Article

Applying design thinking to develop a tourism application for the Halimun Salak National Park Area

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Abstract—This study introduces a ticket-and-lodging application for Halimun Salak National Park, built with a Design Thinking-driven UI/UX approach. Although the park ranks among Indonesia's foremost nature attractions, its existing reservation process remains hampered by an unfriendly booking flow and limited access points. The project followed the five Design Thinking phases—empathize, define, ideate, prototype, and test—to observe visitors, pinpoint their needs, and craft a digital remedy that addresses those needs. Interviews and surveys revealed several obstacles, including confusing menus, slow confirmation, and few payment options. These findings guided the creation of wireframes and interactive prototypes. Prospective visitors then used the prototype, and their comments informed refinements to navigation, visual hierarchy, and support tools such as real-time availability and push notifications. User-satisfaction scores and task-completion times were measured before and after the application's introduction; results showed marked gains in speed and clarity compared with both the conventional website and on-site counters. The new application streamlines ticket and accommodation reservations through an intuitive interface and traveler-oriented features. This solution is expected to spur tourism growth at Halimun Salak National Park while illustrating how digital platforms can advance Indonesia's wider tourism sector.

Keywords—design thinking; lodging; ticket booking; tourism; ui/ux.

1. Introduction

Rapid advances in technology now touch nearly every part of daily life. Toddlers, teenagers, and adults alike rely on digital tools for work, learning, entertainment, and even basic communication (Nurmaharani & Heriyanto, 2023). Because information is easier to obtain and share, corporate strategy, operations, and relationships with customers and business partners are increasingly shaped by information technology. Automation supported by IT allows data to be gathered, processed, and evaluated more quickly and precisely, raising overall operational efficiency. As a result, firms have shifted away from manual procedures toward faster, digitally connected workflows born of ongoing digital transformation (Muhammad Iqbal et al., 2024).

Within today's digital environment, applications that prioritize user interface and user experience have become essential for improving satisfaction and streamlining travel planning (Purbo et al., 2023). Yet the Halimun Salak National Park tourist area still relies on paper-based ticket sales at its main gate, and cashless payment options are not available. Visitors often complain about long queues as well as the lack of electronic payment, which complicates entry for guests who arrive without cash. Users also report frustration with the web-based climbing-permit portal for Mount Salak, whose layout feels confusing. In addition, limited information about guides, attractions, and local lodging leaves many newcomers uncertain about where to go once they reach the park.

This study proposes a single mobile application that combines entrance-ticket purchases, Mount Salak climbing

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Fig. 1. Stages in design thinking method

Table 1. Observation questionnaires

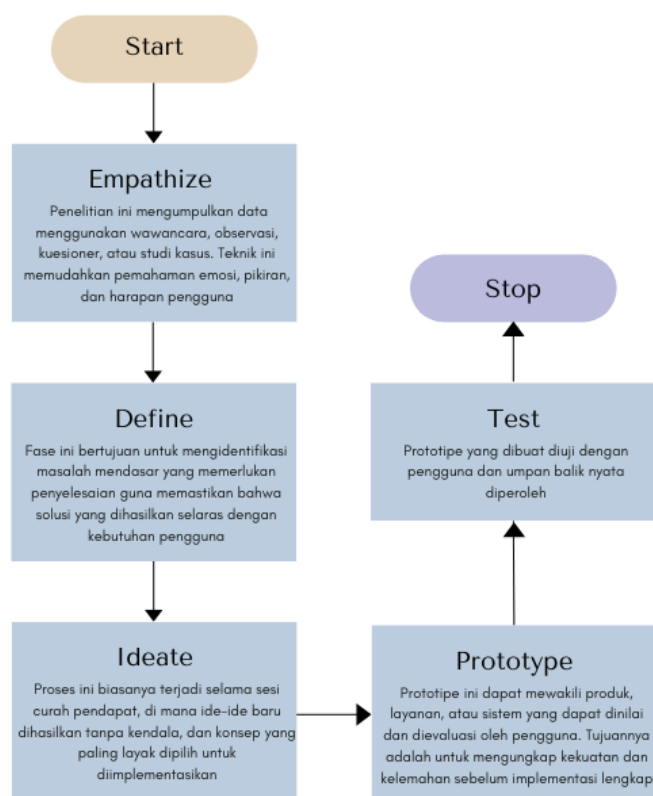| No	Question
1	Do you frequently visit the Mount Halimun Salak tourist area, either for recreation or other activities?
2	In your view, is the current ticket-sales process at the park entrance gate efficient and convenient for visitors?
3	Have you ever hired a tour guide or joined an outbound program while exploring Mount Halimun Salak?
4	Do you find it difficult or time-consuming to obtain reliable information about tour-guide or outbound service providers in the area?
5	Would a dedicated mobile or web application for reserving entrance tickets and tour-guide or outbound services be necessary for travelers?
6	If such a booking application were introduced, do you think it would be effective and genuinely help visitors plan their trips to Mount Halimun Salak?

permits, guide services, hotel or resort booking, and tourism recommendations. The planned interface will be clear for all age groups, and the system flow will remain straightforward. By introducing the application, park managers can shorten queues at the main gate, provide convenient non-cash transactions, manage climbing permits more easily, and strengthen visitor services. Greater service convenience is also expected to attract more tourists to Halimun Salak National Park.

Developing the application calls for tight integration of user interface and user experience elements from the earliest design phase. A thoughtful visual layout seeks to encourage smooth interaction and sustained engagement. Employing a Design Thinking methodology throughout UI and UX creation helps identify real user requirements and address specific pain points. Design Thinking, a solution-oriented approach grounded in deep user insight, guides designers through empathizing with users, defining core issues, generating ideas, prototyping, and testing until the final product meets both functional and experiential needs (Denasfi & Wahyuni, 2020).

2. Method

This study adopts a design-thinking methodology, a user-centered approach that seeks to understand and resolve problems by concentrating on user requirements and experience. The method was selected because it can produce new solutions tailored to each context and because it supports an iterative service-development process. As shown in Fig. 1, design thinking moves through five stages—Empathize, Define, Ideate, Prototype, and Test—each linked to the next in a continuous cycle.

The first stage, empathize, offers a thorough view of client needs, obstacles, and viewpoints. Data are gathered through interviews, observation, questionnaires, and case studies, allowing the team to explore user emotions, thoughts, and expectations (Haryuda et al., 2021).

In the define stage, the insights collected earlier are refined into a concise problem statement. By isolating the core issue, the team ensures that later solutions remain aligned with user priorities (Alamsyah et al., 2022).

In the ideate stage, the research or design group then generates creative concepts that respond to the defined problem. Ideas emerge during open brainstorming sessions, after which the most feasible concepts are chosen for development (Ilham et al., 2021).

In the prototype stage, an initial model of the chosen solution is produced in line with relevant standards. The prototype may be a product, service, or system that users can review and evaluate; its purpose is to reveal strengths and weaknesses before full implementation (Herfandi et al., 2022).

Finally, in the test stage, the prototype is presented to users so that authentic feedback can be collected. Findings from this stage guide ongoing refinement and further development, ensuring that the final outcome truly meets user needs (Ansori et al., 2023). Through this repeated cycle, design thinking fosters solutions that remain responsive and effective over time.

3. Results and discussion

This section presents the findings obtained through each research method, focusing on the application of the design thinking framework to develop an online climbing-permit application and the Halimun Gate ticket-booking system. The investigation followed the five classic design thinking phases—Empathize, Define, Ideate, Prototype, and Test—ensuring that every solution aligns with stated requirements while improving overall efficiency. The discussion also compares existing Gunung Salak web-based permit features with the proposed Halimun Gate application to highlight their respective strengths and gaps.

Table 2. *Pain point*

No	Pain Point
1	Para wisatawan mengeluhkan panjangnya antrean dalam pembelian tiket wisata
2	Wisatawan kesulitan dalam mencari info tempat wisata apa saja yang ada di area wisata gunung salak
3	Para wisatawan mengeluhkan terkait minimnya info jasa *tour guide* dan penyedia *outbound*
4	Wisatawan kesulitan dalam mencari info dan kontak untuk melakukan reservasi wisata
5	Wisatawan kesulitan dalam melakukan pembayaran karena belum tersedianya pembayaran non tunai

Table 3. *How might we*

No	How Might We
1	The online ticketing and reservation system can help reduce queues by allowing users to check and purchase tickets online, minimizing the need for offline ticket purchases.
2	The app displays images and descriptions of tourist attractions, enabling tourists to choose the destinations they wish to visit.
3	It provides information and booking options for tour guides and outbound service providers.
4	The app includes a reservation feature for various tourist activities.
5	Additionally, the app offers ticket purchasing and reservation transactions, allowing for cashless payments within the platform.

Fig. 2. Illustration of user persona

3.1. Empathize

In the first phase, the author collected user insights by distributing a Google Form questionnaire. The survey reached visitors to Halimun Salak National Park, local residents living near the tourist area, and university students who frequently access park services. Table 1 lists the questions addressed to respondents, providing essential information about user needs and expectations that guided subsequent stages of the study.

The questionnaire drew 48 participants, nearby residents, and university students. Their responses revealed several pressing issues, summarized in Table 2. Approximately 80% of respondents judged the current gate-side ticket system inefficient. Then, approximately 55% found it hard to obtain reliable information on tour guide or outbound services. Meanwhile, approximately 90% agreed that a dedicated, all-in-one tourism app for Mount Halimun Salak National Park is essential. Whereas approximately the same 90% believed such an app would greatly assist visitors during their trips.

3.2. Define

The "How Might We" framework offers concise prompts that turn each problem statement into a design goal (Aryansyah et al., 2023). Drawing on the issues listed in Table 2, a

corresponding set of "How Might We" questions was prepared, as shown in Table 3, to direct later design decisions.

3.3. User persona

A user persona serves as a detailed profile representing key characteristics of target users. These profiles are developed based on insights gathered during the initial Empathize stage of the process (Sutrisno et al., 2023). They provide a consistent point of reference throughout the subsequent development phases, ensuring that design decisions remain centered on the user's needs and perspectives. Fig. 2 illustrates the primary persona established for this project. This profile includes essential details such as background information, typical digital activities, challenges encountered (pain points), and desired outcomes or expectations. By keeping this persona visible, the team can continually evaluate proposed designs against the requirements of the intended audience.

3.4. Ideate

The Ideate phase involves generating and organizing potential solutions to address the identified user needs. A commonly used tool in this phase is the affinity diagram, which helps structure a collection of ideas into logical, thematic clusters. Grouping ideas in this manner aids in synthesizing numerous possibilities and highlighting common themes or approaches. These resulting groups then provide clear directions for enhancing various aspects of the project, specifically suggesting improvements for both the written content and the visual presentation of information, such as on a website (Hasna et al., 2023). Fig. 3 presents the final arrangement of these idea clusters, showing the categorized results from the affinity diagramming session.

To supplement the conceptual diagrams, a user journey map was developed using data gathered from surveys. This map illustrates visitor behaviors specifically related to the process of purchasing tickets (Dumalang et al., 2023). Fig. 4 visually represents each point of contact a user has with the system, starting from their initial search for information all the way through providing feedback after a visit. This visualization

Fig. 3. Affinity diagram

Fig. 4. User journey map

serves to highlight areas where interactions could be made smoother and more intuitive for the user.

Furthermore, the concept of user flow was employed. A user flow provides a visual sequence of the actions a user is required to perform to successfully complete a particular task within the application. The structure of this user flow was deliberately designed to align closely with the existing operational procedures of the company. The foundation for this flow originates from the ideas and insights gained through analyzing user problems and understanding typical user behavior patterns (Fahrudin & Ilyasa, 2021). Fig. 5 through Fig. 7 present this detailed flow, offering clear guidance to developers responsible for building the system by showing how to structure screens and create navigation pathways that feel natural and easy for the eventual end-users to follow.

Prior to beginning the main visual design work, wireframes were created. A wireframe serves as a foundational design structure used to arrange the various elements that will appear on a page within the application. Wireframes are commonly produced using specialized design software, such as Figma. In their visual form, wireframes are simplified representations, typically composed of basic lines and boxes, which establish the layout and structural placement of content elements within the application interface (Yusri et al., 2024). Fig. 8 shows the wireframe design for the tourism application before moving on to building a working prototype.

Consistency in design standards and quality across the application is maintained through the use of a design system. This system functions as a centralized collection of reusable components. For this particular study, the design system includes essential components such as defined color palettes, and specific typography styles. The design system elements that were incorporated into the user interface and user experience design are clearly shown in Fig. 9, providing a visual reference for the chosen design components.

Regarding the phase of design development, the creation of both the wireframes and the subsequent prototypes was carried out using the software application Figma. Figma was selected as the tool for this project for several key reasons. It offers robust capabilities that are well-suited for developing user interfaces
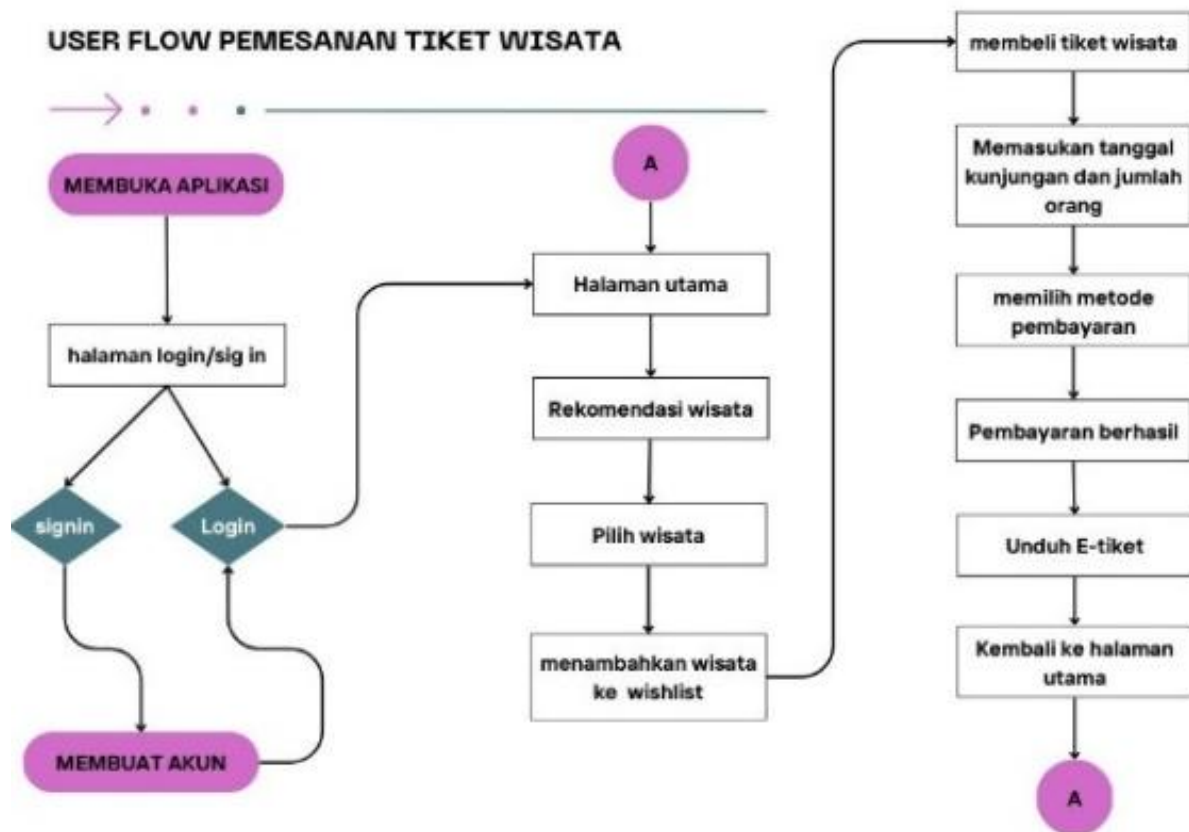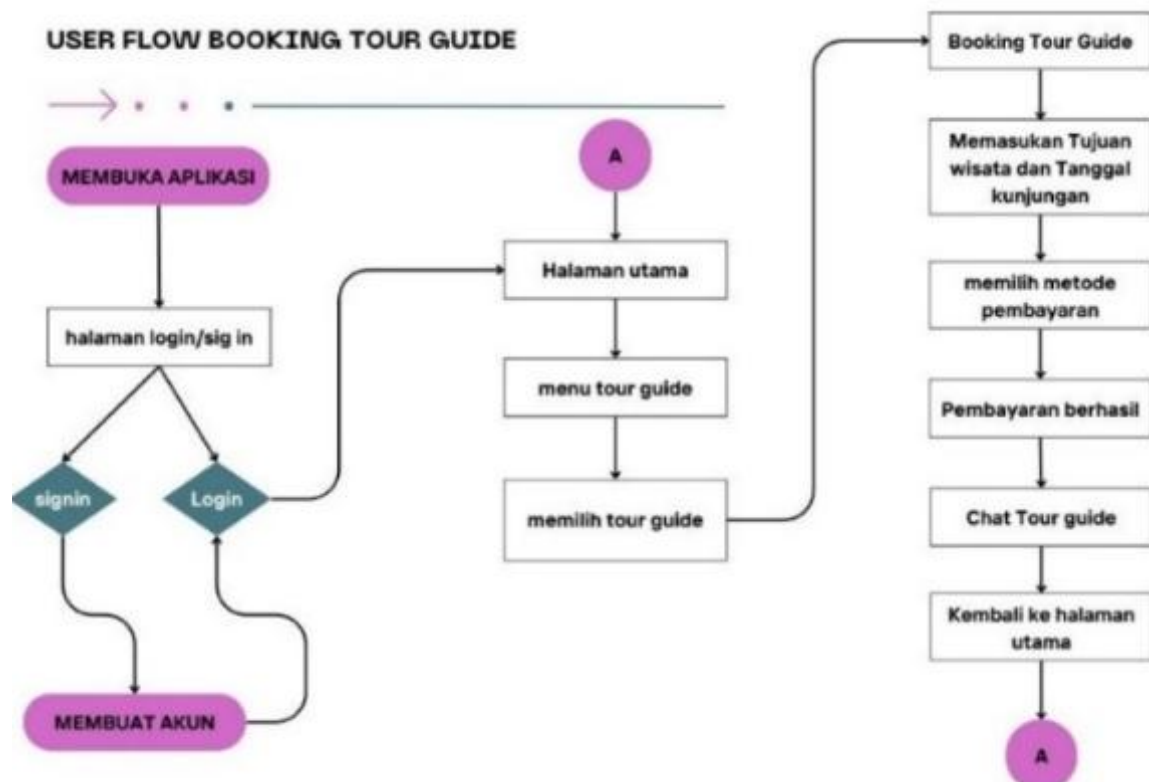
Fig. 5. Ticket ordering process

Fig. 6. User flow to book a tour guide

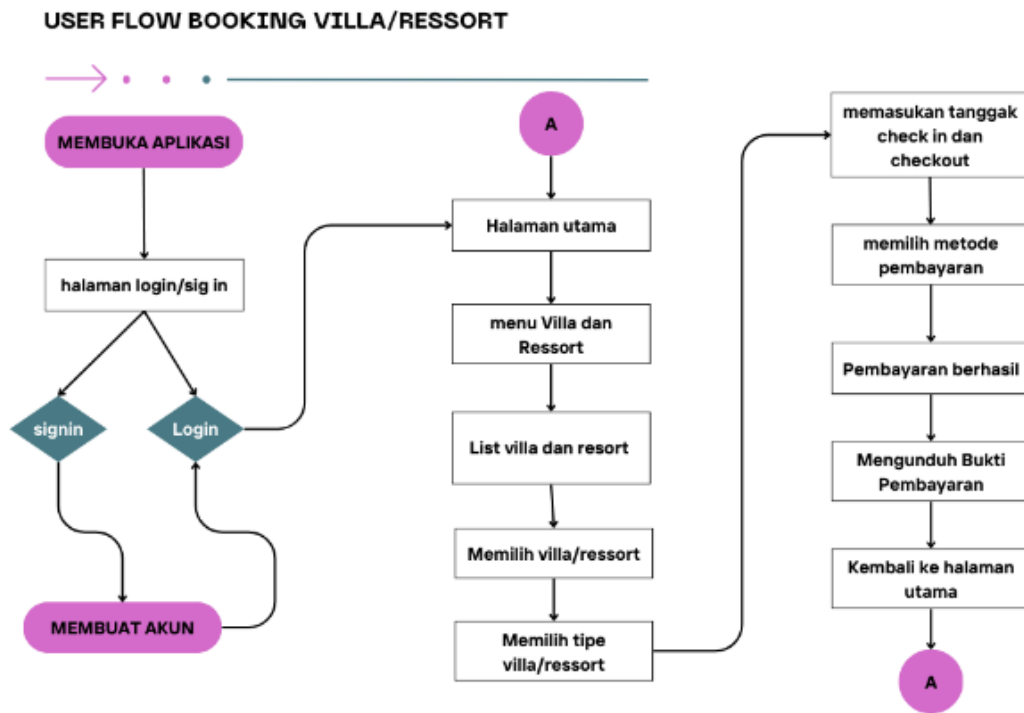## USER FLOW BOOKING VILLA/RESSORT

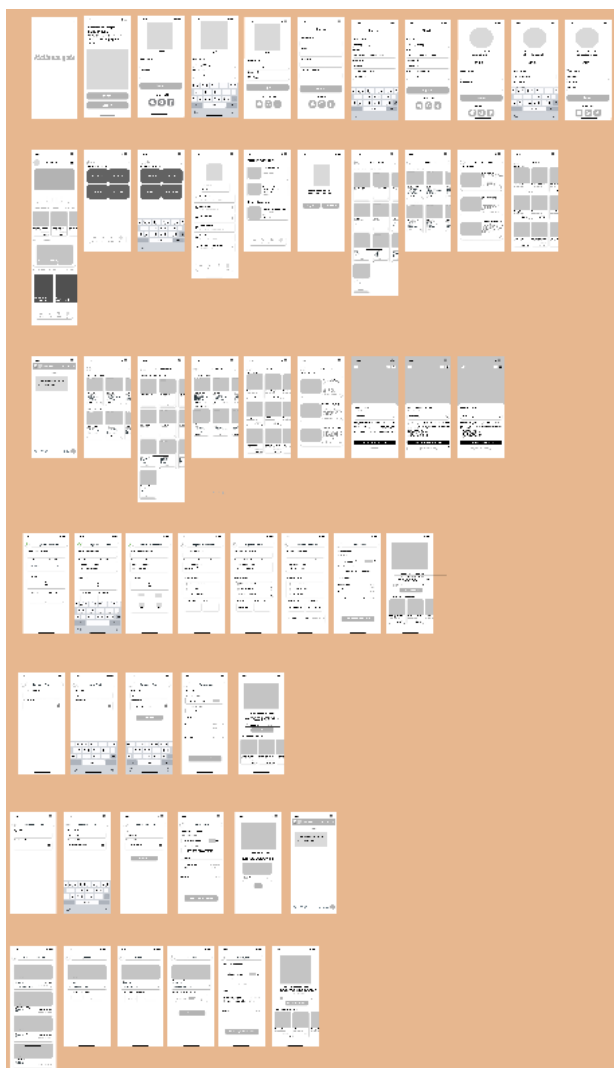Fig. 7. User flow to book a villa or resort

Fig. 8. Wireframe designs for all app pages

Fig. 9. Illustration of design system components

and user experiences. Additionally, the platform provides access to an extensive collection of design references and a large number of readily available UI/UX design elements, which facilitated the design process. A practical advantage is that Figma is available as a free-to-download application, making it a suitable and accessible option for conducting this stage of the design work.

3.5. Prototype

The prototype serves as a high-fidelity design representation and was developed using Figma. For the prototype design, the author opted for a mobile-based layout with dimensions W:393 x H:852. The mobile-based design was chosen because the majority of users tend to access services through smartphones. A responsive and user-friendly interface enhances the app's usability, especially on touchscreen devices. This mobile-first approach also improves the overall user experience. The prototype is visually very similar to the final product, with high fidelity providing a comprehensive and realistic depiction of the design solution, including colors, icons, images, text, buttons, and other elements. The sketches
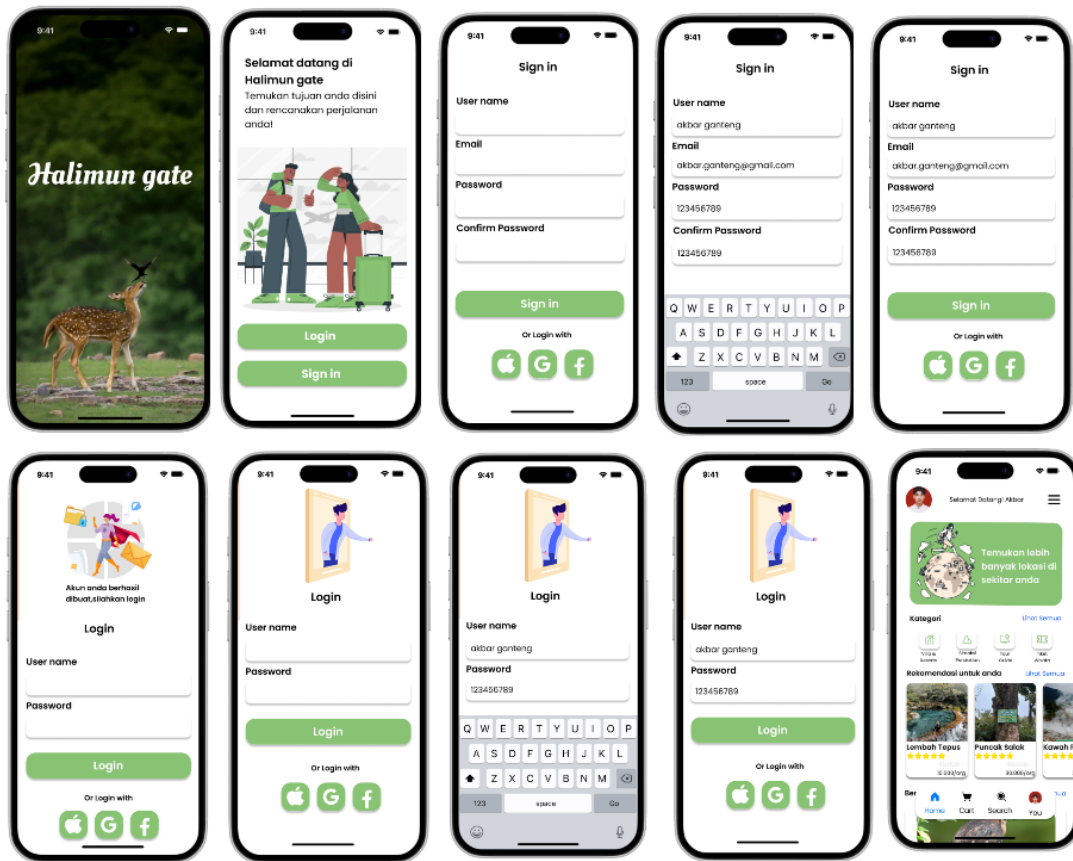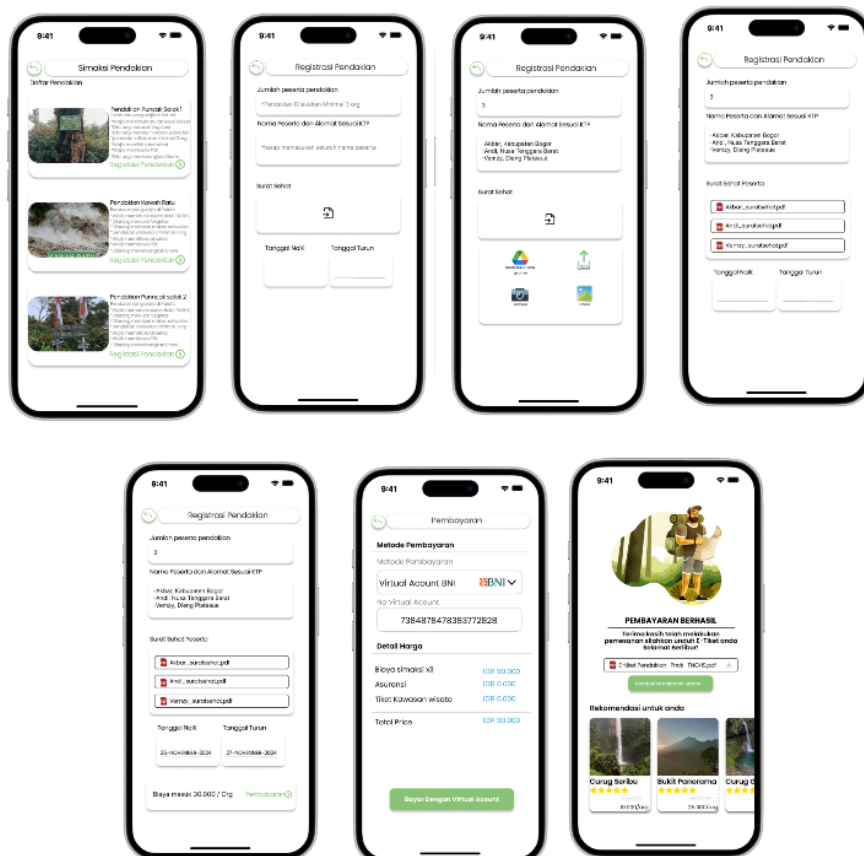
Fig. 10. Designs of sign-in and main pages

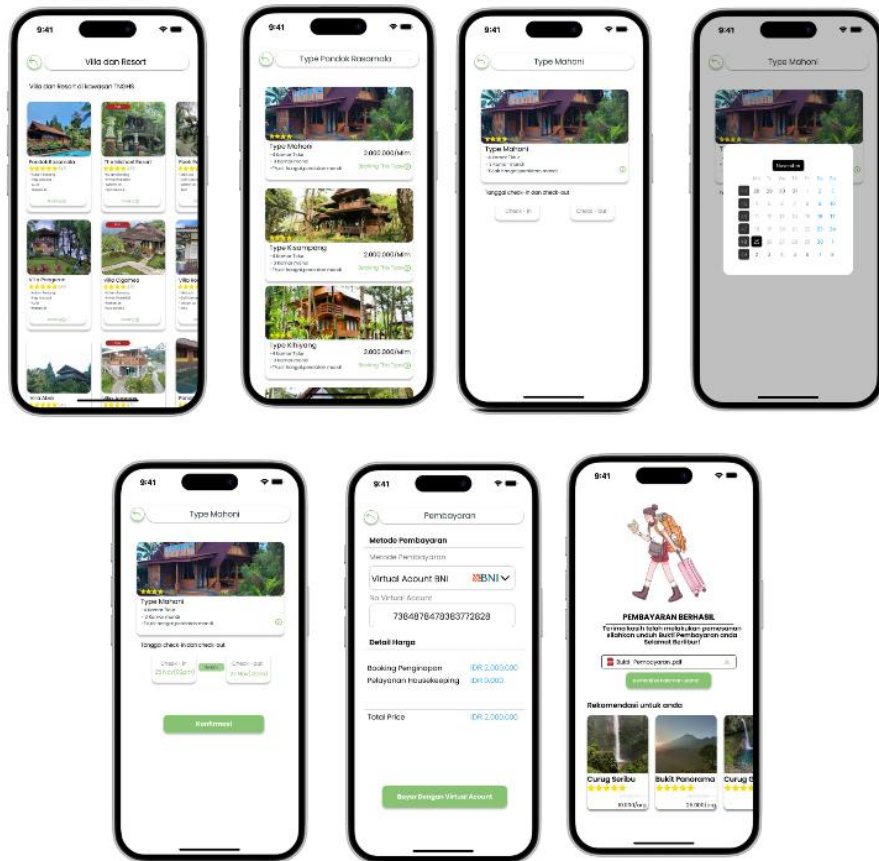Fig. 11. Menu design for *simaksi* (a hiking tourism entry permits)

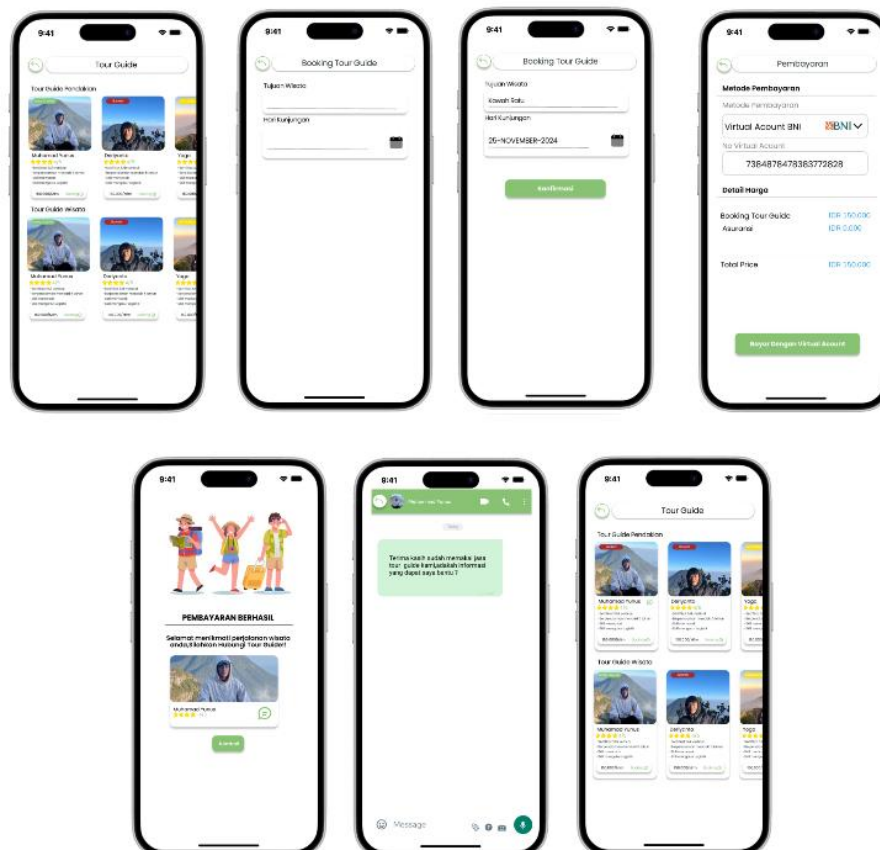Fig. 12. Menu design for villas or resorts booking

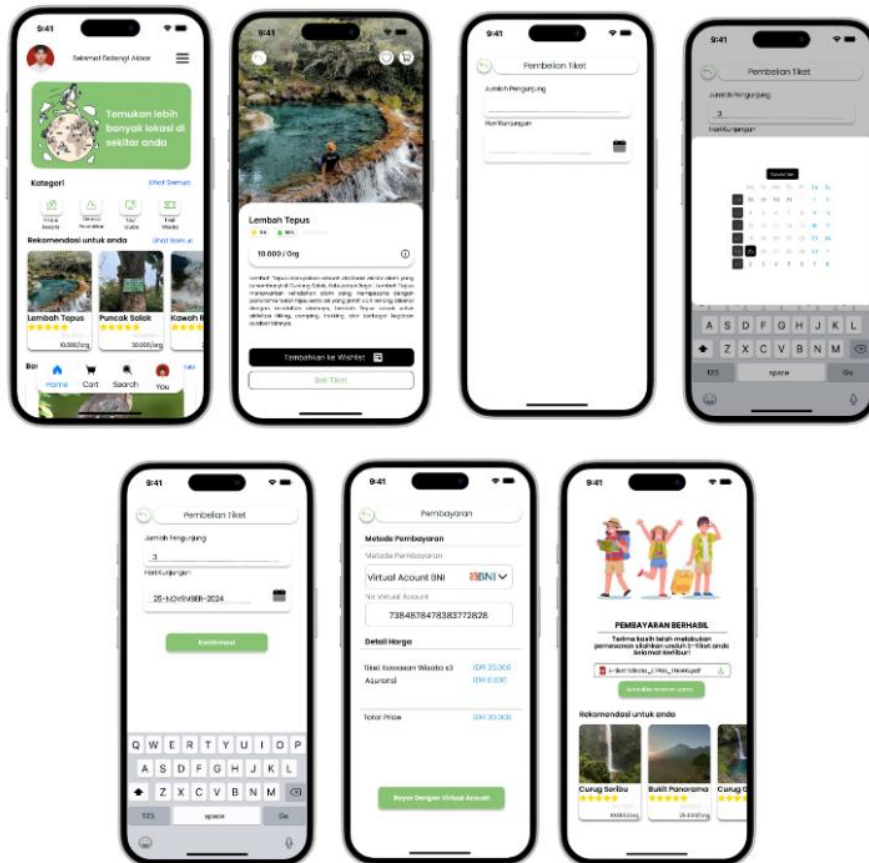Fig. 13. Menu design of the tour guide service ordering

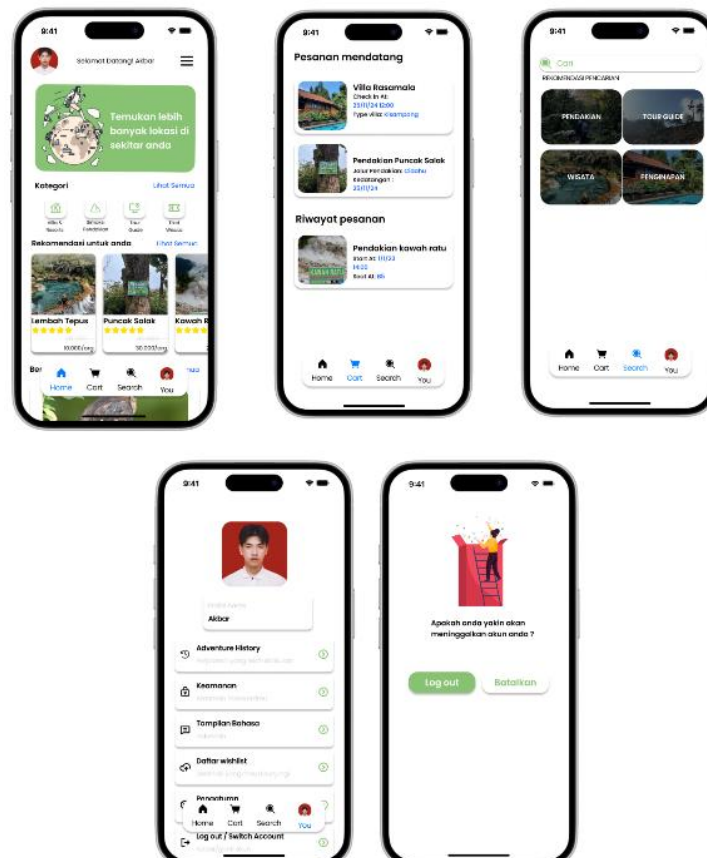Fig. 14. Design of the tourist ticket ordering process

Fig. 15. Designs for home, chart, search, and log out

Table 5. SEQ results from respondents

SEQ	Respondent SEQ Score														Score
	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R12	R13	R14	R15	
T1	7	7	7	7	7	7	7	6	7	4	7	7	7	7	6,7
T2	7	7	7	7	7	7	7	6	7	4	7	7	7	7	6,7
T3	7	7	7	7	7	7	7	5	7	6	7	7	7	6	6,7
T4	7	7	7	7	7	7	7	6	7	7	7	7	2	6	6,5
T5	7	6	7	7	7	7	7	6	7	7	7	7	7	6	6,7
T6	7	6	7	7	7	7	7	7	7	7	7	7	7	7	6,9
T7	7	6	7	7	7	7	6	7	7	7	7	7	7	6	6,7
T8	7	6	7	7	7	7	7	6	7	6	7	7	7	6	6,7
T9	7	6	7	7	7	7	2	6	7	6	7	7	7	6	6,3
	Final Results														6,69

created during the wireframing phase were transformed into a high-fidelity design that closely resembles the final outcome. High fidelity is comprehensive, showcasing an easy-to-understand navigation system, a layout that mirrors the final product, and the ability to monitor the implementation of requirements (Putra & Indah, 2023).

The sign-in page and the home page are the entry points for the sign-in and login process, necessary before accessing all features within the application, as shown in Fig. 10. Tourists who do not have an account must create one before logging in. The account creation process is simple and practical, as tourists can sign up using their Google, Apple, or Facebook accounts.

In the design of the *Simaksi* (a hiking tourism entry permits) menu, additional requirements were incorporated that were not previously available for online processing, such as the feature to upload climbing requirements (Fig. 11). This feature makes it easier and faster for climbers to complete their requirements, while also simplifying the verification process for the national park authorities.

To address the issue of limited information about accommodations and their pricing, the app includes a feature that allows tourists to search for accommodation information and make bookings directly within the app, as illustrated in Fig. 12.

The Halimun Gate application design also includes a feature to search for tour guides, as shown in Fig. 13. Tourists can find information about available tour guides and book their services in advance before their trip.

Tourists can also book tickets online, make reservations ahead of time, and pay electronically, as shown in Fig. 14. This feature will help reduce queues at the main ticket counters and enhance overall service efficiency.

Finally, the app's main page, from the homepage to the logout function, is designed to be attractive and easy to understand, as illustrated in Fig. 15. This ensures that the app is simple to use and does not confuse tourists.

3.6. Test

The final stage of the design process using the design thinking methodology is the testing phase, which involves evaluating the UI/UX prototype of the Halimun Gate application. This evaluation is conducted using the Single Ease Question (SEQ) approach with a 1-7 rating scale. The purpose of

Table 4. UI/UX design testing questionnaire

No	*Pain Point*
1	What is your opinion on the placement of features in the design?
2	How easy are the features in the design to use?
3	What do you think of the font style used in the design?
4	How is the spacing between the font and icons in the design?
5	What is your opinion on the icon style used in the design?
6	How is the color choice in the design?
7	What is your overall impression of the design?
8	Do you like this design?
9	Do you believe this design needs improvement?

this testing method is to assess the comfort and ease experienced by users after interacting with the developed prototype.

Based on the SEQ testing conducted with 15 respondents across 9 design evaluation tasks, the average score obtained was 6.69 on a scale of 1 to 7, as shown in Table 5. This result was derived by asking 9 questions (Table 4) to the 15 respondents. The scores were then calculated using (1).

$$\text{Average SEQ Score} = \frac{\sum \text{Respondent Scores}}{\text{Number of Respondents}} \quad (1)$$

This means the average score of 6.69 shown in Table 5 was calculated from the total SEQ scores across all tasks as in (2).

$$\frac{(6,7 + 6,7 + 6,7 + 6,5 + 6,7 + 6,9 + 6,7 + 6,7 + 6,3)}{9} = 6,99 \quad (2)$$

To understand the significance of the score, reference is made to research conducted by Sauro (2010) at MeasuringU. Their findings suggest that an average SEQ score between 5.3 and 5.6 indicates good usability. Furthermore, a score of 6.1 or higher suggests a very high level of ease of use for the application. Therefore, the results from the SEQ evaluation strongly indicate that the UI/UX design of this application is considered "very easy to use," demonstrating excellent usability. While the SEQ results are favorable, additional improvements and further testing may be beneficial to ensure the UI/UX design fully addresses the wider range of user requirements.

4. Kesimpulan

Based on the testing results, using the design thinking method to develop the Halimun Gate application proved very effective in creating solutions that address the needs of tourists and local residents in Halimun Salak National Park. Suitable ideas and direct testing of the prototype yielded solutions that resolved existing issues. The systematic process followed during the prototyping and testing phases ensures the resulting design is easy to use and effective for the challenges present in the park area. This application will enhance tourism services and make things easier for visitors by providing a central platform. It will also assist the national park in efficiently managing visitors and its tourism operations. However, a limitation in the application's current design is the lack of synchronization with Google Maps to automatically provide directions to tourist sites or lodging. This specific point can serve as a suggestion for future application development.

Data availability

All data produced or examined during this study are present in this paper.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Authors' contributions

All authors participated in the study design, writing, and manuscript revision. AM drafted and revised the manuscript, and SRC supervised the study. All authors have reviewed and approved the final manuscript.

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Photograph and biography of the authors (Akbar Muzija and Saifur Rohman Cholil) were not available at the time of publication.