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Prototyping Approach for User Interface Optimization of "Gowes" Bicycle Rental Mobile Application

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ABSTRACT

Bali, as one of the world's leading tourist destinations, offers various tourist activities including cycling along the beach. To support these activities, an efficient and user-friendly bicycle rental system is needed. In this research, we developed and optimized the user interface (UI) of the "Gowes" bicycle rental mobile application using a prototyping method approach. The prototyping method was chosen because of its ability to create an initial model of the interface which is then tested and refined based on user feedback. The stages in this approach include requirements gathering, initial prototyping, user evaluation and testing, prototype refinement, and final implementation. By involving users in each iteration, developers can ensure that the resulting interface truly matches their needs and preferences. The results show that this approach not only increases user convenience and satisfaction but also reduces the risk of project failure. The implementation of the system using Level 0 Data Flow Diagram (DFD) provides an overview of the data flow and main processes in the application, ensuring that all features and functions run as planned. The "Gowes" application is expected to improve tourists' experience in renting bicycles and enjoying the beauty of Bali.

1. Introduction

One area in Indonesia whose tourism is very famous in the world is Bali. The province of Bali has become a center for intensive tourism development, so that Bali's identity can hardly be separated from its tourism over the last few centuries (Priatmoko et al., 2021). Apart from the culture and stunning natural panorama, Balinese people are also known to be friendly towards newcomers, especially tourists. Tourists who come to Bali come from various parts of the world, both domestic and international. Bali has long been known as one of the world's dream tourist destinations (Rideng et al., 2020), famous for its cultural heritage, arts, friendly people and natural beauty. Currently, tourist visits to Bali continue to increase. Bali offers various tourism products and attractions, ranging from culture, nature, maritime, to culinary. This diversity of tourism products makes tourists interested in visiting Bali (Utama et al., 2023). To enjoy its natural beauty, especially the beach area with white sand stretching from north to south and calm sea water, Bali is very suitable for various marine tourism activities such as diving, snorkeling, canoeing, swimming, and enjoying the sensation of the beauty of the sunrise from the horizon line. eastern horizon (Arida et al., 2019).

Apart from marine tourism activities, beaches in Bali also provide cycling activities along the coast, such as at Sanur Beach. Cycling tourism is a recreational activity that uses a bicycle for one day or several days, for long distance purposes on vacation. Sanur Beach has a special path for tourists

who want to cycle, making it a unique and favorite tourist attraction. This 4 km cycling tourist route starts from Matahari Terbit Beach to Bali Beach, Segara Ayu Beach, Sindhu Beach, Karang Beach, Semawang Beach, to Mertasari Beach. If tourists return to the starting point, the total distance covered reaches 8 km. Bicycles are an environmentally friendly mode of transportation.

With the increasing popularity of cycling activities in Bali, especially on Sanur Beach, a system is needed that makes it easier for tourists to rent bicycles. Using a mobile application for bicycle rental can be an effective solution in improving the tourist experience. However, good mobile application development requires special attention to user interface (UI) design that is intuitive and easy to use (Fanani et al., 2024; Nurninawati et al., 2023; Oktaviana et al., 2022). A good interface not only increases user comfort but can also increase user satisfaction and loyalty.

To optimize the interface design of the "Gowes" bicycle rental mobile application, the prototyping method approach is very relevant. The prototyping method allows developers to create initial models of application interfaces, which can then be evaluated and refined based on user feedback (Permana et al., 2024; Riyanti et al., 2024). This approach not only helps in identifying and fixing problems at an early stage of development, but also ensures that user needs and preferences are taken into account to the maximum extent.

The urgency of this research lies in the importance of providing a user-friendly and efficient application to support cycling tourism activities in Bali. By using the prototyping method (Sudipa, Udayana, et al., 2023), it is hoped that an optimal "Gowes" application interface can be created, so that tourists can easily rent a bicycle and enjoy the beauty of Bali more comfortably. This research also aims to contribute to the field of mobile application development by providing practical guidance for using prototyping methods in user interface design. Therefore, this research will focus on a prototyping approach to optimize the user interface of the mobile bicycle rental application "Gowes", with the hope of improving the performance of bicycle rental data processing quickly, efficiently and effectively.

2. Literature Review

To enhance the user interface of the "Gowes" bicycle rental mobile application, a prototyping approach is crucial. Prototyping methods enable developers to assess and improve features based on user feedback early in the design process (Riyanti et al., 2024). The iterative nature of prototyping allows for continuous evaluation and enhancement of prototypes, leading to the identification of user needs and constraints, ultimately refining the final user interface (Silva & Winckler, 2017). Rapid prototyping, specifically for user interface design, is recognized as a valuable approach in the field of computer science. In the realm of wearable user interfaces, an iterative approach has been demonstrated to be effective in evaluating and improving prototypes, offering valuable insights for developing practical and usable interfaces (Sandhiyasa et al., 2014). Workshops and prototyping are powerful tools for idea testing, effective communication, and aligning design with user expectations (Pandawana et al., 2022; Shakeri, 2024). The use of prototyping techniques not only supports interaction design but also enhances the overall development process of mobile applications (Sandhiyasa & Waas, 2023). Moreover, the design of the "Gowes" application can benefit from incorporating functional requirements, as seen in the development of a mobile system for metro value-added services (Xian & Zhu, 2018). The iterative improvement and updating of prototypes are essential for refining interaction ideas and integrating prototypes effectively (Yoon & Park, 2020). Additionally, evaluating the quality of the prototype through expert judgment is crucial for assessing efficiency, usability, and security aspects (Jauregui-Velarde et al., 2023). Leveraging prototyping methods, particularly in an iterative manner, is fundamental for optimizing the user interface of the "Gowes" bicycle rental mobile application. By incorporating user feedback, refining prototypes based on identified needs, and continuously improving the design, the application can be tailored to effectively meet user expectations.

3. Research Methods

The application of a prototyping approach in optimizing the user interface of the "Gowes" bicycle rental mobile application aims to create an intuitive and user-friendly interface, thereby improving the overall user experience. Prototyping is an iterative process in which developers create

an initial model of an application interface, then test it with real users to get valuable feedback (Ibrahim et al., 2023; Sudipa, Ariantini, et al., 2023). Through this feedback, developers can identify problems or flaws in the interface design and make improvements quickly and efficiently. This process repeats until the interface reaches the optimal level of satisfaction from the user's perspective (Permana et al., 2024). Implementing this method not only helps in reducing the risk of project failure but also ensures that the resulting interface truly meets the user's needs and preferences. In the context of the "Gowes" application, prototyping allows developers to quickly adjust features and design elements based on direct interactions with users, such as ease of navigation, responsiveness, and visual aesthetics. Thus, the "Gowes" application can provide more efficient bicycle rental services, increase user satisfaction, and ultimately support the success and sustainability of the application in a competitive market.

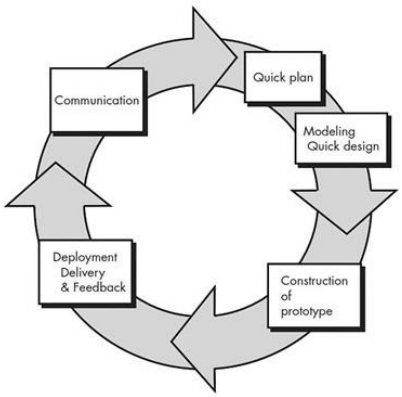

Figure 1. Prototyping Method

Based on Figure 1, it can be explained that the prototyping approach in application development follows several stages designed to ensure the final result meets user needs. The first stage is where developers interact with users and stakeholders to understand needs, expectations and problems faced. This information forms the basis for the design of the initial prototype. The second stage is where the developer creates a simplified version of the application interface that includes basic features. These prototypes are usually not fully functional, but are sufficient to demonstrate the workflow and visual appearance of the application. The third stage is that the prototype that has been created is tested by actual users. Users provided feedback regarding usability, comfort, and problems they encountered while using the prototype. This feedback is very important for further improvements. The fourth stage is Based on feedback from the previous stage, the developer makes revisions and improvements to the prototype. This stage can involve several iterations, where the prototype is tested, evaluated, and refined repeatedly until it reaches the optimal form. The final stage is Once the prototype has been refined and approved by users, the developer uses it as a guide to build the final version of the application. This final version then undergoes further testing to ensure that all features function properly and meet the desired quality standards. The prototyping approach allows developers to focus on user needs and experience from the start of development. By involving users in each iteration, developers can ensure that the final result truly meets expectations and minimize the risk of project failure. In the context of the bicycle rental mobile application "Gowes", this approach helps create an easy-to-use and pleasant interface, thereby increasing user satisfaction and loyalty.

4. Results and Discussions

Needs Analysis

The system analysis stage will be carried out to collect the data needed for research based on the theory that has been studied previously. This stage also aims to obtain information regarding the expectations of users of the system to be developed. The analysis carried out in this research is based

on observations or events during the bicycle rental process to support an activity or event. Before building a mobile-based goods rental information system, researchers must first study the goods rental flow. Based on the needs analysis, there are several system features that are created in the System event list, then there are several system features, namely Login, Managing User Data, Manage Bicycle Data, Consumer Data Management Process, Managing Booking Data, Tenant Transactions, Admin Report and Logout.

System Design

The system design uses Data Flow Diagram modeling, to make it easier to describe the data flow from each process that can be carried out by the system entity, as well as the data flow from the process to the data store used in system design.

Data Flow Diagram Level 0

Data Flow Diagram (DFD) Level 0 describes the data flow and main processes in the "Gowes" bicycle rental mobile application system. This diagram provides an overview of how data moves between various external entities and internal processes without going into technical details.

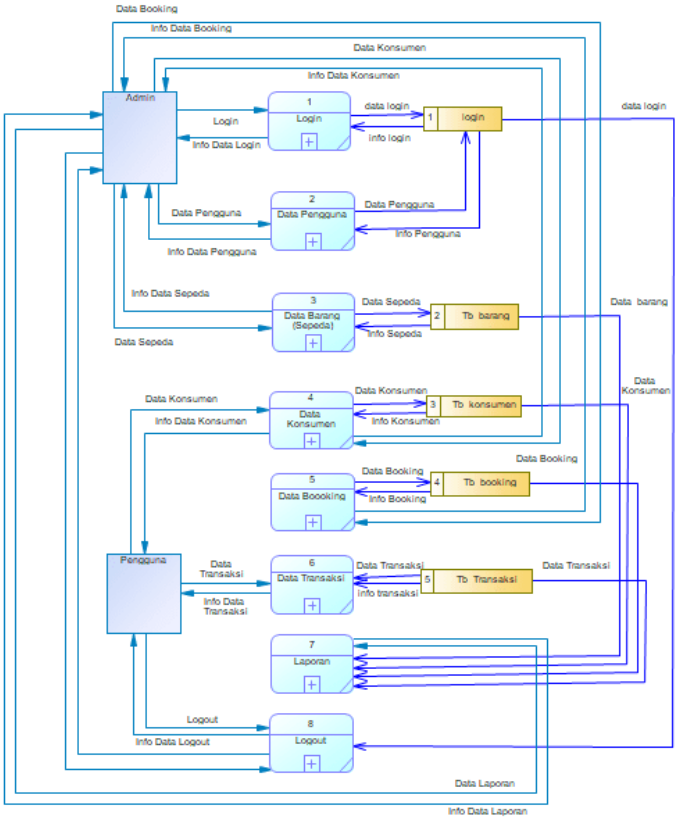

Fig.2. Data Flow Diagram level 0 Bicycle Rental Application "Gowes"

Based on figure 1 it can be explainedThe admin inputs the login into the login data process then the login data is input into tb_login to save the login data inputted by the admin, tb_login produces the login info output into the login process, after that the login process produces the login data info output to the admin. Admin inputs user data into user data process then user data is input into tb_login to store user data inputted by admin, tb_login produces user info output, into user data process, after that user data process produces user info output to admin . The admin inputs bicycle data into the goods (bicycle) data process, then the bicycle data is input into tb_barang to store the bicycle data inputted by the admin, tb_barang produces bicycle info output, into the goods (bicycle) data process, after that the goods data process (bicycle) produces bicycle data info output to admin. The user inputs consumer data into the consumer data process then the consumer data is input into

tb_konsumen to store consumer data inputted by the user, tb_consumer produces consumer info output, into the consumer data process, after that the consumer data process produces consumer data info output to user. Admin inputs booking data into the booking data process then the booking data is input into tb_booking to save the booking data inputted by the admin, tb_booking produces booking info output, into the booking data process, after that the booking data process produces booking data info output to admin. The user inputs transaction data into the transaction process then the transaction data is input into tb_transaksi to store the transaction data inputted by the user, tb_transaksi produces transaction info output, into the transaction data process, after that the transaction data process produces transaction data info output to the user . The admin inputs the report data into the report process, then the report data is entered into tb_barang, tb_consumer, tb_booking, tb_transakasi to save the report data input by the admin, after that the report data process produces report data info output to the admin. The admin inputs logout into the logout data process then the logout data is input into tb_login to save the logout data inputted by the admin, tb_login produces logout data info output into the logout process, after that the login process produces logout data info output to the admin. The user inputs logout into the logout data process then the logout data is input into tb_login to store the logout data inputted by the user, tb_login produces logout data info output into the logout process, after that the login process produces logout data info output to the user.

System Implementation

Logo and Name Concept of the Bicycle Rental Application "Gowes"

GOWES is a bicycle rental business that provides bicycle rental services for a certain period of time to customers, allowing them to enjoy the benefits of bicycles without having to buy them. The main aim of this business is to provide easy and flexible access for people to use bicycles according to their needs, whether for recreation, sport or temporary transportation. The GOWES logo is formed from the main letters G and O which represent the name of GOWES itself. The letters G and O are put together to form a bicycle silhouette with the aim of better explaining this bicycle rental business. The word "GO" in the bicycle logo depicts the spirit of movement and mobility, emphasizes the energy and action in using a bicycle as a means of transportation, and depicts simplicity in its use.

Fig.3. Logo of the Bicycle Rental Application "Gowes"

Login Interface Page

The login page for the Online Bike Rental system (GOWES) is designed so that users who already have an account can access it easily. Users enter their username, email, and password into the fields provided. If users forget their password, they can click the "Forgot Password?" to start the password recovery process via email.

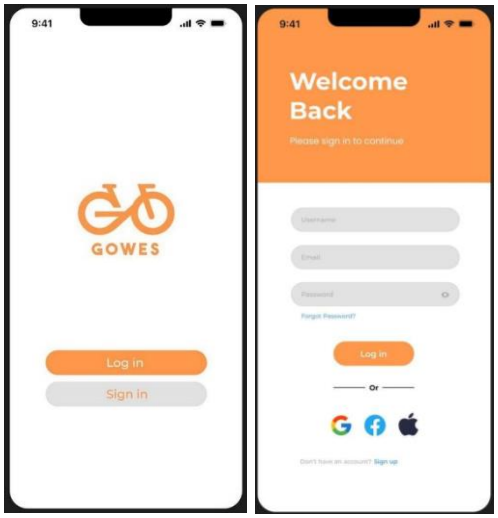

Fig. 4. Login Display

Sign In Interface Page

The signin page for the Online Bike Rental system (GOWES) is designed for users who do not have an account. Users enter their email address, new password, and confirmation of new password into the fields provided. If users forget their password, they can click the "Forgot Password?" to start the password recovery process via email.

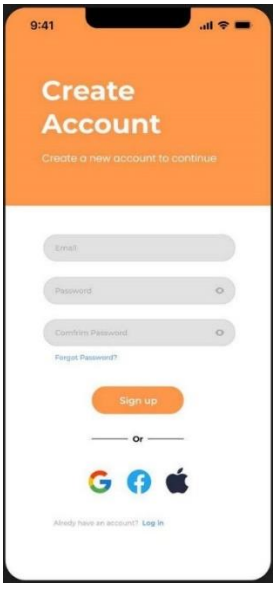

Fig. 5. Sign In display

Interface Home page

On the main part of the page, users can view available bicycle data, including number of bicycles, type and availability status. Consumer Data includes the number of registered consumers. Booking Data is the number of consumers who have made a booking. Users can see the latest transactions that occurred today and yesterday, including details of each transaction.The "Add Tenant Data" button in the footer allows users or admins to quickly add new tenant data. The Admin Profile icon in the footer allows admins to access and manage their profile.

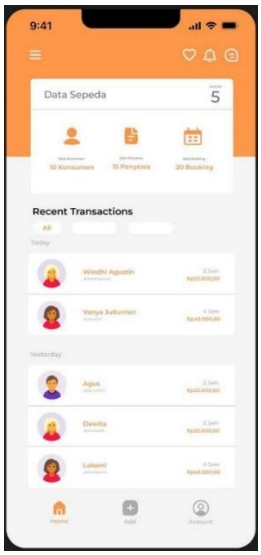

Fig. 5. Home display

Side Bar Interface Page

The sidebar is placed on the left side of the web page, with a vertical design using icons and text to make navigation easier. Each item in the sidebar can be clicked to open the associated page or feature.

1) Accessing Profile: Users can click “Profile” to view and edit their personal information.
2) Checking Notifications: Clicking "Notifications" will display all recent notifications.
3) Viewing Bicycle Data: Users can click on “Bike Data” to view general information about bicycles and “Bike Data List” to view a complete list of bicycles.
4) Viewing Consumer Data: Clicking on "Consumer List" will display a complete list of registered consumers.
5) Checking Bookings: Users can click on "Booking Data" for general information about bookings and "Booking Data List" for a complete list of bookings.
6) Viewing Rental Data: Clicking on "Rental Data" will display general information about rentals and "Rental Data List" for a complete list of rentals.
7) Viewing Reports: Users can click on “Reports” to view various reports related to the bike rental system.
8) Logout: Clicking "Logout" will log the user out of the system.

Fig. 5. Sidebar View

Admin Profile Interface Page

Displays the admin profile photo in the middle of the profile page with a camera icon in the bottom right corner of the profile photo. When clicked, this icon opens a dialog for uploading or taking a new photo.Admin fills in or changes information in the fullname, username, email, password and telephone number fields. After making the desired changes, the admin clicks the "Save" button. The system saves the changes and updates the admin profile information.

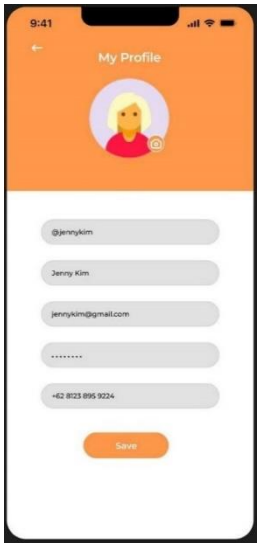

Fig. 5. Admin Profile Display

Bicycle Data Interface Page

This page is used forFill in Bicycle Information. Admin enters the name or type of bicycle in the "Bicycle Type Name" field. Admin enters the unique bicycle code in the "Bike Code" field. Admin enters the bicycle color in the "Bike Color" field. Admin clicks "Choose File" button then a dialog opens to select and upload bike image.Once all the information is entered and the image is uploaded, the admin clicks the "Save" button.

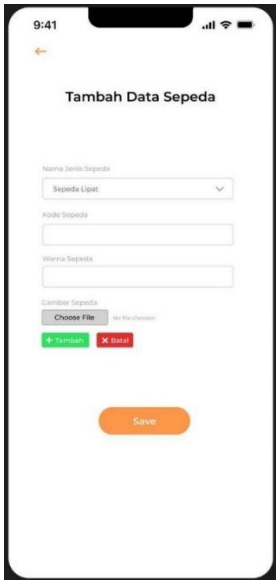

Fig. 5. Bicycle Data Display

Bicycle List Interface Page

This page displays the results of what the admin input on the bicycle data page. Provides buttons to edit, view details, delete and update bike data. The user clicks the "Edit" button on the bike row they want to change. This opens a form with the bike data already filled in for changes. Users click

the "Details" button to see complete information about the bike. This opens a page or modal with the bike details. The user clicks the "Delete" button and the system asks for confirmation before deleting the bike data from the system.

Fig. 6. Bicycle List View

Booking Data Interface Page

This page is used forFill in Booking Information. Admin enters the consumer's name in the "Consumer Name" field. Admin selects or enters the name of the bicycle type in the "Bicycle Type Name" field. Admin enters or selects the rental duration in the "Rental Duration" field. Admin selects the type of payment in the "Payment Type" field. Admin selects the borrowing date in the "Borrowing Date" field. Admin selects borrowing hours in the "Borrowing Hours" field.Once all the information is entered, the admin clicks the "Save" button.

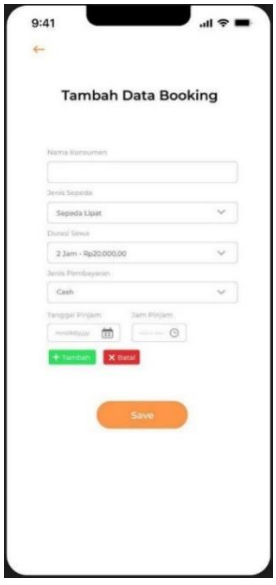

Fig. 6. Booking Data Display

Interface PageRegister Booking

Users see a list of bookings that have been registered in a table with columns for consumer name, name of bicycle type, rental duration, payment type, borrowing date and borrowing hours. The user clicks the "Edit" button on the booking row they want to change. This opens a form with the already filled in booking data for changes. Admin clicks the "Delete" button and the system asks for confirmation before deleting booking data from the system.After making changes or editing the booking data, the admin clicks the "Confirm" button to process and update the booking data. Only admins have access to confirm updates.

Fig. 7. Booking List Display

Interface PageTenant Data

This page is used forFill in Tenant Information. Admin enters the consumer's name in the "Consumer Name" field. Admin selects or enters the name of the bicycle type in the "Bicycle Type Name" field. Admin enters or selects the rental duration in the "Rental Duration" field. Admin selects the type of payment in the "Payment Type" field. Admin selects the borrowing date in the "Borrowing Date" field. Admin selects borrowing hours in the "Borrowing Hours" field.Once all the information is entered, the admin clicks the "Save" button.

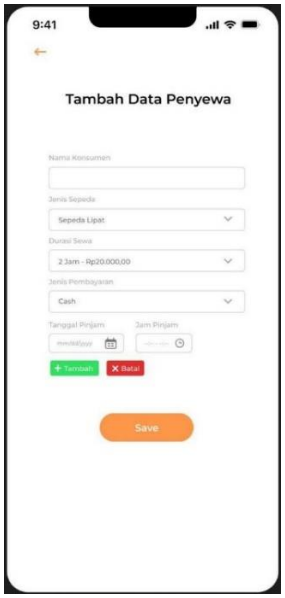

Fig. 8. Tenant Data Display

Interface PageTenant List

The admin sees a list of rentals that have been registered in a table with columns for consumer name, name of bicycle type, rental duration, payment type, borrowing date and borrowing hours. The admin clicks the "Edit" button on the rental row you want to change. This opens a form with the rental data already filled in for changes. Admin clicks the "Print" button on the rental line that you want to print. This opens the print dialog to print the rental details. The admin clicks the "Delete" button and the system asks for confirmation before deleting rental data from the system.Admin clicks the "Tracking" button to track rental status updates. This opens a page or modal to view and update the rental status.

Fig. 9. Tenant List View

Interface PageConsumer Data

This page is used forFill in consumer data information. Admin enters the consumer's name in the "Consumer Name" field. Admin enters the telephone number in the "Phone Number" field. Admin enters the address in the "Address" field. Admin selects the consumer's gender in the "Gender" field with radio buttons or dropdown. Admin uploads consumer profile photos by clicking the "Upload Photo" button. SAfter all the information is entered, the admin clicks the "Save" button.

Fig. 10. Consumer Data Display

Interface PageConsumer List

On the consumer data list page which includes information regarding the consumer's name, telephone number, address, gender, as well as actions to edit, view details, delete and save data. The

admin clicks the "Edit" button on the consumer row that he wants to change. This opens a form with the consumer data already filled in for changes. Admin clicks the "Details" button on the consumer row that he wants to see in more detail. This opens a page or modal with complete information about the consumer. The admin clicks the "Delete" button and the system asks for confirmation before deleting consumer data from the system. After making changes, the admin clicks the "Update" button to save the changes.

Fig. 11. Consumer List Display

Interface PageReport

The rental report page contains important information about the bicycle rental transaction. The data in this report includes invoice code, bicycle code, borrowing date, return date, consumer name, bicycle type, rental duration, and the option to print the report. Admin clicks the "Print" button on the report line you want to print. This opens the print dialog to print the report details.

Fig. 12. Report View

5. Conclusion

The conclusion of the research is that this research succeeded in developing and optimizing the user interface (UI) for the bicycle rental mobile application "Gowes" using a prototyping method approach. This approach has proven effective in producing intuitive and easy-to-use interfaces that suit user needs and preferences. Through repeated iterations involving prototyping, user testing, and refinement based on feedback, the “Gowes” application was able to provide more efficient services and increase user satisfaction. System implementation using Level 0 Data Flow Diagrams (DFD)

provides a clear structure and ensures efficient data flow between various processes and entities in the application. This application not only supports cycling tourism activities in Bali but also strengthens Bali's position as a leading tourist destination by offering a modern and user-friendly bicycle rental experience. Thus, this research makes a significant contribution to the field of mobile application development, especially in the context of tourism services, and shows that the prototyping method is an effective approach for user interface design.

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