USER INTERFACE AND USER EXPERIENCE DESIGN OF A MOBILE APPLICATION FOR HOUSING CLEANING SERVICES IN CAMPUS AREAS WITH DESIGN THINKING

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Abstract

Students living in shared accommodation often face difficulties in maintaining the cleanliness of their living spaces due to busy academic schedules, limited time, and ineffective coordination. This situation often leads to shared cleaning schedules being neglected, which in turn affects comfort, health, and productivity. This study aims to design the user interface (UI) and user experience (UX) of a mobile cleaning service application on campus using the Design Thinking approach, which consists of the stages of Empathize, Define, Ideate, Prototype, and Testing. The design process resulted in an interactive prototype with five main features, including group service booking and real-time progress monitoring. Usability testing results showed a high task success rate (average >90%), validating the core functionality. However, challenges in navigation efficiency were identified, as indicated by a misclick rate of 47.6%. Despite this, users' overall perception of the user experience remained highly positive (average score >4.5 out of 5). These findings underscore the importance of applying UI/UX principles in designing responsive digital service platforms tailored to user needs.

Keywords: User Interface, User Experience, Design Thinking, Aplikasi Mobile

INTRODUCTION

Students who come from various regions and study outside their hometowns usually need temporary accommodation during their studies. Due to the considerable distance from their homes, they generally choose to rent accommodation such as boarding houses, rented rooms, or dormitories that are strategically located and close to the campus. The need for temporary accommodation is important for students during their studies at university, especially for those who come from outside the campus area. (Satria et al., 2023). In fact, temporary accommodation such as boarding houses is included in the primary needs of students, equivalent to other basic needs such as food and clothing, which play a role in supporting the smooth running of the learning process while studying abroad. (Damayanti Asikin et al., 2022).

Rental housing is a place of residence that is rented out by its owner, either in whole or in part, to students as users or consumers. (Nurdini, 2012). Each type of residence has different characteristics, such as facilities, social interaction, and level of freedom, allowing students to choose according to their lifestyle and needs. Nurdini (2012) Classifying rental housing into

several types based on the units being rented, namely boarding houses, rented houses, and dormitories. A shared apartment is a rental property with individual rooms that may have private bathrooms or shared facilities such as kitchens and common areas used by other residents. A rental house is a house rented out in its entirety to one or more residents at the same time. A dormitory is similar to a shared apartment but is typically associated with a specific program and requires residents to share rooms with others. According to Wibowo (2018), discipline, and social relationships for students living away from home. Life in student accommodation requires students to be independent and able to manage their time without parental supervision. Students' time management is often hampered by busy schedules filled with assignments, organizations, work, and social activities. (Anabillah et al., 2022). This accumulated pressure can trigger academic burnout, which leads to a decline in focus and self-confidence, and the emergence of procrastination (Marchella et al., 2023).

As a result, limited time and energy often lead to neglect of residential cleanliness. Data was collected through a mini questionnaire distributed to students at Semarang State University to identify the main reasons behind the habit of not regularly cleaning their residences, as shown in the following table.

Figure 1. Questions

Most students (83.3%) stated that time constraints and heavy academic workload were the main reasons they rarely cleaned their dorm rooms. Fatigue and lack of support from other residents also played a role. This indicates that these factors contribute to the neglect of living space cleanliness.

Poor living environment cleanliness can pose serious health risks for students. Gusti & Risandi (2021), found that 61.5% of boarding houses around Andalas University had disease vectors such as flies, mosquitoes, rats, and cockroaches. Dirty environments, especially due to the accumulation of garbage, are ideal breeding grounds for Aedes aegypti mosquitoes (which cause dengue fever) and flies that carry E. coli bacteria, which causes diarrhea. Ismiati & Wijayanti (2021), It also emphasizes that unmanaged waste can attract disease-carrying animals such as diarrhea, cholera, and typhoid, which can spread through contaminated drinking water.

A clean and comfortable living environment plays an important role in supporting student productivity and well-being. According to Maulida & Syahrani (2022), Housing that meets the needs of rest and study can create a conducive atmosphere, thereby increasing student motivation in pursuing academic activities. A comfortable boarding house is an essential need because it not only serves as a place to live but also as a shelter and must meet standards of adequacy (Belatian Detiara et al., 2024). A clean and tidy environment can support mental

health by improving mood, reducing stress, and providing a sense of control. Conversely, a dirty home can increase stress and interfere with focus (Penney, 2023).

Students need practical and efficient solutions to maintain cleanliness in their living quarters without disrupting their routines. Cleaning services, as part of the service sector, offer added value such as convenience and ease because they are consumed directly when provided (Lupiyoadi, 2013). In order to reap the maximum benefits, service quality is a key factor. According to (Sulistyorini & Rahardjo, 2018), service quality is determined by the service provider's commitment to meeting consumer needs and expectations through the delivery of accurate and expected services. Cleanliness itself, as explained by Yuliani & Nazaruddin (2014), is a state that is free from all forms of impurities, diseases, and other elements that have the potential to negatively impact various aspects of life. This view is reinforced by Yuliani & Mudarya (2021), which further emphasizes that the essence of cleanliness includes being free from various types of dirt such as dust, trash, and odors, and covers a broad spectrum, ranging from personal hygiene to the cleanliness of the surrounding environment.

Digitalization has driven the shift of conventional activities to the online realm, as students have become increasingly dependent on smartphones and applications that support their lifestyles (Fitri et al., 2021). According to Irfan et al., (2023), Digital progress has made various daily activities easier through more practical and efficient online access. One example of this convenience is mobile applications, which allow users to access important information in real time and flexibly through devices connected to the internet, without time or location restrictions (Sani et al., 2019).

Mobile applications are inseparable from interface design and user experience, known as User Interface and User Experience. UI/UX plays a crucial role in application development because the design must be neat, structured, and tailored to user needs (Ahsan et al., 2020).

According to Hamidli (2023), User interface or UI is the process of designing visual and interactive elements in digital products, such as applications or websites, to produce an aesthetic and user-friendly display. Meanwhile, Malewicz & Malewicz (2020) states that UI acts as a link between users and product features. Therefore, good UI design plays a vital role in supporting users in achieving their goals.

User Experience (UX) covers all aspects of user interaction with a product or service, such as ease, efficiency, comfort, and satisfaction (Interaction Design Foundation - IxDF, 2016). UX design aims to deliver a positive and meaningful experience that drives user satisfaction and loyalty (Wiwesa, 2021) One strategy that has proven effective is gamification, as it increases engagement and retains users for longer periods of time (Widagdo et al., 2024). This study project aims to produce interface designs and user experiences for mobile applications for residential cleaning services in campus areas using design thinking.

IMPLEMENTATION METHOD

The design process in this study project uses David Kelley's (Stanford University) Design Thinking approach, which consists of five main stages: Empathize, Define, Ideate, Prototype, and Test.

The Empathize stage begins with research activities, such as distributing questionnaires and conducting in-depth interviews. The data obtained is used to create empathy maps, user personas, and user journey maps to understand the needs, behaviors, and context of users. In the Define stage, the collected data is analyzed and grouped into an affinity map. This stage aims to identify patterns and formulate the main problems in a more focused manner. The Ideate stage focuses on finding creative solutions through the formulation of how might we, mapping idea priorities, and compiling user flows as the basis for user experience design. Moving on to the Prototype stage, visual designs are developed through the process of creating information architecture, sitemaps, wireframes, UI style guides, high-fidelity designs, and interactive prototypes. The final stage, Test, is conducted by testing the prototype using platforms such as Maze. Users are asked to complete a number of task scenarios and then provide feedback through a post-test questionnaire to evaluate the effectiveness of the design.

To ensure that the developed UI/UX design optimally addresses user needs, a thorough audience analysis is conducted. The analysis identifies the primary target users as final-year students (semesters 6–8) residing on campus. They have high levels of academic and non-academic activity and are accustomed to using mobile apps to access various services.

RESULTS AND DISCUSSION

1. Emphatize Stage

In the Empathize stage, research was conducted by distributing questionnaires to 40 respondents to understand the perspectives, needs, and obstacles of students. The results of this research were then synthesized and visualized using Empathy Map, User Persona, and User Journey Map.

2. Define Stage

The research findings from the Empathize stage are then identified and analyzed further in the Define stage. At this stage, one of the methods used is the Affinity Diagram to group various pain points and findings into main themes. From this synthesis, the problem statement is formulated that users need an effective way to delegate their household cleaning tasks in a practical and trustworthy manner, driven by their desire to remain focused on their main priorities without being burdened by concerns about security and privacy.

3. Ideate Stage

Based on the problem statement, the process continued to the Ideate stage, which aimed to brainstorm and generate as many creative solution ideas as possible. To spark these ideas, the existing challenges were reformulated into a series of "How Might We" (HMW) questions that focused on opportunities. This ideation session produced various feature concepts, including daily service cleaning, group cleaning services, manual staff selection, gamification features, and features to monitor service progress. These potential ideas were then prioritized using a Prioritization Matrix to select solutions with the highest impact and most realistic effort.

4. Prototype Stage

After going through the Ideation stage in the design thinking process, a UI/UX design work was produced in the form of a mobile application prototype called Kosan Care. The design concept behind Kosan Care is simple, functional, and user-friendly, where every visual element and interaction is designed to be easy for users to understand and use. The UI/UX design of Kosan Care includes several key features, including:

a. Sign-Up or Sign-In Feature

This is the initial screen users will see when they first access the Kosan Care app prototype. Before proceeding with the registration process, users are directed to an onboarding page featuring a welcome message and two main buttons: one for signing in and another for creating a new account.
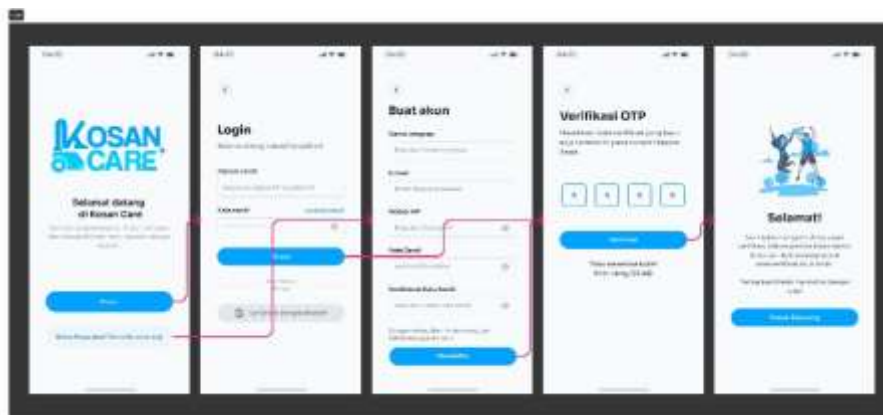

Figure 2. Sign Up or Log In Feature Flow

On each page in this stage, UX principles such as Fitts's Law and Jakob's Law are applied to support ease of interaction and consistency of user experience. Fitts's Law is reflected in the "Log In" CTA button, which is designed to be larger, prominent with the main color, has a wide touch area, and is placed in an easily accessible position, thereby facilitating quick and efficient user interaction. Meanwhile, Jakob's Law is applied through the placement of elements such as input fields, links, and buttons that follow the general pattern of other application interfaces, so that users can immediately understand how the application works without having to adapt again.

b. Service Booking Feature

After logging in to the homepage, users will be presented with four main service icons. Each icon represents a service category that can be selected as needed. When clicked, users will be directed to the service details page, where they can set the duration, schedule, and location. After that, users proceed to the page for selecting an agent according to their preferences, then to the payment page that displays the order details. After clicking the "Pay Now" button, a pop-up will appear confirming that the payment was successful.
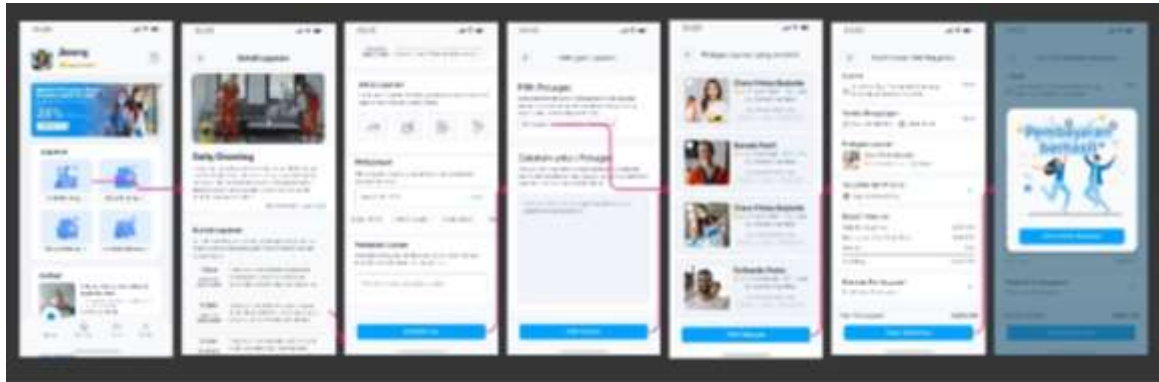
Figure 3. Service Order Flow

Law The Law of Similarity is reflected in the service icon components, which are divided into four main categories: Daily, Deep, Group, and Furniture Cleaning. Each category is presented with consistent icons and colors, making it easier for users to recognize visual patterns, quickly understand options, and reduce cognitive load. Furthermore, Jakob's Law is applied in the placement of navigation icons at the bottom of the app, following the common pattern of other mobile apps. This helps users feel familiar and eliminates the need to re-learn the navigation structure. Fitts's Law is also applied to the CTA buttons, which are designed with a large size and placed at the bottom of the screen. This placement makes it easier for users to reach with their thumb, resulting in faster and more efficient interactions. Meanwhile, the Law of Proximity is evident in the arrangement of service information elements such as duration, schedule, and location, which are grouped together. This grouping helps users understand that these three elements are part of a single functional unit in the service booking process.

c. Shared Service Order Feature

On the menu bar, there is a "Group" icon. On this page, a list of previously created groups is displayed. Users can create a new group by pressing the "Create Order Group" button. After that, users will be directed to the "Create Group" page, where they can set the group name, select the type of accommodation, and add other members. Next, users will enter the group order details page to discuss and coordinate fund collection. Group representatives can place a service order by clicking the "Next" button, which will display a pop-up with service type options that will then redirect to the corresponding order page based on the category.
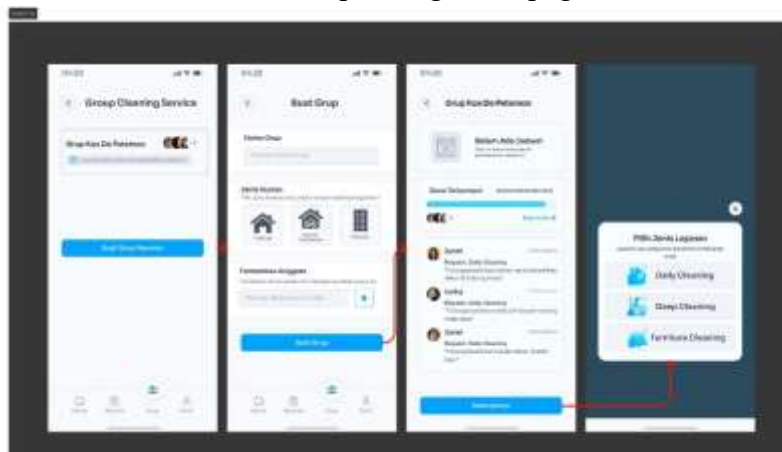

Figure 4. Shared Service Ordering Flow

Jakob's Law is applied in the placement of navigation icons at the bottom of the application, in line with the general pattern used in other mobile applications. Meanwhile, Fitts's Law is applied through main action buttons such as "Create Group" and "Next," which are designed to be large, with contrasting colors, and strategically positioned at the bottom of the screen so they are easy to reach with the thumb. The Law of Similarity is reflected in the service icons, which are divided into three main categories: Daily, Deep, and Furniture Cleaning.

d. Order Monitoring and Review Features

On the menu bar, there is an "Orders" icon, which displays three categories: In Progress, Completed, and Cancelled. Users can press the "Monitor Order" button to view the details of ongoing orders. On the progress page, information about the service provider, a chat button, work status, progress photos, and a live checklist are available. After the service is completed, users can rate the service provider through the review feature by giving stars, appreciation, and comments. After submitting the review, a "Order Completed" pop-up will appear, displaying the badge and points earned.

Figure 5. Flowchart for Monitoring Orders and Providing Reviews

During the monitoring and review stage, Fitts's Law is applied through large buttons such as "Monitor Order" and "Submit Review" placed at the bottom of the screen for easy access. Jakob's Law is reflected in the familiar UI flow of monitor–review–confirm, minimizing the learning curve for users. Elements such as status, progress photos, and checklists are grouped together according to the Law of Proximity so that they are easily understood as a single sequence. After the review is submitted, a "Order Complete!" pop-up appears, which is an application of the Law of Feedback that provides certainty and reward. Meanwhile, the use of simple icons and text reflects the Law of Clarity, ensuring that information is conveyed clearly and concisely.

e. Level and Benefit Features

On the menu bar, there is a "Profile" icon that directs users to the user profile page. On this page, users can view account information, level status, and the number of points collected. Users can also access features such as edit profile, saved addresses, payment methods, and app settings. When clicking the "View Benefits" button, users are directed to the Level & Benefits page, which displays user tiers such as Shiny Friend, Clean Champion, and Hygiene Sultan, complete with their respective points and benefits.

Figure 6. Flowchart for Accessing Level and Benefit Features

On the profile and benefit level pages, Jakob's Law is evident in the bottom navigation structure and vertical layout that follow the general pattern of mobile applications, making users feel familiar and easy to adapt. The Law of Similarity is evident in the consistency of icons and colors in each icon, helping users quickly recognize similar functions. Related elements such as user points, level badges, and benefit details are visually grouped together in accordance with the Law of Proximity, enabling users to understand the relationships between elements as a whole. Once users reach a certain point threshold, the system provides feedback in the form of level changes and new badge displays, reflecting the Law of Feedback. Additionally, all information is presented concisely using simple icons and text, embodying the Law of Clarity to avoid confusion and support quick comprehension.

5. Testing Stage

The next step was to conduct testing involving 15 respondents via the Maze platform using three key indicators: direct success, misclick rate, and average duration. A summary of the Maze report results is presented below.

Table 1. Report Maze

No	Task	Direct success	Misclick rate	Average Duration
1	Membuat Akun Baru	100%	28.7%	21.0s
2	Melakukan Pemesanan Layanan	95.2%	47.6%	26.5s
3	Melakukan Pemesanan Group Cleaning Service	95.0%	43.0%	24.8s
4	Melakukan Pemantuan Pemesanan dan Memberikan Review	84.2%	44.2%	24.1s
5	Akses Halaman Level & Benefit	100.0%	43.2%	12.8s

The percentage of users who successfully completed tasks according to the specified flow showed high results, namely 100% for creating a new account, 95.2% for ordering services,

95% for ordering group cleaning services, 84.2% for monitoring orders and providing reviews, and 100% for accessing the level & benefits page. Although most tasks have a high success rate, some still show a relatively high misclick rate, such as 47.6% for service booking and 44.2% for order monitoring and leaving reviews. The high misclick rate for service orders is primarily due to users clicking on links such as "Schedule," "Extra Services," and "Select Schedule," which are actually outside the main task flow in Maze, resulting in them being recorded as misclicks.
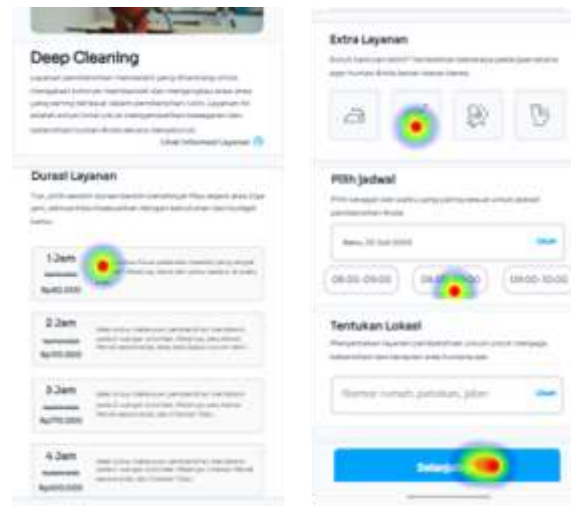

Figure 7. Heatmap on the service order details display

We've made some design improvements to the order tracking section. One of them is changing the "View Order List" button that pops up after a successful order to "Track Order Now," and adding order status info to the home page to make it easier for users to find the order tracking feature and leave reviews.
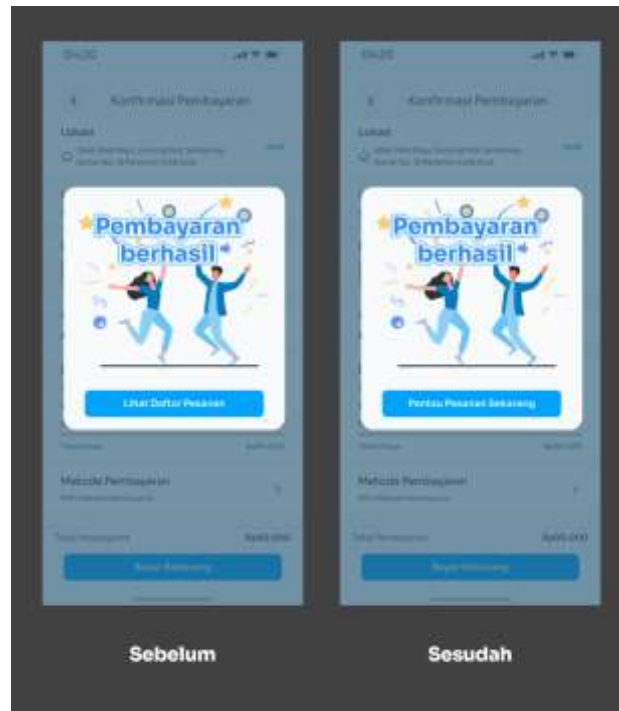
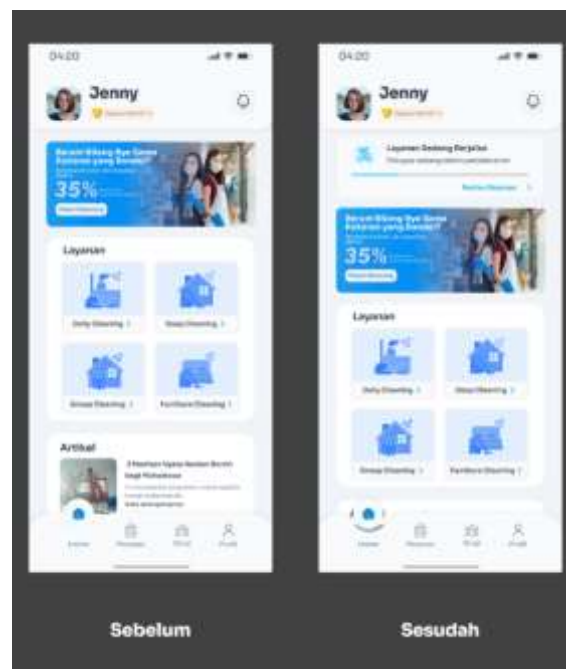**Figure 8. Results of the Monitor Order Now Button Iteration**

Figure 9. Home Page Iteration Results

After completing usability testing through Maze, users were asked to fill out a post-test questionnaire consisting of 7 Likert scale items. The questionnaire results showed that users' perceptions of the application were very positive. The overall experience received an average score of 4.71, while task completion ease was rated highly with a score of 4.57. The information presented was deemed easy to understand (4.64), as was the ease of finding interactive elements (4.43) and app navigation (4.50). Additionally, the majority of users felt they did not need

technical assistance to use the application (4.14). Visual elements were rated as sufficiently consistent with an average score of 4.64. Overall, these results reflect a high level of satisfaction and clarity of use, although there is still room for improvement in terms of technical support and consistency of elements across pages.

CONCLUSION

The scientific paper titled "Designing the User Interface and User Experience of a Mobile Application for Residential Cleaning Services in Campus Areas Using Design Thinking" resulted in five main features, namely: individual service booking, group service booking, monitoring and review features, level & benefit pages, and user profile pages. The results of the UI/UX design testing showed good outcomes, with an average direct success rate above 90%. However, some tasks such as monitoring and providing reviews showed a high misclick rate (44.2%), as did service booking (47.6%), indicating the need for design iterations, particularly in navigation elements and task path clarity.

Overall, user acceptance is in the positive category. Post-testing questionnaire results show high scores in overall experience (4.71), ease of task completion (4.57), information clarity (4.64), navigation (4.50), and design element consistency (4.64). However, some users still felt that improvements were needed in terms of ease of use without technical assistance (4.14).

For further development, the UI/UX design of this application can be improved through visual enhancements with a more emotional and consistent branding approach, the addition of subscription features for regular users, and the optimization of a points- and mission-based gamification system to enhance user loyalty.

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