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Next-Gen Sport Center: Innovative Mobile-based System for Sport Facility Reservations

Gathan Andhika Febriansyah
Yogyakarta University of Technology
Yogyakarta, Indonesia

Anita Fira Waluyo
Yogyakarta University of Technology
Yogyakarta, Indonesia

ABSTRACT

Field rental facilities in Indonesia for various sports activities such as futsal, volleyball, and badminton currently require customers to come directly to the site to check the field schedule through the available announcement boards. In addition, the process of producing the rental data report is still done manually using books, which can result in human error and the risk of data loss. To solve this problem, a system needs to be developed that can help customers and managers make field reservations and manage rental data more efficiently. The design method of this mobile application involves using the REST API to connect customers and administrators to the database as the primary data source. Initial steps included report design and system workflow visualization, DFD (Data Stream Diagram), and ERD (Entity Relationship Diagram). Furthermore, the program design process involved various programming languages such as PHP, HTML, CSS, and JavaScript, with the implementation of the Laravel framework and the use of XAMPP for mobile application development. The required data was taken from Mahendrik Sport Center. With the successful development of this mobile application, customers can make field reservations easier, while managers can manage data and print rental data reports as needed. This helps in improving the efficiency and accuracy of field reservation processes as well as the management of renting data in these sports facilities.

General Terms

Android, Laravel, Kotlin, PHP.

Keywords

Android Application, Sport Center, Reservation.

1. INTRODUCTION

Sport activities are new phenomena in the twenty-first century to make everyone keep health [1]. Sport is a subset of physical activity that can be particularly beneficial for short-and-long-term physical and mental health, and social outcomes in adults [2]. The concept of sport science and technology is continually changing over the years, and the use of sport science and technology especially for improving sport performance is just one of the areas that has made an impact on the development of sports in the modern era [3].

Mobile phones are considered extremely crucial for their daily usage due to their unique features such as mobility, availability, and compatibility [4]. One of the most progressive applications on IT recently is mobile technology [5]. Research shows that mobile booking has risen by 60% at the end of the 4th quarter of 2017 and automating this problem through a mobile platform helps the users to make convenient reservations and venue owners to avoid the need of answering calls and having a convenient approach to view all the reservations in one platform [6]. Many growing companies

from multinational and startup utilizing this type of application to present information at very least, which discussed in planning meeting for their resources and for managing their operational companies [7]. There are many applications in the real world that implement this system to enable a faster interface for the end-user as the world is growing in this technology era [8]. There are several venues around neighborhood which aren't being used much often due to difficulties in making reservations which leads most people avoid playing sports in their available time [9]. Therefore, the system was built to help the field owner in managing booking schedules and to facilitate customers in making the sports field ordering process easier [10].

Sports facility rentals in Indonesia are increasing along with the increasing public awareness of the importance of exercise. The process of booking sports facilities is still done conventionally, customers must come to the location to see the schedule, make reservations, and make transactions. In addition, there is often a miscalculation of rental data recorded in the ledger for report generation, so that the reports generated are inaccurate and often not on time. Therefore, Next-Gen Sport Center: Innovative Mobile-Based System for Sports Facility Reservations was created.

2. RESEARCH METHOD

The stage of research can be elucidated by means of an architectural system, as illustrated in Figure 1.

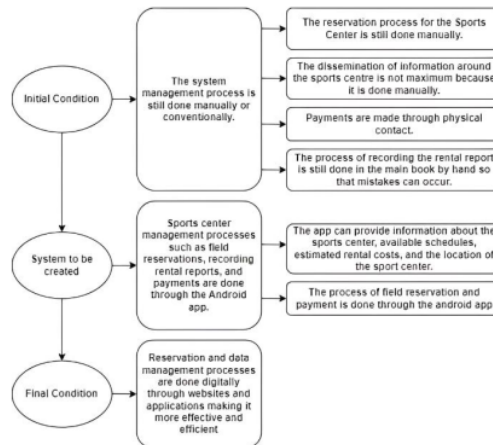


Fig. 1 Research Framework

The research conceptual framework is a tool used to describe the relationship or relationship between the variables to be investigated. In this research, the system creates a connection between the initial state, the proposed model, and the final state of the sports hall booking process. Below is the conceptual

framework used in this research.

2.1 Architecture System

In the proposed model, the application becomes the primary means of distributing information related to the sports space. This system allows clients and administrators to effectively connect with each other through REST API implementation that connects various components into a central database. Thus, this model not only improves the accessibility of information for customers, but also facilitates the overall administration and management of the sports space.

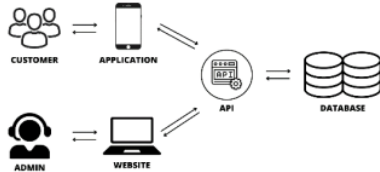


Fig. 2 Architecture System

2.2 Data Collection Procedure

The following data collection procedures were carried out to sample this study.

2.2.1 Observation

The location of data collection through observation of Mahendrik Sport Center which is located on Jl. Kapuknahun, Dermaga Kec. Cisolak, Subang Regency, West Java. The location according to the map can be seen from Figure 2.

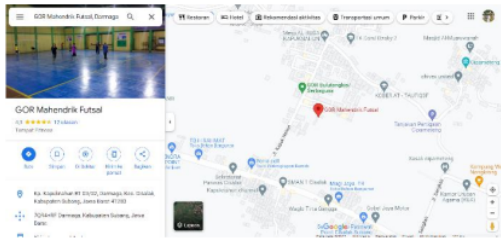


Fig. 3 MSC Location

2.2.2 Interview

The data collection process is meticulously executed through one-on-one, face-to-face interviews with the agency owner, Mr. Yopi Mahendrik. These interviews are thoughtfully structured, featuring a comprehensive array of topics and meticulously crafted questions that have been thoughtfully prepared in advance to ensure a thorough and insightful exploration of the subject matter.

2.2.3 Data Source

Data sources are primary data sources obtained through interviews with agency owners in the form of sports hall operating hours, location, staff, availability of facilities, events / competitions taking place and rental prices.

2.3 Design Logic

Logical design is a structured approach used to describe the workflow and functional components of the system being constructed. This system often employs various visual tools such as Data Flow Diagram (DFD) and Entity-Relationship Diagrams (ERD) to illustrate and document the system's workflow, data interactions, and relationships between entities and data elements.

2.3.1 Data Flow Diagram (DFD)

Data Flow Diagram (DFD) describes data interconnections in a functional process. The administrator has full access, manages system data. Users must register and log in for secure and personalized access to the application features, improving the user experience.

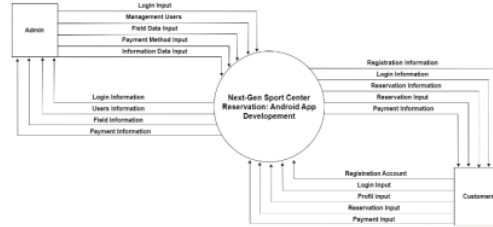


Fig. 4 Data Flow Diagram

2.3.2 Entity Relationship Diagram (ERD)

ERD is used to explain the concept of tables of entities and attributes that relate to each other. Entity Relationship Diagram can be illustrated in Figure 5.

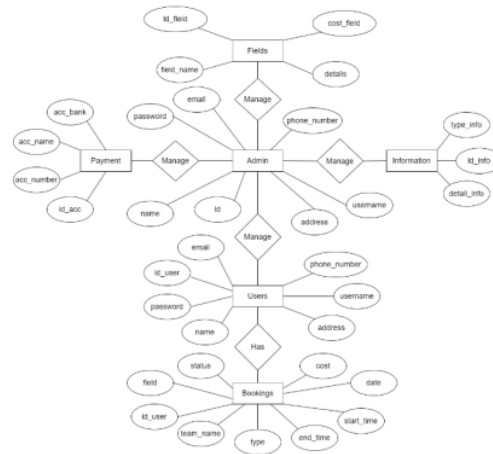


Fig. 5 Entity Relationship Diagram

2.4 Physical Design

Physical database design involves defining structural aspects of a database table, including data types, field lengths, constraints, and other attributes that govern data storage, organization, and search.

Table Name	Fields	Data Type	Constraints
tbl_users	id_bgnit20	unsigned	Primary Key
tbl_users	username	varchar(255)	
tbl_users	password	varchar(255)	
tbl_users	nama	varchar(255)	
tbl_users	email	varchar(255)	
tbl_users	no_tlp	varchar(255)	
tbl_users	alamat	varchar(255)	
tbl_users	created_at	timestamp	
tbl_users	updated_at	timestamp	
tbl_admins	id_bgnit20	unsigned	Primary Key
tbl_admins	id_email	varchar(111)	
tbl_admins	id_phone	varchar(255)	
tbl_admins	id_admin	varchar(255)	
tbl_admins	id_admin_acc	varchar(255)	
tbl_admins	id_admin_name	varchar(255)	
tbl_admins	id_admin_id_admin	varchar(255)	
tbl_admins	id_admin_id_user	varchar(255)	
tbl_admins	id_admin_id_email	varchar(255)	
tbl_admins	id_admin_id_phone	varchar(255)	
tbl_admins	id_admin_id_address	varchar(255)	
tbl_admins	id_admin_id_username	varchar(255)	
tbl_admins	id_admin_id_password	varchar(255)	
tbl_admins	created_at	timestamp	
tbl_admins	updated_at	timestamp	
tbl_bookings	id_bgnit20	unsigned	Primary Key
tbl_bookings	id_admin	unsigned	Foreign Key
tbl_bookings	id_user	unsigned	Foreign Key
tbl_bookings	id_email	varchar(255)	
tbl_bookings	id_phone	varchar(255)	
tbl_bookings	id_address	varchar(255)	
tbl_bookings	id_username	varchar(255)	
tbl_bookings	id_password	varchar(255)	
tbl_bookings	id_admin_acc	varchar(255)	
tbl_bookings	id_admin_name	varchar(255)	
tbl_bookings	id_admin_id_admin	varchar(255)	
tbl_bookings	id_admin_id_user	varchar(255)	
tbl_bookings	id_admin_id_email	varchar(255)	
tbl_bookings	id_admin_id_phone	varchar(255)	
tbl_bookings	id_admin_id_address	varchar(255)	
tbl_bookings	id_admin_id_username	varchar(255)	
tbl_bookings	id_admin_id_password	varchar(255)	
tbl_bookings	created_at	timestamp	
tbl_bookings	updated_at	timestamp	
tbl_payments	id_bgnit20	unsigned	Primary Key
tbl_payments	id_admin	unsigned	Foreign Key
tbl_payments	id_user	unsigned	Foreign Key
tbl_payments	id_email	varchar(255)	
tbl_payments	id_phone	varchar(255)	
tbl_payments	id_address	varchar(255)	
tbl_payments	id_username	varchar(255)	
tbl_payments	id_password	varchar(255)	
tbl_payments	id_admin_acc	varchar(255)	
tbl_payments	id_admin_name	varchar(255)	
tbl_payments	id_admin_id_admin	varchar(255)	
tbl_payments	id_admin_id_user	varchar(255)	
tbl_payments	id_admin_id_email	varchar(255)	
tbl_payments	id_admin_id_phone	varchar(255)	
tbl_payments	id_admin_id_address	varchar(255)	
tbl_payments	id_admin_id_username	varchar(255)	
tbl_payments	id_admin_id_password	varchar(255)	
tbl_payments	created_at	timestamp	
tbl_payments	updated_at	timestamp	
tbl_migrations	id_bgnit20	unsigned	Primary Key
tbl_migrations	id_email	varchar(255)	
tbl_migrations	id_phone	varchar(255)	
tbl_migrations	id_address	varchar(255)	
tbl_migrations	id_username	varchar(255)	
tbl_migrations	id_password	varchar(255)	
tbl_migrations	id_admin_acc	varchar(255)	
tbl_migrations	id_admin_name	varchar(255)	
tbl_migrations	id_admin_id_admin	varchar(255)	
tbl_migrations	id_admin_id_user	varchar(255)	
tbl_migrations	id_admin_id_email	varchar(255)	
tbl_migrations	id_admin_id_phone	varchar(255)	
tbl_migrations	id_admin_id_address	varchar(255)	
tbl_migrations	id_admin_id_username	varchar(255)	
tbl_migrations	id_admin_id_password	varchar(255)	
tbl_migrations	created_at	timestamp	
tbl_migrations	updated_at	timestamp	
tbl_personal_access_tokens	id_bgnit20	unsigned	Primary Key
tbl_personal_access_tokens	id_admin	unsigned	Foreign Key
tbl_personal_access_tokens	id_email	varchar(255)	
tbl_personal_access_tokens	id_phone	varchar(255)	
tbl_personal_access_tokens	id_address	varchar(255)	
tbl_personal_access_tokens	id_username	varchar(255)	
tbl_personal_access_tokens	id_password	varchar(255)	
tbl_personal_access_tokens	id_admin_acc	varchar(255)	
tbl_personal_access_tokens	id_admin_name	varchar(255)	
tbl_personal_access_tokens	id_admin_id_admin	varchar(255)	
tbl_personal_access_tokens	id_admin_id_user	varchar(255)	
tbl_personal_access_tokens	id_admin_id_email	varchar(255)	
tbl_personal_access_tokens	id_admin_id_phone	varchar(255)	
tbl_personal_access_tokens	id_admin_id_address	varchar(255)	
tbl_personal_access_tokens	id_admin_id_username	varchar(255)	
tbl_personal_access_tokens	id_admin_id_password	varchar(255)	
tbl_personal_access_tokens	created_at	timestamp	
tbl_personal_access_tokens	updated_at	timestamp	

Fig. 6 Database Design Table

2.5 Interface Design

Interface design serves as the foundational stage for assembling and presenting the elements within a website or application's design. This phase occurs prior to the product creation process and is typically accomplished using design tools such as Figma. Presented below is the interface design of Android application for users or customers.

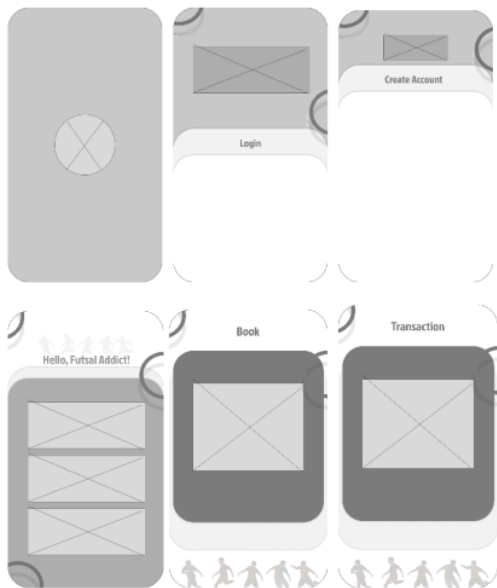


Fig. 7 Interface Design of Android Application

Interface design for the website used by the admin. Admin can manage all data by adding, editing, deleting, and printing digital reports.

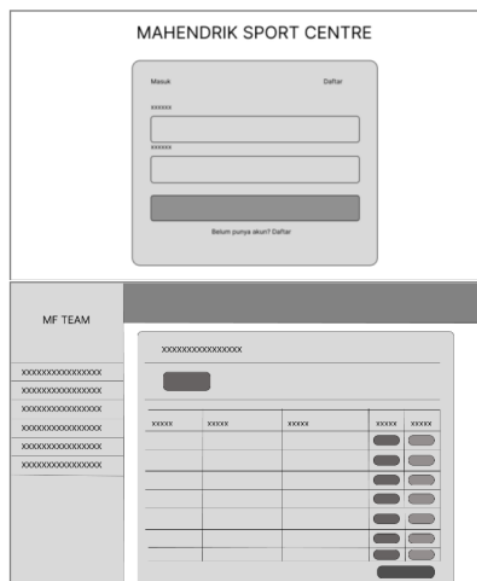


Fig. 8 Interface Design of Website

3. RESULT AND DISCUSSION

3.1 Assumptions

Application users are customers who wish to access the sports hall schedule, make reservations, and complete online payments using the various features provided by the application. To utilize these functionalities, users must first register and log in as part of the system's verification process.

The administrator has the authority to manage all system data comprehensively through the website platform, which includes tasks such as data deletion, adding, and editing. The administrator is also able to generate both monthly and annual rent reports.

The sports centre operates from 08:00 PM to 24:00 PM, giving users flexibility in choosing schedules to suit their needs. The system automatically records the complete history of rental data.

3.2 Hypothesis

The hypothesis is formulated using assumptions that were gathered and substantiated during the feedback and research phases. In this research, it is posited that the "Next-Gen Sport Center Reservation: Android App Development" is achievable.

3.3 Feature

The MSC app incorporates many functions. These features have been created with insights derived from various customer needs.

Table 1. List of Feature MSC Application

No	Actor	Description
1.	Customers	register, login, checking schedule, booking, transaction, information, profile.
2.	Administrator	login, dashboard, add data, delete data, update data, reservation list, check payment status, print report.

3.4 Run an Experiment

After the completion of the wireframing phase, the next step involves coding the application in accordance with the design. This coding process is carried out using Visual Studio Code and involves programming languages such as HTML, PHP, CSS, and JavaScript, with the utilization of the Laravel framework. Simultaneously, the application is coded in Kotlin using Android Studio for the Android platform.

3.5 Implementation

The carefully designed and fully coded system has now advanced to the practical implementation stage. This implementation includes the development of web-based and Android applications, which cater to a wider user base. The following is the implementation of the system through the website and android application.

3.5.1 Admin Login Page

The admin uses this page to perform an authentication process (login) to manage the data.

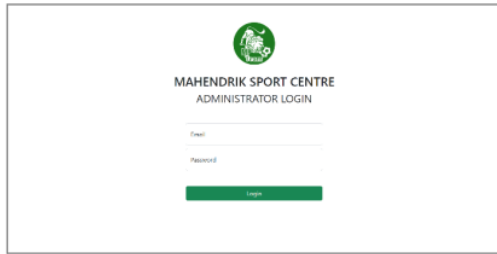


Fig. 9 Admin Login Page

3.5.2 Admin Dashboard (Customer List)

Admin uses this page to manage all customer data in the system. The admin can edit, add, and also delete registered customer data.

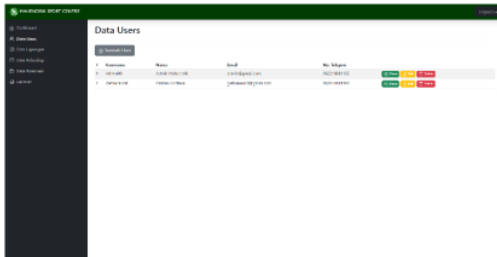


Fig. 10 Admin Customer List Page

3.5.3 Admin Dashboard (Field List)

Admin uses this page to manage field data in the system. Admin can edit, add, and delete field data.

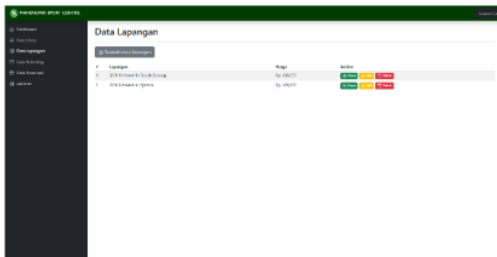


Fig. 11 Admin Field List Page

3.5.4 Admin Dashboard (Payment Method)

Admin uses this page to manage account data in the system. Account data is used to make transactions with users. Admin can add, edit, and delete account data.

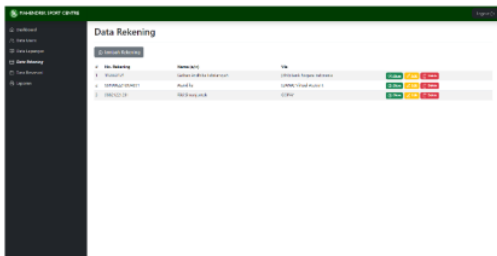


Fig. 12 Admin Payment Method List Page

3.5.5 Admin Dashboard (Reservation List)

The admin uses this page to manage the incoming reservation data. Admin can add, edit, and delete reservation or schedule data.

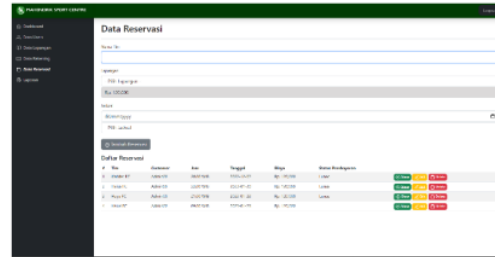


Fig. 13 Admin Reservation List Page

3.5.6 Admin Dashboard (Report)

This page contains reports in the form of schedules or reservation data made by users. On this page, the admin can print the reservation data/report.

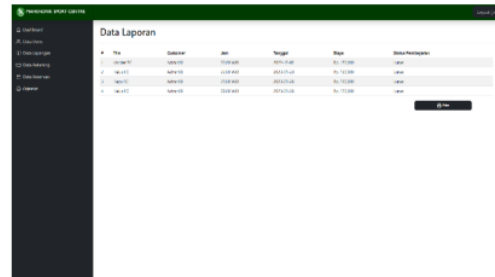


Fig. 14 Admin Report Page

3.5.7 Splash Screen

The Splash Screen page is an initial interface that greets users when they first launch the application. It prominently displays the distinctive identity logo associated with the application or agency, in this case, the Mahendrik Sport Center. This screen serves as a brief and visually appealing introduction, providing users with a recognizable emblem that signifies the app's affiliation. Moreover, it remains on the screen for a duration of approximately 2 seconds.



Fig. 15 Splash Screen

3.5.8 Login and Registration

This page contains forms that users must fill out when they want to register or create a new account. After successful registration, the user can perform the login process. The login page is used by users to enter previously registered data, such as email addresses and passwords, so that they can log in to the system and proceed with the booking process.

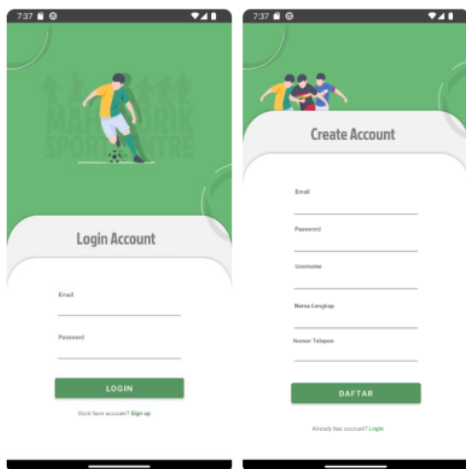


Fig. 16 Login and Registration Users

3.5.9 Dashboard and Profile

This page is the main page that appears when the user successfully logs into the system. Here, there are a number of buttons that facilitate user interaction. The profile page is where users can access personal information related to the account they have registered.

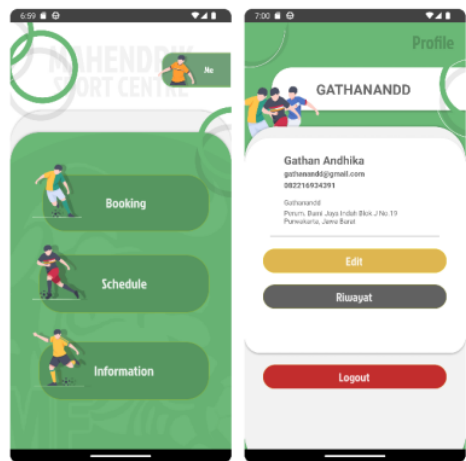


Fig. 17 Dashboard and Profile Users

3.5.10 Information and Schedule

The information page is the source of the latest information about Mahendrik Sport Center. Meanwhile, the schedule page is used to display a list of schedules available at this sports center.

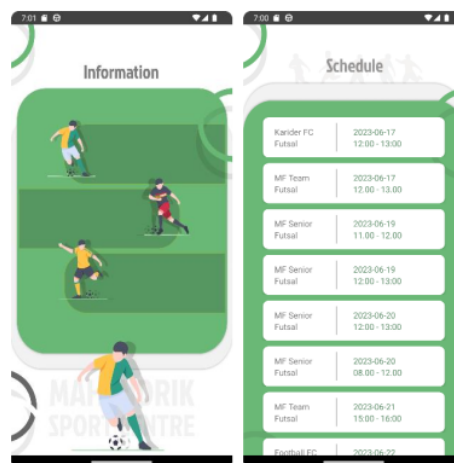


Fig. 18 Information and Schedule Users

3.5.11 Booking and Transaction

The Booking page is where users can make reservations or field reservations. Then, the Transaction page is used when the user has filled in the booking information and wants to proceed to make a payment. The available payment methods will be displayed on this page so that users can choose what method is most suitable for use.

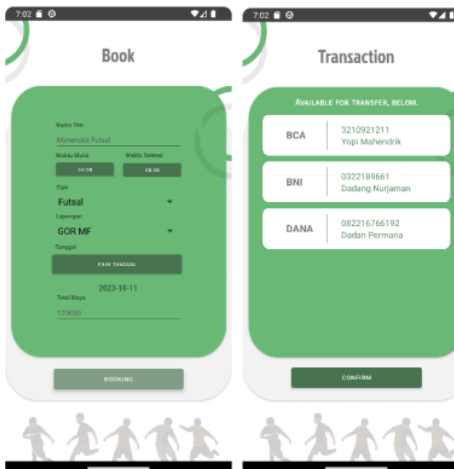


Fig. 19 Booking and Transaction Users

3.6 Feedback and Result

Conduct a thorough assessment of all aspects of the system, looking at it from both an administrative and customer perspective. This thorough evaluation was facilitated through structured presentation sessions. Alongside this step, special Q&A sessions were carefully organized to get diverse inputs and gather invaluable feedback for the improvement of the system. Blackbox testing was also an important part of this evaluation stage. The next section presents the results that emerged from the analysis and testing of the system features.

Table 2. Website Feature Testing Results (Admin)

No.	Feature	Condition	Status
1.	Login	If the email columns and passwords are not filled in or one of the column's not, then the login will fail. However, if the email and password columns are filled in according to the data in the system, then login will work	Success
2.	Manage users	Admin adds, edits, views, and deletes user data	Success
3.	Manage fields	Admin adds, edits, views, and deletes fields data	Success
4.	Manage payment methods	Admin adds, edits, views, and deletes payment methods for transaction	Success
5.	Manage reservations	Admin adds, edits, views, and deletes reservation data	Success
6.	Print report	Admin view and print reports based on reservation data	Success

Table 3. Application Feature Testing Result (Customer)

No.	Feature	Condition	Status
1.	Register	If the registration fields are filled in accordingly, the registration is successful and redirected to the login page	Success
2.	Login	If the login field is filled in according to the data in the system, the user is directed to the home page	Success
3.	Schedule	Users can view data or list of reservation schedules in the system	Success
4.	Booking	Users can book or reserve field schedules	Success
5.	Transaction	Users can access available payment methods	Success

Based on the results of the tests that have been carried out, it can be concluded that all features of the system are operating very well, with a success status that indicates optimal performance and conformity to what is expected. It indicates that all features have been functioning according to the plan and expectations that have been set. This comprehensive evaluation reinforces the belief that the system has reached the desired level of quality.

4. CONCLUSION

The development of the website and android sports center reservation app using Laravel, Kotlin, PHP, and Android Studio for Mahendrik Sport Center Subang yielded a number of significant benefits. The app increases efficiency in the booking process by enabling online reservations, saving time and effort. The ease of access through web and mobile platforms gives users the flexibility to make reservations anytime and anywhere. In addition, the implementation of the online payment system eliminates the need for physical contact in the payment. The process of generating automatic rental reports reduces manual work. Users also experience an enhanced experience in booking by viewing real-time availability schedules, choosing the right time, and getting instant confirmation. This, along with the online payment system, increases user satisfaction. In addition to the benefits for the user, the use of this technology also improves the operational efficiency of Mahendrik Sport Center Subang, reduces human error, and provides a better experience in the booking and rental process.

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