy-MM-dd", Locale.getDefault());
        date = sdf.format(selectedDate.getTime());
    }
});
```

Fig. 3 *Code segment to adjust the available dates in the datePicker*

Users can view and edit the cleaning tasks when booking a cleaning service. The cleaning tasks are in the form of a checklist, as shown in Fig. 4 (a). Users can view the booking status in the "My Booking" section, as shown in Fig. 4 (b). Fig. 4 (c) is the cleaning supplies rental page that allows users to rent any of the cleaning supplies. Fig. 4 (d) shows the customer's shopping cart.



(a) **(b)** **(c)** **(d)**

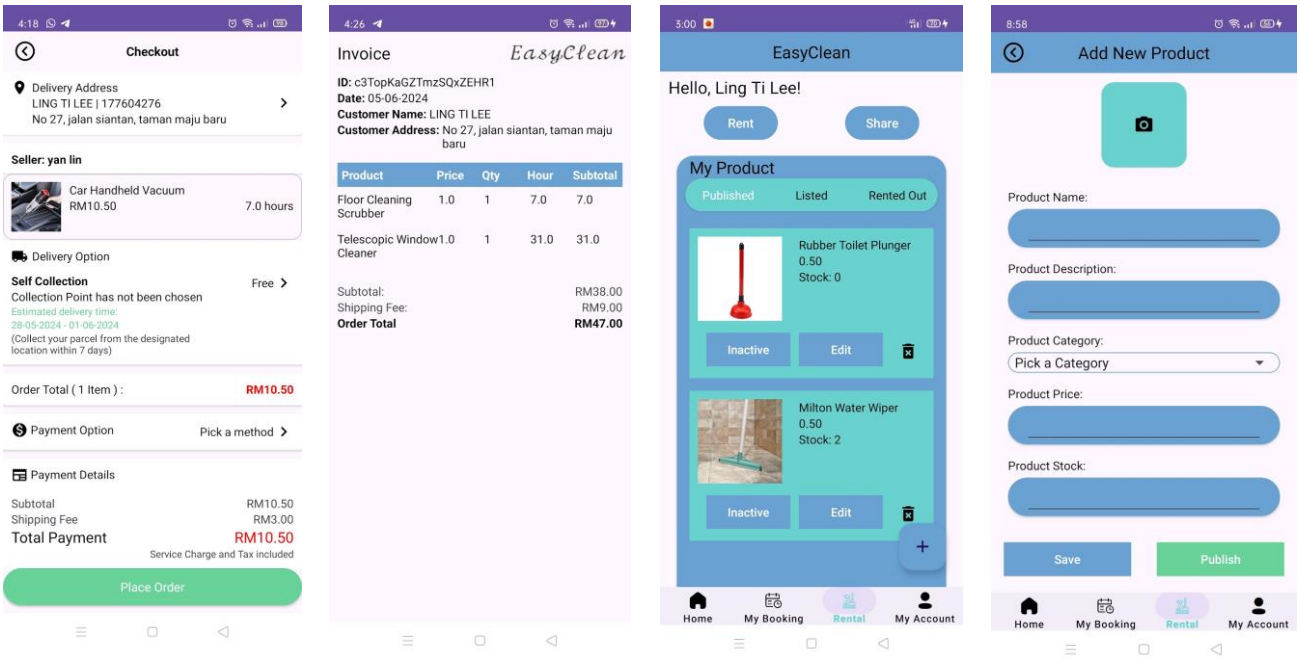
Fig. 4 *(a) Home cleaning checklist; (b) Booking history page; (c) Cleaning supplies rental page; (d) Cleaning supplies rental shopping cart*

When the user edited the checklist, Fig. 5 shows how I iterate through the homeItemList to find the text that needs to be updated.

```
// Get the homeItemList field which contains a list of tasks
List<Map<String, Object>> homeItemList = (List<Map<String, Object>>) documentSnapshot.get("homeItemList");

// Iterate through the homeItemList to find the task with the initial text
for (Map<String, Object> task : homeItemList) {
    String txtChecklistItem = (String) task.get("txtChecklistItem");
    if (txtChecklistItem.equals(initialText)) {
        // Found the task, update it
        task.put("txtChecklistItem", newTask);

        // Update the document in the database
        db.collection( collectionPath: "Users") CollectionReference
                .document(uid) DocumentReference
                .collection(subcollectionName) CollectionReference
                .document(documentId) DocumentReference
                .update( field: "homeItemList", homeItemList) Task<Void>
                .addOnSuccessListener(new OnSuccessListener<Void>() {
                    @Override
                    public void onSuccess(Void aVoid) {
                        // Update successful
                        Toast.makeText(context, text: "Task updated successfully", Toast.LENGTH_SHORT).show();
```

Fig. 5 *Code segment for update checklist item*

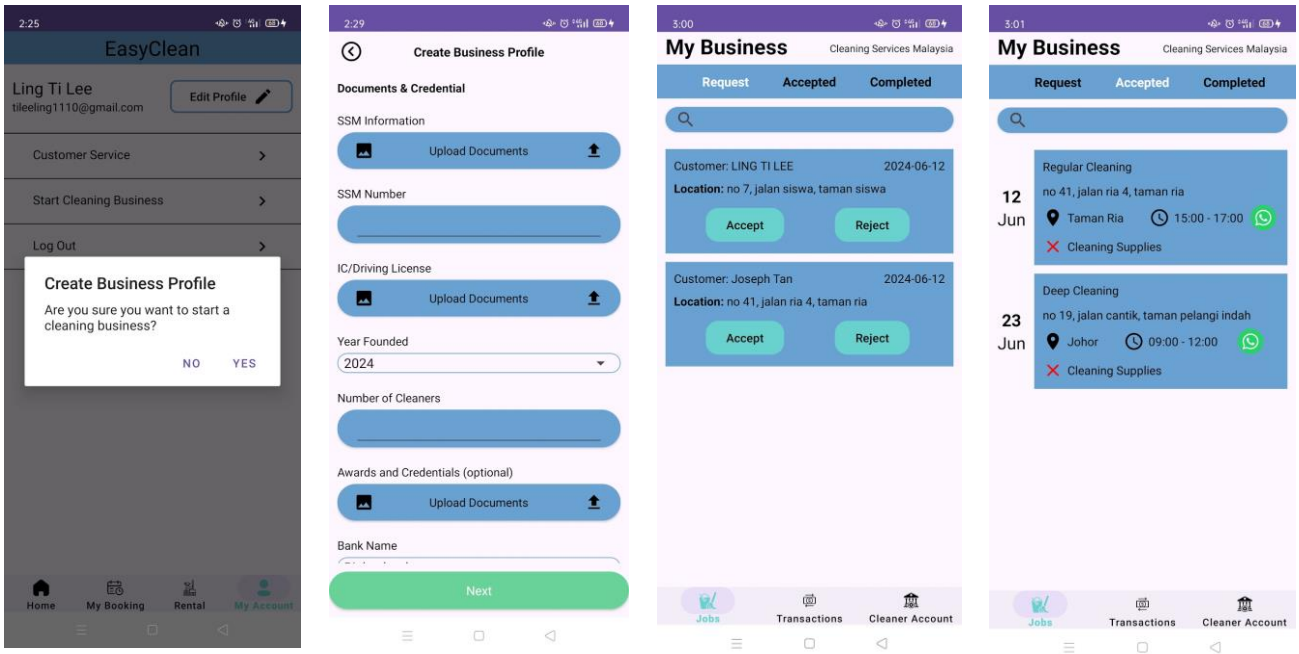
Users can tap on the bottom Checkout button from the shopping cart in the rental section; then they will be directed to Fig 6 (a). Fig. 6 (b) shows the payment invoice of the rental product. Fig. 6 (c) shows the cleaning supplies shared and published by the user. When users need to add a new product, they can tap on the plus button in the bottom right corner, and then a page like Fig. 6 (d) will be shown.



(a) **(b)** **(c)** **(d)**

Fig. 6 *(a) Cleaning supplies rental checkout page; (b) Rental product invoice; (c) Published cleaning supplies page; (d) Add new cleaning supplies for rent page*

A dialog box, as shown in Fig. 7 (a), will appear when users tap on the "Start Cleaning Business" button that is located in the My Account section. Fig. 7 (b) shows that if users want to register a business account in EasyClean application, they need to be well prepared with the official documents like SSM certificate and copy of IC. When the user books a cleaning service, the section "Request" displays the cleaning request the cleaner receives, as shown in Fig. 7 (c). After the cleaner accepts the cleaning request, the cleaning request is changed to under the "Accepted" section of the page, as shown in Fig. 7 (d).



(a) **(b)** **(c)** **(d)**

Fig. 7 *(a) A dialog box asking the user whether to create a business account; (b) Create business profile page; (c) Cleaning request page; (d) Cleaning requests that have been accepted*

5.2 Functional Testing

The test plan and its results are explained in Table 5.

Table 5 *Test Plan*

No	Function	Test Case	Expected Result	Status
1.	Registration	Test_1001: user input has empty fields	Display a toast message showing that empty fields are not allowed.	PASS
		Test_1002: user email has invalid format	Display a toast message showing that the email format is invalid.	PASS
		Test_1003: repeat username or email address	Display a toast message showing the username or email already in use.	PASS
		Test_1004: unchecked term and condition	Display a toast message to prompt user to check the term and condition.	PASS
		Test_1005: all registration information is entered correctly	The account is successfully registered, user information is saved into Firestore, and the user is redirected to the login page.	PASS
2.	Login and Logout	Test_2001: user input has empty fields	Display a toast message showing that empty fields are not allowed.	PASS

Table 5: *(cont)*

No	Function	Test Case	Expected Result	Status
2.	Login and Logout	Test_2002: user email has invalid format	Display a toast message showing that the email format is invalid.	PASS
		Test_2003: user enter an invalid credential	Display a toast message showing that the login credential is invalid and the login is failed.	PASS
		Test_2004: user enter a valid credential	Login successfully and users are redirected to the home page.	PASS
		Test_2005: user tap on the logout button	User successfully logout the app and are redirected to the initial page.	PASS
3.	Booking Cleaning Service	Test_4001: choose a cleaning service provider	User should be able to view the information of all the valid cleaning service providers and tap on the "Book Now" button to proceed with booking.	PASS
		Test_4002: incomplete booking form	Display a toast message showing that empty fields are not allowed.	PASS
		Test_4003: booking time conflict	Time and date selected by a user cannot be selected by another user again.	PASS
		Test_4004: user want to edit the checklist cleaning task	The edited checklist cleaning task will be saved and uploaded to the firestore.	PASS
		Test_4005: booking cancelled	After booking successfully, the user must pay within 24 hours; otherwise, the booking will be cancelled.	FAIL
		Test_4006: user pay for the booking cleaning service	After all booking information is entered, user should be redirected to their designated banking API to complete the payment.	FAIL
		Test_4007: track the booking status	After booking successfully, user should be able to track the booking status through the app.	PASS
		Test_4008: user write a review after the cleaning service is completed	The review will be saved into the firestore and displayed in the review section.	PASS
4.	Rent Cleaning Supplies	Test_5001: add any products into shopping cart	User should be able to tap on the "Add To Cart" button and add any of the available products into his shopping cart.	PASS
		Test_5002: product out of stock	User should see the "Únavailable" red text prompting the user that the product is unavailable and the product cannot be added into the shopping cart.	PASS

Table 5: *(cont)*

No	Function	Test Case	Expected Result	Status
4.	Rent Cleaning Supplies	Test_5003: search any products	User should be able to enter a keyword in the search field and search results will be shown based on the keyword entered.	PASS
		Test_5004: choose pick up and drop off date and time	For each product, the user should be able to set the pick up date and time and drop off date and time. Then, the total hour and price will be calculated.	PASS
		Test_5005: delete a product in the shopping cart	Each user can delete any of the products in their shopping cart.	PASS
		Test_5006: user able to edit his delivery address	In the checkout page, user can tap on the "Delivery Address" to edit his delivery address's information, and the edited data will be saved in the firestore	PASS
		Test_5007: users are free to choose a delivery option	In the checkout page, user can choose door-step delivery or self collection. Then, user decisions will be saved in the firestore.	PASS
		Test_5008: users are free to choose a payment option	In the checkout page, user can choose a payment method (credit/debit card or online banking) and a payment type (full payment or pay deposit first)	PASS
		Test_5009: after checkout, user can proceed with payment	The user taps on the "Place Order" button on the checkout page and is redirected to the banking API; proceed with payment	FAIL
		Test_5010: after place order, user can view his rental product history	User can open the purchases history and view all the passed rental products	PASS
		Test_5011: after returning a rental product, user can write a review	User can write a review for his rental product after returning the product and the review will be saved into firestore and displayed in the app	PASS
		Test_5012: after place order, user can view the order invoice	User can view the rental product invoice by tap on the "View Payment" button, and an invoice will be generated	PASS
5.	Share Cleaning Supplies for Rent	Test_6001: user able to share his cleaning supplies for rent	User can tap on the plus button in the share page and fill in all the necessary information to share a product for rent. The data entered will be saved in the firestore.	PASS
		Test_6002: user have the option to choose whether to publish his product	User can publish or inactive his product which means start or stop renting the product to others	PASS

Table 5: *(cont)*

No	Function	Test Case	Expected Result	Status
5.	Share Cleaning Supplies for Rent	Test_6003: user can edit the information of his existing products	User can tap on the "Edit" button and edit his product information. The edited information will be updated in the firestore.	PASS
		Test_6004: user can delete any of his products	User can delete any of his product for rent by tap on the dustbin icon	PASS
6.	Recruitment	Test_8001: user fill in all information to register a cleaning business account in the app	The business information will be saved in the firestore.	PASS
		Test_8002: user fill in incomplete information to register a business account	Display a toast message showing that empty fields are not allowed.	PASS
		Test_8003: after registered successfully a business account, the account status still be invalid	After the admin validates all the information then only the admin changes the status of the business account from invalid to valid.	PASS
		Test_8004: user with a invalid business account	The cleaning business profile will not be displayed in the home page.	PASS
		Test_8005: user with a valid business account	The cleaning business profile will be displayed in the home page.	PASS

5.3 User Acceptance Testing

A user acceptance testing session was conducted with the participation of 8 individuals. These participants were asked to interact with various application features and provide feedback on their experiences. The testing focused on evaluating the app's functionality, usability, and overall performance, helping to identify any issues or areas for improvement before the official release. The insights gathered from these 30 users were crucial in refining and enhancing the application's quality. The questions asked in the user acceptance testing are put in Appendix D.

5.4 Overall Test Result

Five test cases for the registration function, including checks for empty fields, invalid email formats, repeated usernames or emails, unchecked terms and conditions, and successful registration, all passed as expected. Similarly, five test cases for the login and logout functions tested various scenarios, with all tests passing. Three test cases for the forgot password function also passed. Eight test cases for booking cleaning services were conducted, with two failing due to booking cancellations if there was no payment after 24 hours and banking API support issues. Twelve test cases for renting cleaning supplies had one failure related to banking API connectivity. All four test cases for sharing cleaning supplies for rent and all five recruitment function tests passed successfully.

For the user acceptance testing, 12.5% of users think the app is difficult to navigate. 12.5% of the users also think it is hard for a cleaner to see his income information. While 100% of users think it is easy for an admin to view, edit, and delete a booking record, a user profile, or a business account.

6. Conclusion and Future Works

6.1 Advantage of Application

The EasyClean mobile application offers several advantages: convenience, time-saving, economic value, and flexibility. Users can easily schedule cleaning services or rent supplies with a few taps, avoiding phone calls or appointments. It saves time by allowing quick booking of services and promotes local employment by enabling residents to register their cleaning businesses. Additionally, the app allows users to customize their cleaning preferences, including service type, preferred hours, number of cleaners, and specific tasks.

6.2 Limitation of Application

The EasyClean mobile application has several limitations: it lacks support for real-world banking APIs, preventing users from performing financial transactions. The app's reliance on WhatsApp for customer service excludes users without access to the platform, potentially affecting satisfaction. Additionally, navigation issues can disorient users; there is one back button that redirects them unexpectedly to the main page rather than back to the previous page, while an insufficient notification system fails to alert users about important updates, leading to missed appointments and dissatisfaction.

6.3 Suggestion for Improvement

To improve the EasyClean mobile application, integrating banking APIs will facilitate secure in-app transactions, streamline payments, and enhance user satisfaction. Diversifying customer service channels by adding in-app chat, email support, and a help center will ensure broader access to assistance. Improving the app's navigation with clear cues and a reliable 'back' function will enhance user flow, while a robust notification system offering push, SMS, and email alerts will ensure users receive timely updates on bookings and service changes.

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Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this thesis.

Author Contribution

The authors confirm contribution to the thesis as follows: study conception and design: Ling Ti Lee, Dr. Firkhan Ali Bin Hamid Ali; data collection: Ling Ti Lee; analysis and interpretation of results: Ling Ti Lee, Dr. Firkhan Ali Bin Hamid Ali; draft manuscript preparation: Ling Ti Lee, Dr. Firkhan Ali Bin Hamid Ali. All authors reviewed the results and approved the final version of the thesis.

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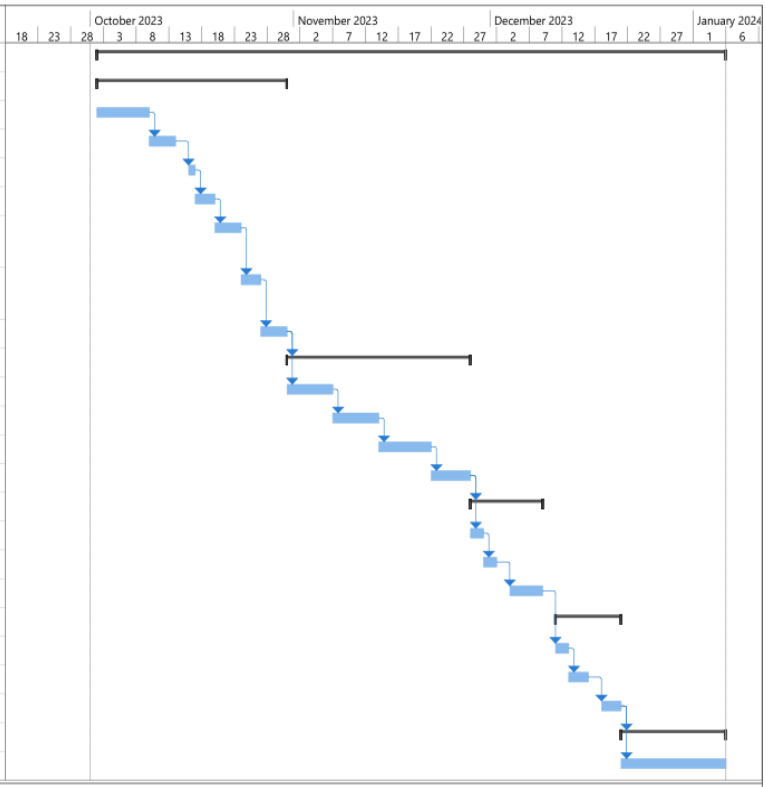
Appendix A: Project Gantt Chart PSM1

ID	Task Name	Duration	Start	Finish
1	**EasyClean System**	**70 days**	**Mon 2/10/23**	**Fri 5/1/24**
2	**System Conception**	**21 days**	**Mon 2/10/23**	**Mon 30/10/23**
3	Decided Project Title	6 days	Mon 2/10/23	Mon 9/10/23
4	Do Proposal	4 days	Tue 10/10/23	Fri 13/10/23
5	Title Defend	1 day	Mon 16/10/23	Mon 16/10/23
6	Determine project background	3 days	Tue 17/10/23	Thu 19/10/23
7	Determine problem statement and objective	2 days	Fri 20/10/23	Mon 23/10/23
8	Determine project score and expected result	3 days	Tue 24/10/23	Thu 26/10/23
9	Determine project significance	2 days	Fri 27/10/23	Mon 30/10/23
10	**Analysis**	**20 days**	**Tue 31/10/23**	**Mon 27/11/23**
11	Do literature review	5 days	Tue 31/10/23	Mon 6/11/23
12	Do comparison table	5 days	Tue 7/11/23	Mon 13/11/23
13	Explain methodology	6 days	Tue 14/11/23	Tue 21/11/23
14	Determine requirements	4 days	Wed 22/11/23	Mon 27/11/23
15	**System Design**	**9 days**	**Tue 28/11/23**	**Fri 8/12/23**
16	Develop flowchart	2 days	Tue 28/11/23	Wed 29/11/23
17	Do use case diagram	2 days	Thu 30/11/23	Fri 1/12/23
18	Do sequence diagram	5 days	Mon 4/12/23	Fri 8/12/23
19	**Class Design**	**8 days**	**Mon 11/12/23**	**Wed 20/12/23**
20	Do Class Diagram	2 days	Mon 11/12/23	Tue 12/12/23
21	Design user interface	3 days	Wed 13/12/23	Fri 15/12/23
22	Develop database tables	3 days	Mon 18/12/23	Wed 20/12/23
23	**Implementation**	**12 days**	**Thu 21/12/23**	**Fri 5/1/24**
24	Develop system	12 days	Thu 21/12/23	Fri 5/1/24

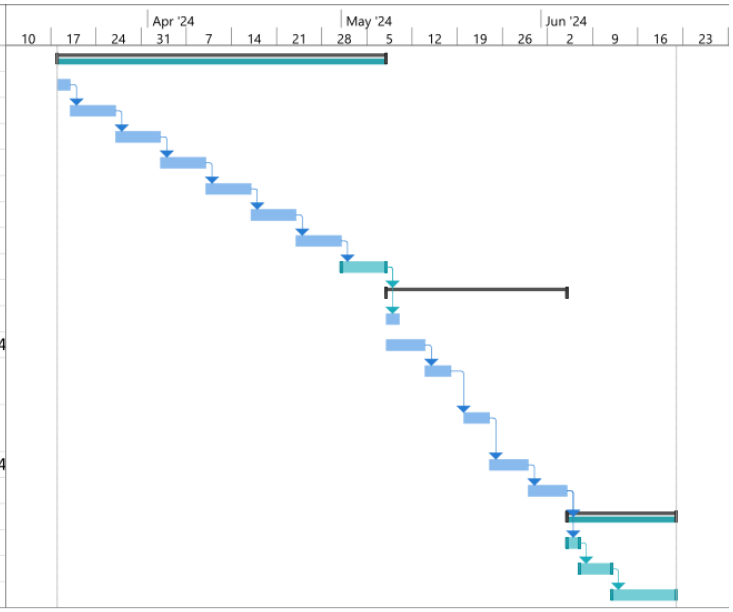


Project: GanttChart_FYP
Date: Thu 4/7/24

Task
Split
Milestone
Summary
Project Summary
Inactive Task
Inactive Milestone
Inactive Summary
Manual Task
Duration-only
Manual Summary Rollup
Manual Summary
Start-only
Finish-only
External Tasks
External Milestone
Deadline
Progress
Manual Progress

Appendix B: Project Gantt Chart PSM2

ID	Task Name	Duration	Start	Finish
1	**Mobile App Coding**	**37 days**	**Mon 18/3/24**	**Tue 7/5/24**
2	reset password	2 days	Mon 18/3/24	Tue 19/3/24
3	customer dashboard	5 days	Wed 20/3/24	Tue 26/3/24
4	cleaning service bookin	5 days	Wed 27/3/24	Tue 2/4/24
5	rental and sharing syste	5 days	Wed 3/4/24	Tue 9/4/24
6	cleaner registration	5 days	Wed 10/4/24	Tue 16/4/24
7	cleaner dashboard	5 days	Wed 17/4/24	Tue 23/4/24
8	cleaner business profile	5 days	Wed 24/4/24	Tue 30/4/24
9	customer review	5 days	Wed 1/5/24	Tue 7/5/24
10	**Admin Website Coding**	**20 days**	**Wed 8/5/24**	**Tue 4/6/24**
11	login register	2 days	Wed 8/5/24	Thu 9/5/24
12	admin dashboard	4 days	Wed 8/5/24	Mon 13/5/24
13	booking request management	4 days	Tue 14/5/24	Fri 17/5/24
14	cleaning supplies management	4 days	Mon 20/5/24	Thu 23/5/24
15	user management	4 days	Fri 24/5/24	Wed 29/5/24
16	cleaner management	4 days	Thu 30/5/24	Tue 4/6/24
17	**Testing**	**13 days**	**Wed 5/6/24**	**Fri 21/6/24**
18	Functional testing	2 days	Wed 5/6/24	Thu 6/6/24
19	User acceptance testing	3 days	Fri 7/6/24	Tue 11/6/24
20	Fix error and bug	8 days	Wed 12/6/24	Fri 21/6/24



Project: PSM2GanttChart
Date: Thu 4/7/24

Task	Inactive Summary	External Tasks	
Split	Manual Task	External Milestone	
Milestone	Duration-only	Deadline	
Summary	Manual Summary Rollup	Progress	
Project Summary	Manual Summary	Manual Progress	
Inactive Task	Start-only		
Inactive Milestone	Finish-only		

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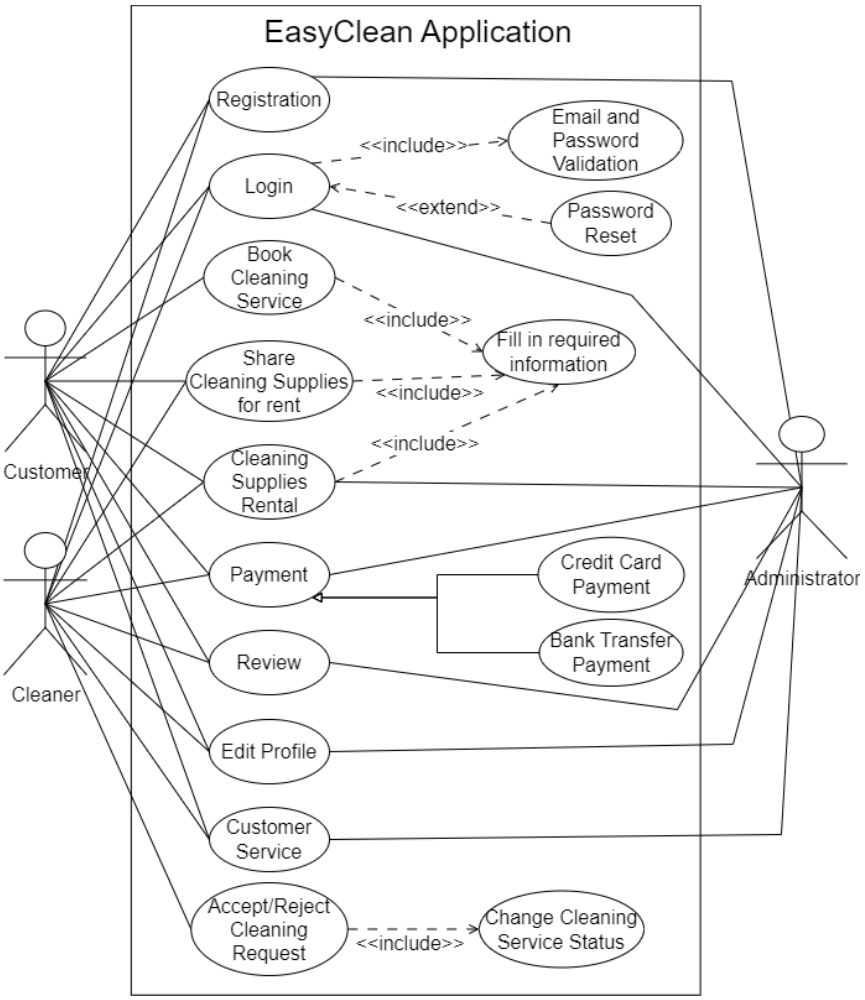
Appendix C: Use Case Diagram



Appendix D: User Acceptance Testing Questions

In this section, you will be asked to evaluate my user side of cleaning service mobile application on a scale from 1 to 5.

- **1 – Very Poor**:Very difficult to use.
- **2 – Poor**:Below average, needs improvement.
- **3 – Fair**:Meets basic expectations.
- **4 – Good**:Exceeds average expectations.
- **5 – Excellent**:Outstanding, highly functional.

Table 6 *Questions asked in the user acceptance testing*

Section	Question
A (User side)	• How easy was it to register an user account on the app? • How clear and user-friendly was the login process? • How easy was the app to navigate? • How clear were the instructions for filling out details when booking a cleaning service? • How easy was it to rent a cleaning supplies from the app? • How well did the app allow users to share cleaning supplies for rent?
B (Cleaner side)	• How easy was it to register a cleaner business account? • How easy was it to edit your business profile? • How easy was it to accept or reject a cleaning request? • How well did the app allow you to communicate with clients? • How clear was the income information provided by the app?
C (Admin side)	• How easy was it to log in as an admin? • How clear was the navigation within the admin webpage? • How easy was it for admin to create, view, edit, and delete a booking record? • How easy was it for admin to create, view, edit, and delete a user profile or cleaning business account? • How easy was it for admin to create, view, edit, and delete a cleaning supplies? • How easy was it for admin to view and search a payment history?