

Designing User Interface (UI) And User Experience (UX) of a Sport Space Rental Application using Design Thinking Method

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Abstract

This study aims to enhance the design and streamline the process of renting sports facilities through the development of a user interface (UI) and user experience (UX) for a sport space rental application. Utilizing the Design Thinking method, the research addresses inefficiencies in the current manual booking process and proposes innovative solutions, including search features, user reviews, availability notifications, and direct booking options. The state of the art in this study is represented by the application of user-centric design principles and iterative prototyping to meet the evolving needs of sports enthusiasts. Usability testing, conducted through detailed task scenarios on the MAZE platform, yielded positive results, with an average completion rate of 80% and insights into areas for improvement. The findings suggest that the proposed UI/UX design significantly enhances the efficiency and user experience of renting sports facilities, providing a more convenient and engaging platform for users.

Keywords— UI/UX Design, Sport Space Rental, Design Thinking, User Interface

1. INTRODUCTION

In this modern era, the shift towards health and fitness lifestyles has increasingly become a major focus for society [1]. Digital technology helps with this change. People are interested in sports not just for physical activity but also to connect with others who share the same interests. The growing public awareness of the importance of a healthy and active life has driven the growth of health and fitness applications. However, this progress is not aligned with the evolution of the booking and renting process for sports facilities. Until now, all stages, from booking, and scheduling, to payment, are still conducted manually. This procedure leads to inefficiencies, requiring prospective renters to be physically present to make reservations, schedule, and complete payments, including down payments or cash transactions. Consequently, there is a risk of scheduling conflicts among renters, which can be disappointing due to inaccuracies in recording already rented facilities [2]. This situation results in users spending a significant amount of time.

To fix these problems, a rental application will be created. This app will let people book and rent sports facilities using their smartphones without visiting the location. Therefore, this study aims to design the user interface (UI) and user experience (UX) for this booking app. It will help users, especially sports fans, book fields more easily. The app design aims to make the booking process simpler and provide a better user experience.

The design of the UI/UX for the Sports field Booking Application serves as the foundation before the system's implementation. This enables researchers to identify needs and receive feedback from prospective users. This process allows researchers to understand renters' expectations and adjust the application design to meet users' preferences and needs [3].

The main contribution of this paper is the application of the Design Thinking method to create a user-centered UI/UX design for a sports facility rental app. This method involves five stages: empathize, define, ideate, prototype, and test. By using Design Thinking, the study not only addresses technical aspects but also considers emotional and social factors in the design process, ensuring the app meets user needs and provides a satisfying experience. This approach differentiates this paper from others by its comprehensive, iterative process and its focus on real user feedback throughout development. The benefits of using this method include its applicability to solving various problems, from technology development, product design, and marketing to facility design [5].

The unique point of this study is the use of the Design Thinking method, which has not been applied before for developing a sports facility rental application. This novel approach ensures that the app design is highly user-centric, addressing specific pain points in the current manual booking process and integrating community-driven features such as user reviews and ratings. This innovative use of Design Thinking sets this study apart and highlights its potential to significantly improve the user experience in the sports facility rental market.

2. RESEARCH METHOD

2.1. Literature Review

The purpose of this literature review is to provide an overview of existing research and methodologies relevant to the design and development of user interfaces (UI) and user experiences (UX) for mobile applications, with a specific focus on the Design Thinking method and tools like Figma. This section will explore the fundamental concepts, importance, and applications of UI and UX design, and discuss the benefits of using the Design Thinking method and Figma in the development process.

2.1.1. User Interface (UI)

User Interface, commonly abbreviated as UI, is a structure in the form of an interface design in a system that focuses on appearance. UI includes elements such as icons, text, colors, and shapes that are designed optimally to attract attention. More clearly, UI can be defined as the overall appearance of a product or system that can be seen by the user. UI is the meeting point between the user and the application or computer program for interaction [6].

2.1.2. User Experience (UX)

User Experience (UX) is the process of designing products with a user-centered approach, focusing on the desires and needs of the users [7]. UX refers to the responses and reactions that arise in users after they use a system or product. It is a field of study that considers how users feel about their experience when using the system and the extent of satisfaction they gain after using it [8].

The importance of good UX lies in its ability to create a sense of comfort and security for users. Thus, users tend to feel satisfied and comfortable using the system or product, encouraging them to return to it. Effective UX creates a positive relationship between users and the product, which in turn can increase user retention and loyalty to a platform or service [9].

2.1.3. Usability Testing

Usability Testing is a critical component of the UI/UX design process, particularly within the Design Thinking methodology. It involves evaluating a product by testing it with real users to identify any usability issues, collect qualitative and quantitative data, and determine overall user satisfaction. This stage is crucial for ensuring that the design meets the needs and expectations of its users. A study by Hussain et al. [10] highlights the importance of usability testing in the development of mobile applications. Their research demonstrates that incorporating usability testing into the Design Thinking process for mobile app development leads to significant

improvements in user satisfaction and usability metrics. The study emphasizes the need for iterative testing and feedback loops to refine the design and ensure a user-centered product [10].

2.1.4. *Design Thinking Method*

Design Thinking is a method or approach to problem-solving and developing solutions that focus on the user. Design Thinking not only focuses on technical aspects but also considers emotional and social aspects in creating products or services [11]. Design Thinking is an effective process that helps in understanding and formulating problems, enabling creative solutions, and providing new perspectives on the physical and social landscape. This method is iterative and non-linear.

In this case study, researchers use the design thinking approach to develop a solution to the previously described problem in the form of a mobile application design. There will be five stages, which can be seen in Figure 1, and the explanation of each stage is as follows:

a. *Empathize*

Empathize is the stage aimed at gathering information to understand the needs or desires of the users. This stage is usually conducted through interviews, where designers can ask structured questions to gain in-depth information about the use of the product or system, the obstacles faced, and the users' expectations regarding their experience. Interviews also allow designers to capture non-verbal nuances, facial expressions, and emotions that might not be revealed through questionnaires or surveys [12].

b. *Define*

After gathering the interview results in the Empathize stage, the Define stage is used to analyze and identify the core problems faced by the users [13]. This analysis helps clarify the scope of the problem and creates a challenge statement that can be addressed through the design process. This challenge statement serves as a guide to ensure that the solutions developed are truly relevant and beneficial.

c. *Ideate*

At this stage, ideation techniques such as Brainstorming, are used to generate ideas and identify solutions to the existing problem [14]. These techniques help the team consider various possible solutions and encourage creativity without limitations. The Ideation stage also opens up space for innovation and exploration of concepts that may not have been considered in the previous stages.

d. *Prototyping*

This stage is the implementation phase of the design solution ideas that have been generated previously, which are then transformed into application models in the form of simulations or samples [15]. The prototyping process involves creating visual and functional representations of the proposed design. These prototypes can include initial models of the user interface, key features, or the application's workflow. With prototypes, designers can test their ideas more realistically and obtain feedback early in the development cycle.

e. *Testing*

At this stage, testing is conducted with users to gather feedback from the usability tester. This feedback is crucial for identifying the strengths and weaknesses of the created UI design, allowing for improvements to be made [16]. User testing provides an opportunity to evaluate how well the design meets their expectations and needs. The feedback obtained helps identify areas needing improvement, understand user preferences, and capture aspects that may not have been considered by the design team. Testing is the process of evaluating software or systems to determine if they function correctly according to the specified requirements or specifications [17].

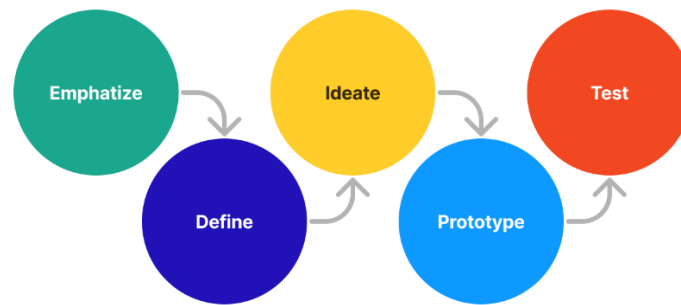


Figure 1. Five Stages of Design Thinking Method

2.1.5. Figma

Figma is a cloud-based design application and prototyping tool for digital projects. This application can save design verification time because it allows real-time collaboration, such as providing comments, and suggestions, even making changes to the design simultaneously. Figma also makes it easy to create interactive prototypes that users can test. This feature enables teams to test the functionality of the design and receive feedback before proceeding to further implementation stages.

By using Figma, designers can collaborate on projects and work as a team anytime and anywhere. Additionally, Figma helps designers create efficient and effective systems. One of the advantages of using Figma is that project design files are stored on Figma's server, not on the computer.

2.2. Research Methodology Process

The research process is divided into three main sections: Input, Process, and Output. Here's a step-by-step explanation of each part:

Input

1. Start: The research process begins here.
2. Empathize Phase - Interview: This phase involves gathering information directly from users through interviews. The goal is to understand user needs, behaviors, and pain points.

Process

1. Define Phase - User Persona: Based on the information gathered during the Empathize Phase, user personas are created. These personas represent typical users and their characteristics, needs, goals, and behaviors.
2. Define Phase - User Story: Development of user stories, which are simple descriptions of features from the perspective of the end user. User stories help to capture what the user needs and why.
3. Define Phase - User Scenarios: Detailed scenarios are crafted to illustrate how users will interact with the application in various situations. These scenarios help to visualize the user's journey.
4. Define Phase - Customer Journey Map: This map outlines the steps that users take as they interact with the application, highlighting their experiences and emotions at each stage.
5. Ideate Phase - User Flow: A diagram that shows the steps users take to complete specific tasks within the application. It helps to identify the paths users follow and any potential obstacles.
6. Ideate Phase - Sitemap: Creation of a sitemap, which is a hierarchical representation of the application's structure. It shows how different sections and pages are organized.
7. Prototyping Phase - Wireframe Lo-Fi (Low Fidelity): Initial sketches of the application's interface, focusing on layout and basic elements without detailed

design. These wireframes are used to quickly iterate and gather feedback.

8. Prototyping Phase - Wireframe Hi-Fi (High Fidelity): Detailed and polished versions of the wireframes, incorporating design elements like colors, typography, and imagery. These are more representative of the final product.
9. Testing Phase - Usability Testing: Testing the hi-fi wireframes with real users to gather feedback on usability. This step involves observing users as they interact with the prototype and noting any issues or areas for improvement.

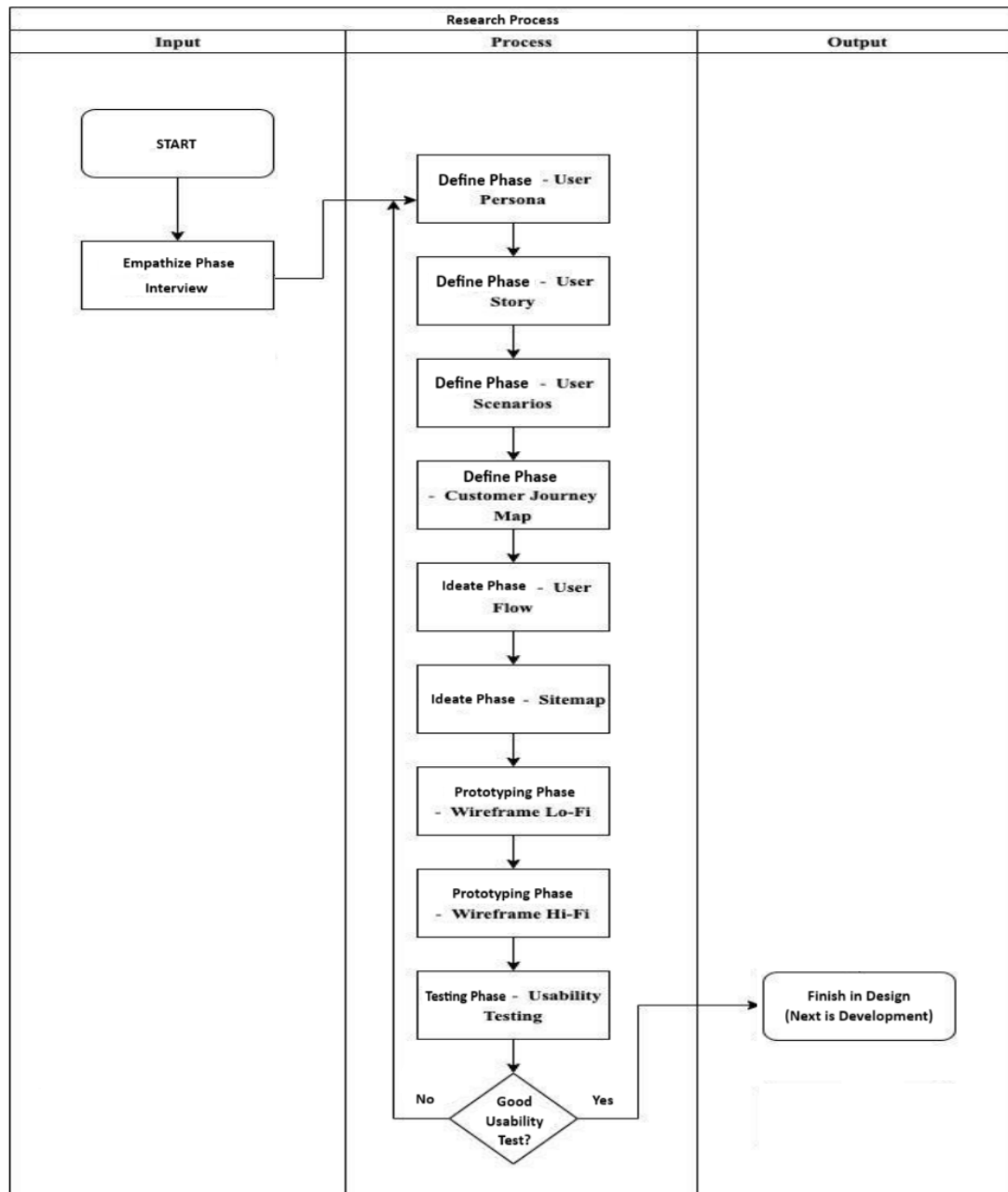


Figure 1. Research Methodology

Decision Point

Good Usability Test?: After usability testing, there is a decision point to determine if the usability test results are satisfactory.

- No: If the results are not satisfactory, the process loops back to the Prototyping Phase to refine the design based on user feedback.
- Yes: If the results are satisfactory, the process moves forward to the next stage.

Output

Finish in Design (Next is Development): The final output is a well-designed and tested user interface and experience, ready for the development phase. This ensures that the application meets user needs and provides an optimal user experience.

2.3. Related Studies

Using the Design Thinking method to design the KiriHuci SME website made it easier for users, as shown by positive feedback from thirty participants, including both owners and consumers of KiriHuci products. Usability testing revealed that the website's interface was well-received [13]. The method also helped create user-friendly prototypes for payoprint.id, solving online transaction issues and making it simple for customers to place orders [12].

Similarly, designing the UI and UX for the My CIC application using Figma resulted in an attractive, modern, and minimalist interface [19]. Additionally, the Metanesia website, designed with the Design Thinking method, provided educational content about the Metaverse and received positive feedback for being informative and communicative [20].

3. RESULTS AND DISCUSSION

3.1. Empathize

In the Empathize stage, observations and interviews help understand user needs for the application design. By observing and interviewing sports field renters, we can learn what potential users want from a sports field rental service. Researchers focus on sports enthusiasts, mainly general public renters aged 23 years.

The interviews revealed that users have trouble finding sports facilities that fit their needs and schedules. They struggle to find available locations at convenient times, often searching online without knowing rental prices. Therefore, a solution is needed that offers easy access to complete information about facilities, including location and costs.

3.2. Define

After collecting the necessary data in the empathize stage, the next step is the define stage, which aims to analyze the data and problems encountered in the previous stage [8].

Table 1. Analysis of Sports Field Rental Issues

NO.	Problem	Reason
1.	Users experience difficulties in finding sports facilities that meet their needs and schedules.	Because it is very difficult to find out whether the sports venue has been booked or not, users sometimes have to move around to find a place because it is already fully booked.
2	Users have difficulty finding locations and the availability of facilities at flexible times.	Because of their busy schedules, users often find it difficult to take the time to go to the sports venue to book a place.
3	Users have to search for information about sports facilities in their area using search engines or online sources.	Since no application can comprehensively display location, price, and available times to review sports facilities, users rely on the internet, which only shows the location of the sports venues.

4	Users do not know the rental prices.	Most online information only provides the location of the sports fields without listing the prices.
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After analyzing the problems encountered, the next step is to analyze the user needs data, which can serve as the basis for designing the application to be created. Table 2 provides a list of user needs.

Table 2. List of User Needs

No	User Needs
1	Wants easy access to find sports facilities that match their preferences and schedules.
2	Wants quick and easy access to information about the location of sports facilities.
3	Wants better access to information about sports facilities, including prices, reviews from other users, and ratings to help them assess the quality of the facilities.
4	Wants assurance of facility availability and information related to the operational hours of the facilities.
5	Wants access to a more regular and definite schedule regarding the availability of sports facilities.
6	Wants time reminders to help them manage their playtime better.
7	Wants to make reservations for sports venues or facilities.

3.3. Ideate

The ideate stage follows the define stage, and its goal is to create solutions based on user needs data and the problems analyzed in the previous stage. Based on the problem analysis conducted during the define stage, and after identifying the root causes from the cause-and-effect analysis, the solutions proposed by the researchers can be seen in the table below.

Table 3. Solution Analysis

No.	Problem	Solution
1.	Wants easy access to find sports facilities that match their preferences and schedules.	A search feature for the sports facilities they want to use.
2.	Wants quick and easy access to information about the location of sports facilities.	A search feature that allows users to quickly and easily search for sports facilities based on location.
3.	Wants better access to information about sports facilities, including prices, reviews from other users, and ratings to help them assess the quality of the facilities.	Providing a review and rating feature that allows users to give reviews and ratings of the facilities they use.
4.	Wants assurance of facility availability and information related to the operational hours of the facilities.	A feature that can notify users when their favorite sports facilities are available.
5.	Wants access to a more regular and definite schedule regarding the availability of sports facilities.	A regular schedule feature related to the availability of sports facilities.
6.	Wants time reminders to help them manage their playtime better.	A reminder feature that allows users to set time reminders for their sports activities.
7.	Wants to make reservations for sports venues or facilities.	A booking feature that helps with the direct booking process through the application.

3.4. Prototype

This stage involves creating models from the ideas generated based on the analysis of user needs and the solutions to the cause-and-effect problems analyzed in the previous stage. The prototype can be in the form of sketches, physical models, digital mockups, or interactive simulations that provide a real picture of how the solution will function. This stage serves as a guideline for researchers in designing the UI/UX of the sport space rental application as follows:

3.4.1. High Fidelity Prototype

After determining the basics such as defining the information infrastructure, creating application sketches using low-fidelity wireframes, and then selecting the fonts and colors to be used, the next step is to design the user interface in high-fidelity wireframes. The wireframe is based on a low-fidelity design. This is the UI/UX view of the sport space rental application, shown in Figure 3.

Business Owner Pages	User Pages	
1. Business Owner	1. Welcome Page	11. Venue Badminton Page (4 Pages)
2. Login Owner Page	2. Sign Up Page	12. Venue Futsal Page
3. Sign Up Owner Page	3. Log in Page	13. Venue Basketball Page
4. Add Facility Page	4. Main Page	14. Logout Page
5. Confirm Page	5. Filter Page	15. Loading Page
6. Add Photo Pop Up	6. Filter by Badminton Page	16. Notification Slide
	7. Filter by Basketball Page	17. Menu Slide
	8. Filter by Swimming Page	18. Profile Page
	9. Filter by Futsal Page	19. History Page
	10. Venue Swimming Page (3 Pages)	20. Confirm Page
		21. Order Summary Page
		22. Payment Method Page
		23. Order Summary with Method Page
		24. Booking Calendar Page
		25. Booking Calendar Selected Page
		26. Booking Success Page

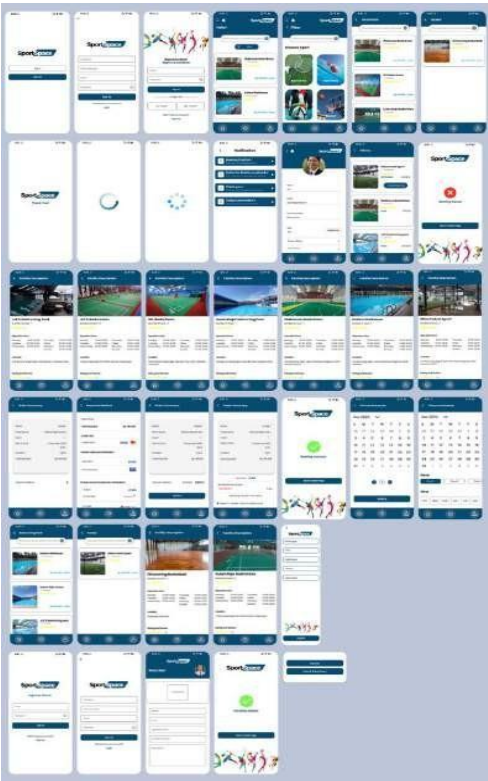


Figure 3. UI/UX view of the sport space rental application

As it might take too much space, full-size images can be accessed by clicking this link and zooming the images for better quality :

https://drive.google.com/file/d/1Mqd_cgnL3zfhdO8qfMWJuIRsiLZITWMQ/view

3.4.2. *Typography and color*

Typography is a design element that arranges messages in a work to be easily readable and have aesthetic value when the typographic elements are text. The next factor is color, which brings aesthetic value and comfort when using the application. You can see the font style and colors applied in the sports space rental application in Figure 4.



Figure 4. Typography and Color PointApps Application

3.5. *Testing*

The testing phase is used to conduct usability testing on the UI/UX design of the application. In this phase, the researcher analyzes qualitative data collected through the testing scenario results. This will be carried out by potential users via the MAZE platform on their website. The whole report can be accessed here: <https://app.maze.co/report/SportSpace-Prototype-Testing/2jk3tlpjzrle/9aeb8a01#mission-1>

The prototype test of the sports facility booking application involved 51 testers who logged in to choose and book various sports facilities such as badminton, futsal, basketball, or swimming. Users could select a specific field, pick the date and time, proceed to the payment section to choose their preferred payment method, review their booking history, and cancel bookings if needed. Upon completion, users logged out. The test results showed a direct success rate of 78.4%, with 7.8% of missions unfinished. The average duration to complete a task was 46.1 seconds, and there was a 30.2% misclick rate.

The prototype test results provided a general overview of user interactions and success rates, revealing some challenges in the process. To gain a deeper understanding, a detailed usability test was conducted for each screen, highlighting areas of success and opportunities for improvement.

The usability test for the sports facility booking application provided detailed insights for each screen, highlighting areas of success and opportunities for improvement. On the welcome page, users spent an average of 11 seconds, with a 6% misclick rate, and a high usability score of 90, indicating a generally smooth experience. The login page, however, saw users spending an average of 6 seconds, with a significant increase in the misclick rate to 33%, resulting in a lower usability score of 67. This suggests that the login process may need to be simplified or made more intuitive to reduce errors.

The loading page had the shortest interaction time of 1 second, no misclicks, and a perfect usability score of 100, indicating it performed its function effectively. Conversely, the main page, where users select their desired facility, had an average interaction time of 19 seconds and no misclicks but received a low usability score of 23. This low score suggests that despite the absence of misclicks, users might have found the page confusing or difficult to navigate. These results indicate that while some screens perform well, particularly the loading page, the login and main pages require significant improvements to enhance the overall user experience and reduce friction points.

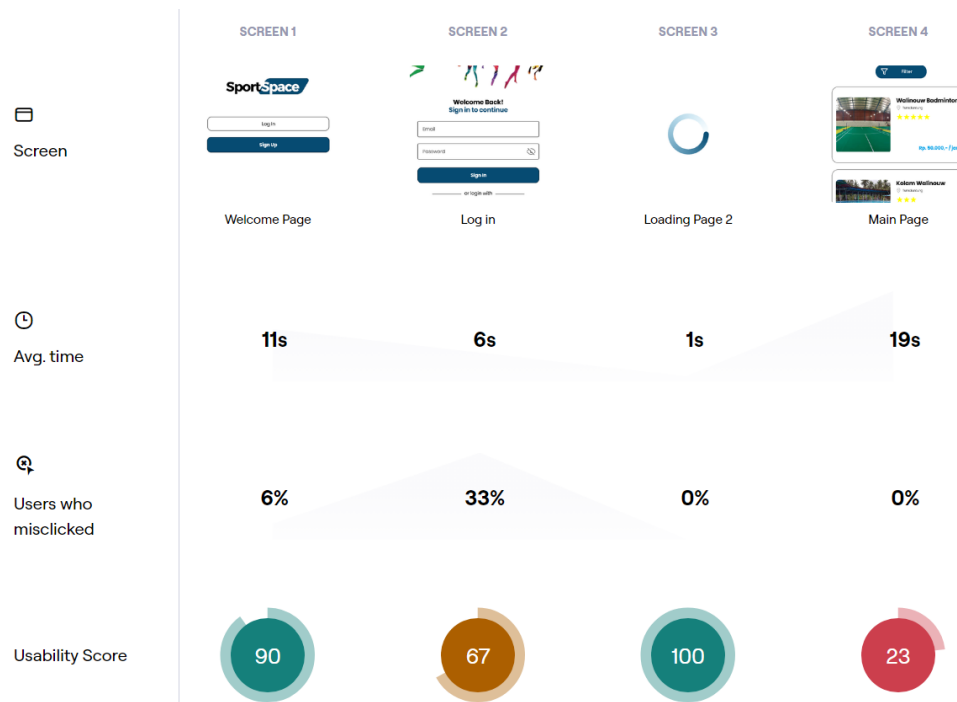


Figure 5. Usability Metrics: Average time, misclick rates, and usability scores for each screen in the sports facility booking app.

4. CONCLUSION

This study aimed to enhance the design and streamline the process of renting sports facilities through the development of a user interface (UI) and user experience (UX) for a sport space rental application. By employing the Design Thinking approach, which includes the steps of Empathize, Define, Ideate, Prototype, and Test, the research successfully identified and addressed inefficiencies in the current manual booking process.

The main findings indicate that the proposed UI/UX design significantly improves the efficiency and user experience of renting sports facilities. Usability testing involved 51 testers who logged in, selected facilities, picked dates and times, proceeded to payment, and reviewed their booking history. The test results showed a direct success rate of 78.4%, with 7.8% of missions unfinished, an average task completion time of 46.1 seconds, and a misclick rate of 30.2%. Detailed screen-by-screen analysis revealed that the welcome page had a usability score of 90 with a 6% misclick rate, the login page had a usability score of 67 with a 33% misclick rate, and the main page had a usability score of 23, despite no misclicks.

These results underscore the effectiveness of the Design Thinking method in creating user centric solutions. The iterative design and feedback process ensured that the final prototype met user needs and preferences, offering a more convenient and engaging platform for booking sports facilities. Overall, this study demonstrates the potential of well-designed UI/UX to enhance user satisfaction and operational efficiency in digital applications.

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