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DEVELOPMENT OF THE TREVCAR APPLICATION USING THE SYSTEM DEVELOPMENT LIFE CYCLE METHOD

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ABSTRACT

The development of the online business industry in the service sector is rapid and promising, attracting many individuals to engage in it. In Cianjur, there is a travel car service community known as Trevcar. Trevcar is a car rental service that can be rented by the people of Cianjur. Currently, they only accept rental orders based on personal connections and familiarity. The researcher, who is closely connected to the Trevcar community, is interested in creating an application to facilitate promotion, allowing the rental business to attract more customers and not be limited to just a few individuals. For renters, it will be easier to find rental locations and the required units. This application is not focused on a single rental location; anyone operating a car rental business can utilize it. This research employs the System Development Life Cycle (SDLC) method, which consists of several stages: planning, analysis, design, implementation, and maintenance. The result is the development of the Trevcar application that meets the needs of the community, specifically in Cianjur.

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1. INTRODUCTION

The Cianjur Regency is located in West Java Province. Cianjur borders Bogor and Purwakarta Regencies to the north, Sukabumi Regency to the west, and Bandung and Garut Regencies to the east. Cianjur encompasses an area known as the golden triangle, which serves as a meeting point for toll routes from Sukabumi, Jakarta, Purwakarta, and Bandung [1]. Therefore, Cianjur has the potential to develop its industrial sector. The demand for transportation is certain to increase, as companies require vehicles, particularly cars, to operate efficiently [2]. However, not everyone can afford a car due to its relatively high cost [3]. To facilitate the various business activities of companies and meet the needs of the people of Cianjur or visitors to Cianjur, Trevcar serves as a transportation solution [4]. Renters, specifically those from Cianjur or visitors to the area, can rent cars in Cianjur to support various activities, such as company operations, trips to Cianjur, travel between cities, or other personal needs [5][6].

Currently, Trevcar operates on a small scale, managed by a rental community that does not have many vehicles or a diverse range of car types, and with a limited quantity. Every day, the Trevcar community is capable of renting out all of its cars. However, the business relies solely on information shared through close relationships and word of mouth from friends, despite the vast market potential in Cianjur [7][8][9]. This presents an opportunity for rental owners (the Trevcar community) to enhance their business and increase their revenue. Based on this phenomenon, a researcher who is close to them has the idea to develop the Trevcar application. The researcher proposes naming the application after their community, Trevcar, which is designed to better connect potential renters with car rentals available in Cianjur. This way, customers can more easily rent cars and have a wider selection of vehicle types that suit their needs [10].

It is expected that this application will serve as a bridge between renters and rental companies, making it easily accessible anytime and anywhere [11]. Therefore, a good system for ordering cars is required to provide ease, accuracy, and speed in delivering information to customers and all parties in need [12][13][14][15]. The development of the car rental system aims to streamline the process of data management, transactions, and orders for vehicles to be rented,

making it more effective [16]. To illustrate the solution and develop the application system more quickly and accurately, this car rental application must be well-developed and maintained, and a specific methodology is needed for its development [17].

2. METHOD

In data collection, the researcher uses the SDLC method. The system development method that will be used in this research is the SDLC method. Generally, the stages in the System Development Life Cycle (SDLC) are divided into several phases [17]:

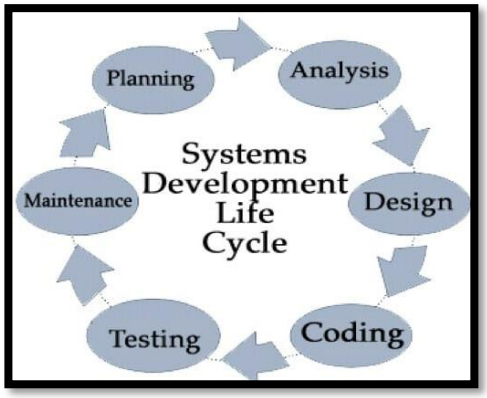


Figure 1. SDLC [17]

a. Planning: Identifying and prioritizing the information systems to be developed, the objectives to be achieved, the implementation timeline, while considering the available budget and who will carry out the project.
b. Analysis: System analysis is the examination of existing systems with the aim of designing a new system or updating an existing one.
c. Design: This stage involves applying the results of the analysis and the specifications to the design or prototype. Similar to constructing a building, the design stage is akin to what an architect would do.
d. Implementation: The development phase is when the design is created and implemented into programming languages.
e. Testing: This phase involves testing the application to identify any errors that may arise during its operation, as well as to determine whether the application meets the required specifications. The testing method used at this stage is black-box testing.
f. Maintenance: After a system is completed, tested, and confirmed to function properly and optimally, it is time to publish the system for user access. However, the process does not stop there; we must conduct system maintenance to ensure that it continues to operate normally and optimally at all times.

3. RESULTS AND DISCUSSION

This stage serves as a space to present findings and discuss the results of research conducted through the implementation of the planned research method or application development. Since this research is conducted scientifically by employing an appropriate research method, the findings are as follows:

3.1 Planning

Planning is the initial stage of all research planning activities. It involves analyzing requirements, data, methods, and approaches to implementing the research into a structured work plan based on a specific methodology to ensure accuracy and scientific rigor.

a. System Analysis: This research produces an application designed for the needs of renters and online transportation rental businesses, specifically providing rental recommendations in the Cianjur area.
b. Requirements Analysis: This analysis aims to identify problems within the system and determine system requirements, including problem analysis, data analysis, and analysis of the current system.
c. Non-Functional Requirements Analysis: This analysis identifies the necessary hardware and software requirements for running the designed application. The hardware and software specifications needed for the Trevcar application are as follows: Hardware: Hardware analysis is a non-functional requirement to support the application's performance. The minimum hardware requirements for the Trevcar application are as follows: Computer Specification: MacBook Pro (13-inch, Mid 2012), 2.5 GHz Intel Core i5 Processor, 16 GB 1600 MHz DDR3 RAM, and Intel HD Graphics 4000 1536 MB.
d. Functional Requirements Analysis: This analysis describes the activities that will be implemented in the system to ensure its proper functioning. It includes Use Case Diagram, Activity Diagram, Sequence Diagram, Class Diagram, Database Design, and User Interface Design.

3.2 Design

System design is conducted to provide a complete overview of what needs to be done. This phase helps in preparing the necessary requirements for developing the overall system architecture

a. Use Case Diagram: This is a sequence of interactions that are interrelated between the system and the actors. A use case provides a brief illustration of the relationship between the actors and use cases. In the Trevcar application, the

actors are as follows: 1. Trevcar administrators who manage the application, 2. Rental providers who supply rental cars, and 3. Renters who rent the cars.

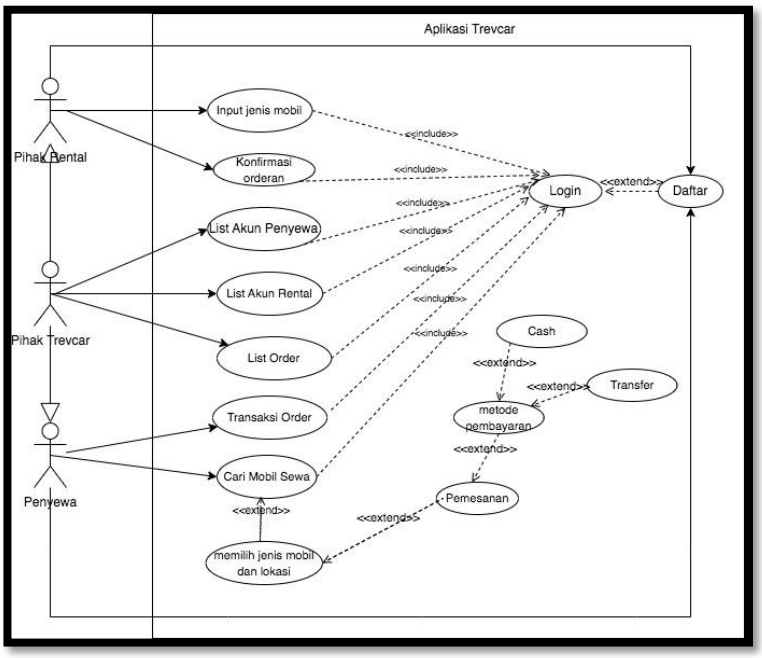


Figure 2. Use Case Diagram

Based on Figure 2 above, all users must first log in before performing activities in the Trevcar application. As previously explained, each actor has a different role. For example, renters can only perform activities in two menus: input car type and order confirmation. The Trevcar administrators can only access the renter account list, rental account list, and order list. Renters, on the other hand, can only access the order transaction menu, search car menu, and their related submenus.

b. Activity Diagram

The Activity Diagram illustrates the activities that occur within the system. Below is the activity flow of the TrevCar application

1. Renter

   The system for the renter consists of activity diagrams for registration, login, searching for rental cars, and transaction orders.

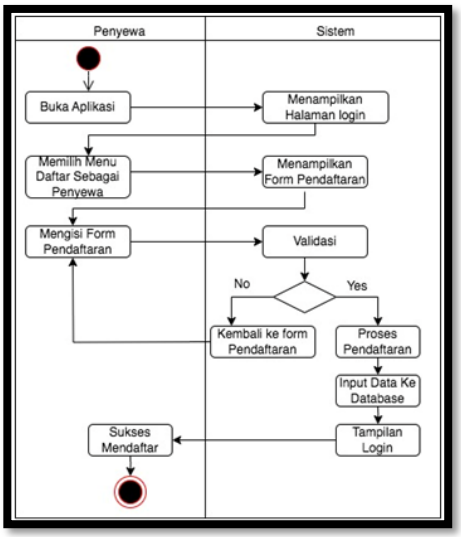


Figure 3. Activity Diagram for Renter Registration

Figure 3 is one of the activity diagrams in the application for the renter actor.

2. Rental Provider

   For the rental provider actor, the activities include Register, Login, Input Vehicle Type, and Order Confirmation.

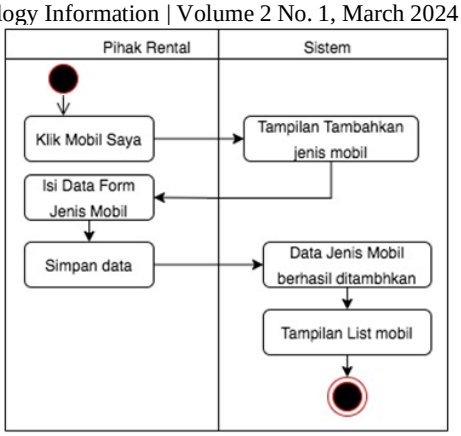


Figure 4. Activity Diagram for Vehicle Type Input

The rental provider enters data for the available vehicles to be rented, as shown in the activity diagram in Figure 4 above. Next, the rental provider confirms the booking requested by the renter, verifying the accuracy of the uploaded payment proof.

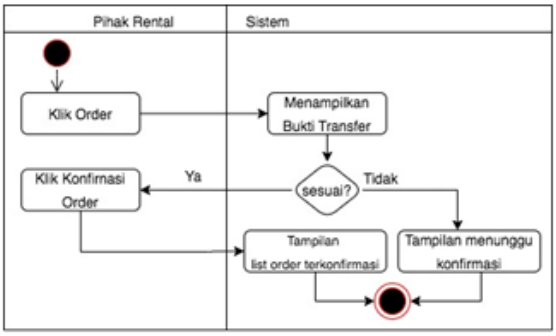


Figure 5. Activity Diagram for Order Confirmation

Figure 5 illustrates the response actions taken by the rental provider for an order placed by a prospective renter.

3. Trevcar:
The activity diagram for the Trevcar actor consists of the following actions: Login, View Renter Accounts, View Rental Accounts, and View Order List.

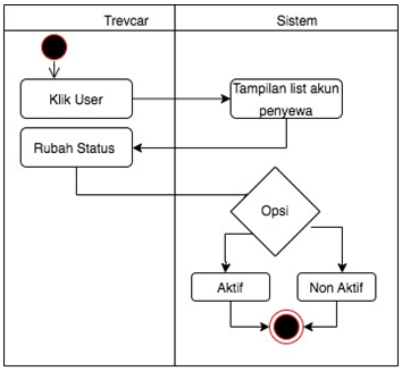


Figure 6. Activity Diagram for Renter Account List

In the Trevcar actor section, a crucial part is the list of renters. Therefore, Figure 6 describes the activity diagram for the renter account list.

c. Squence diagram
Sequence Diagram illustrates the behavior of objects in a use case by describing the lifespan of objects and the messages sent and received between them.
1. Sequence Diagram for Renter:
Below is the sequence group for the renter actor, which consists of Register, Login, Search for Rental Car, and Order Transaction.

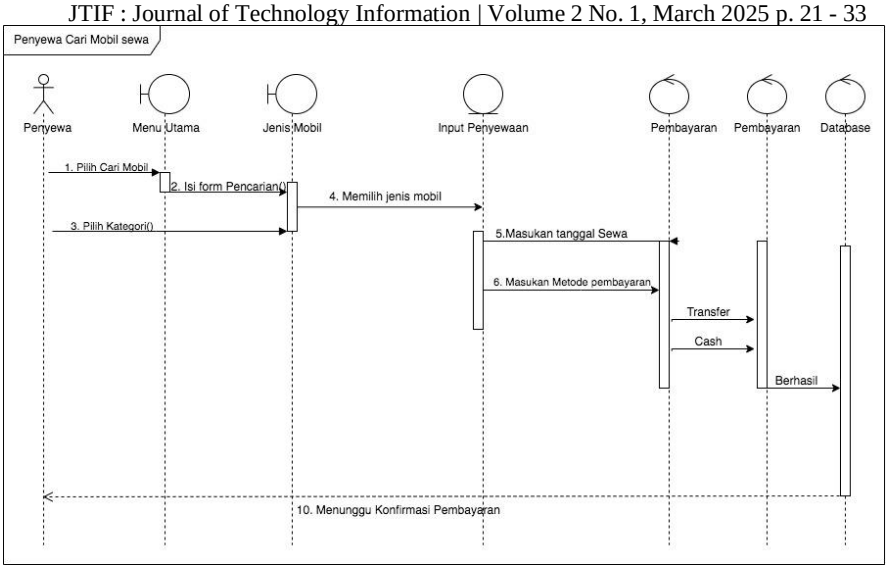


Figure 7. Sequence Diagram for Searching Rental Car

The renter searches for the location they wish to rent from, fills out the form according to their needs, places an order, and uploads the transfer proof.

2. Rental Provider:
Below is the sequence diagram for the rental provider, which includes Register, Login, Input Car Type, and Order Confirmation.

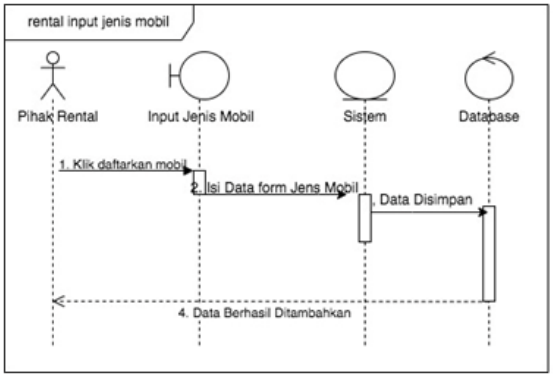


Figure 8. Sequence Diagram for Car Type Input

Figure 8 shows a sample sequence diagram for the rental owner when entering car type data into the TrevCar application.

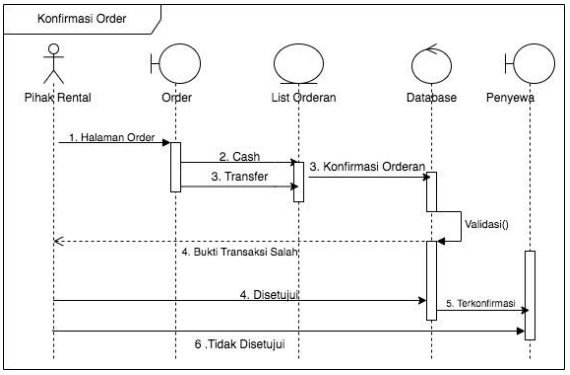


Figure 9. Sequence Diagram for Order Confirmation

After a renter submits a rental request, the car owner must confirm it in the TrevCar system. Figure 9 illustrates the sequence for the confirmation activity carried out by the car owner.

3. TrevCar Management:
For the TrevCar management team, the sequence diagram includes: renter account list, rental account list, and order list.

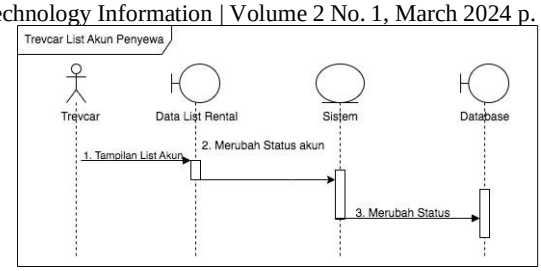


Figure 10. Renter Account List Sequence

The figure above shows an example of the sequence for the list of renter accounts, which can be viewed by the TrevCar management team.

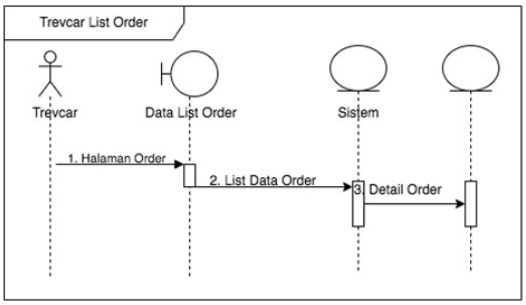


Figure 11. Order List Sequence

In TrevCar management, there is a report for the list of orders, so Figure 11 illustrates the sequence diagram for the order list to ensure that all orders are managed effectively.

d. Class diagram

The Class Diagram is a type of structural diagram in UML that clearly illustrates the structure and description of classes, attributes, methods, and relationships between each object.

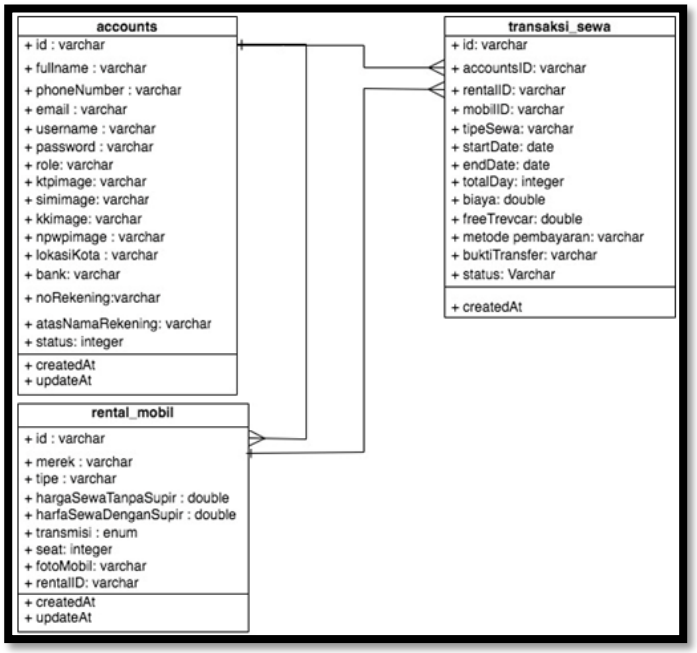


Figure 12. Class Diagram

As shown in Figure 12, the class diagram describes that the database for the TrevCar application consists of three tables.

e. Database Design

Database design is a structural overview of the data storage medium. The database design for TrevCar includes the following: the account table, the car rental table, and the rental transaction table.

Table 1. Rental Transactions

Field	*Type Data*	*Length*	Description

Id	*Vachar*	36	
Account ID	*Vachar*	36	
Rental *ID*	*Vachar*	36	
Mobil *ID*	*Vachar*	36	
Tipe Sewa	*Vachar*	10	
Start Date	*Date*		
End Date	*Date*		
Total *Day*	*Integer*	11	
Biaya	*Double*		
Fee Trevcar	*Double*		
Metode Pembayaran	*Vachar*	25	
Bukti *Transfer*	*Varchar*	125	
Status	*Vachar*	25	
Created at	*Datetime*		

Table 1 shows an example of a table within the Trevcar application. Based on Table 1, all transactions that occur within Trevcar must be managed effectively.

f. Application Storyboard

1. Lessee: This consists of several designs, including the login page, lessee registration page, main page, search for rental cars, list of cars, rental date, payment mode, transaction order, and order details.

(a) (b)

Figure 13. a. Wireframe of the Lessee Registration Page, b. Wireframe of the Search Rental Car Page

2. Rental Provider: This consists of several designs, including the login page, registration page, rental provider main page, list of cars & addition of car types, input for car types, rental order list, and payment order details.

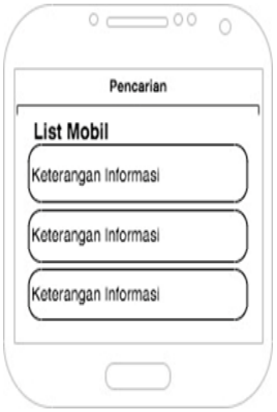


Figure 14. Wireframe of the Car List Page

The wireframe displays the car list page filled in by the lessee in the data search form according to their preferences. It includes information about the brand, type, rental price, and the name of the rental provider.

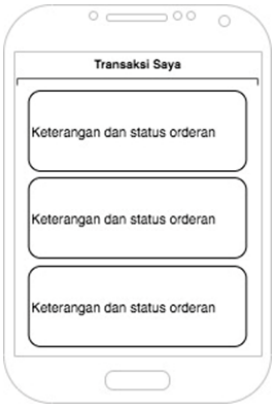
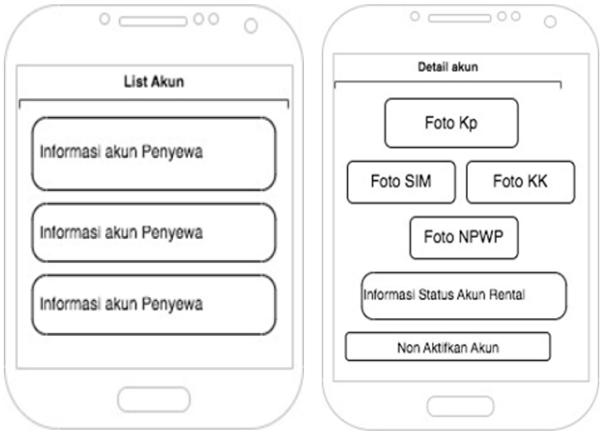


Figure 15**.** Wireframe of the Order Transaction Page

After the lessee selects a payment method, the status of the order and details of the car to be rented will be displayed.

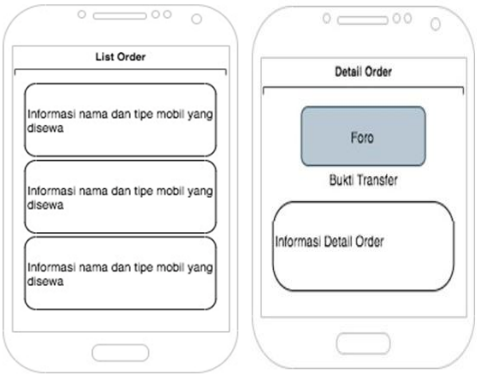
3. Trevcar team: This section includes several designs such as: Trevcar login, main page, list of lessee accounts, lessee account details, list of rental accounts, rental account details, order page, and order details. The first menu view presents a framework image of the list of registered lessee accounts, showing several lessee accounts that have already been registered.



(a) (b)

Figure 16. a. Wireframe of the Lessee Account List, b. Wireframe of Lessee Account Details

This wireframe illustrates the order list page, which displays transactions that have already occurred between the lessee and the rental party.



(a) (b)

Figure 17. a. Wireframe of the Order List Page, b. Wireframe of the Trevcar Order Details Page

g. Coding
This stage involves implementing the planning into source code.

h. Implementation
After the design phase, the next step is to implement the system design. In this stage, the author applies the results of the previously created designs. Implementation refers to the process of showcasing the developed

system or software. The results of the implementation include:

1. Lessee: This includes: Login, Registration, Main Page, Car Rental Search, Car Details, Lessee Order Confirmation, My Orders Menu, Lessee Order Details, and Order Confirmation.

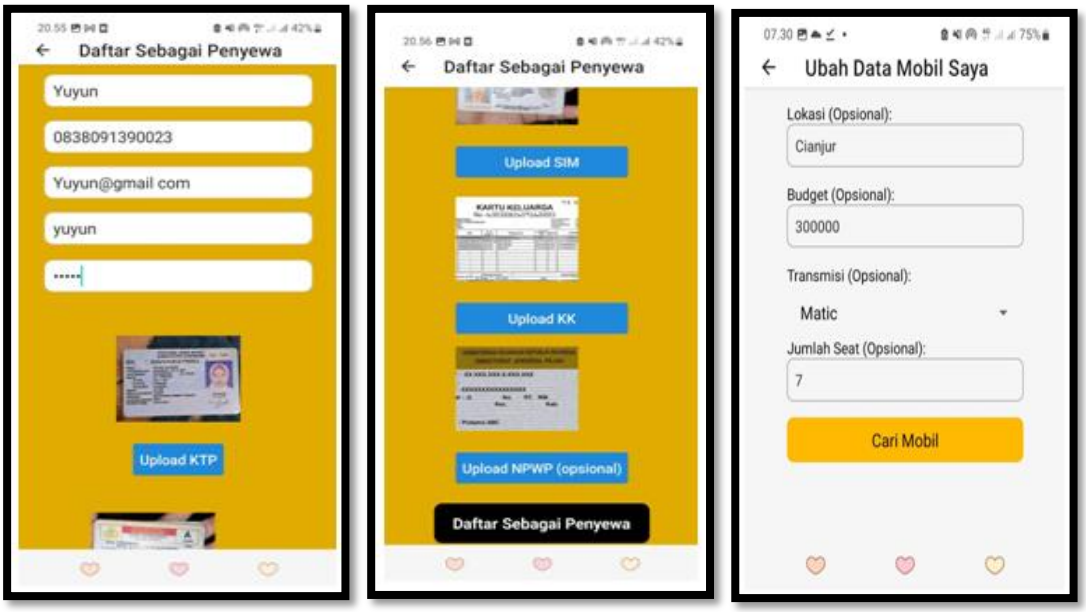
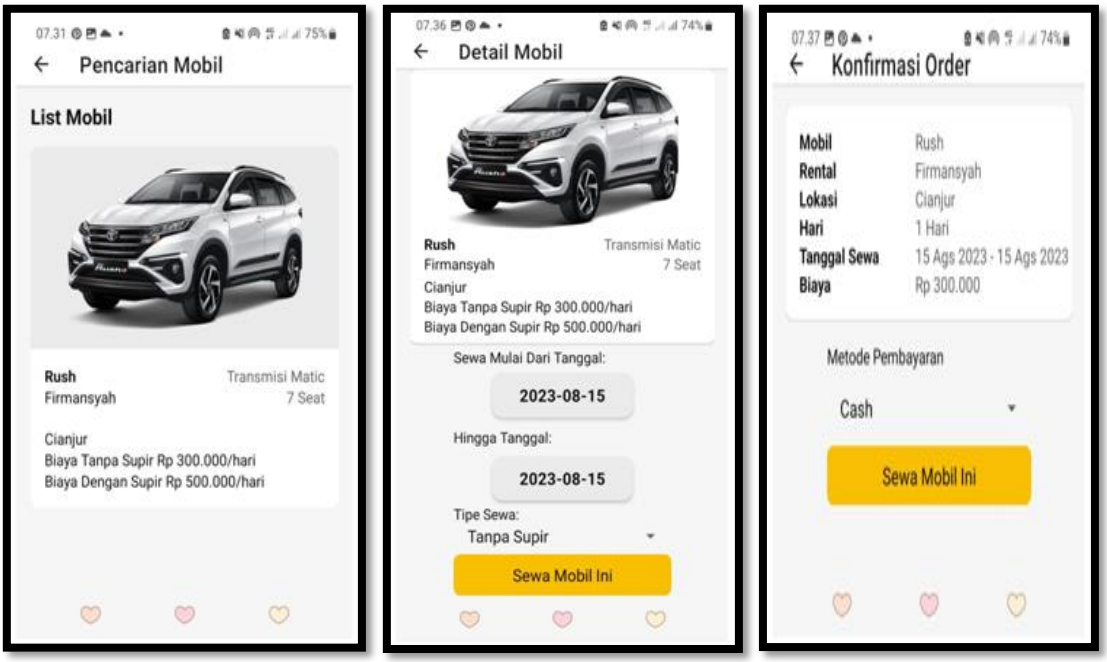


Figure 17. a. Prototype of the Registration Page Filled Out, b. Image of Car Search

Figure 17a shows the registration page for lessees, while Figure 17b illustrates the interface for searching for cars in the Cianjur area.

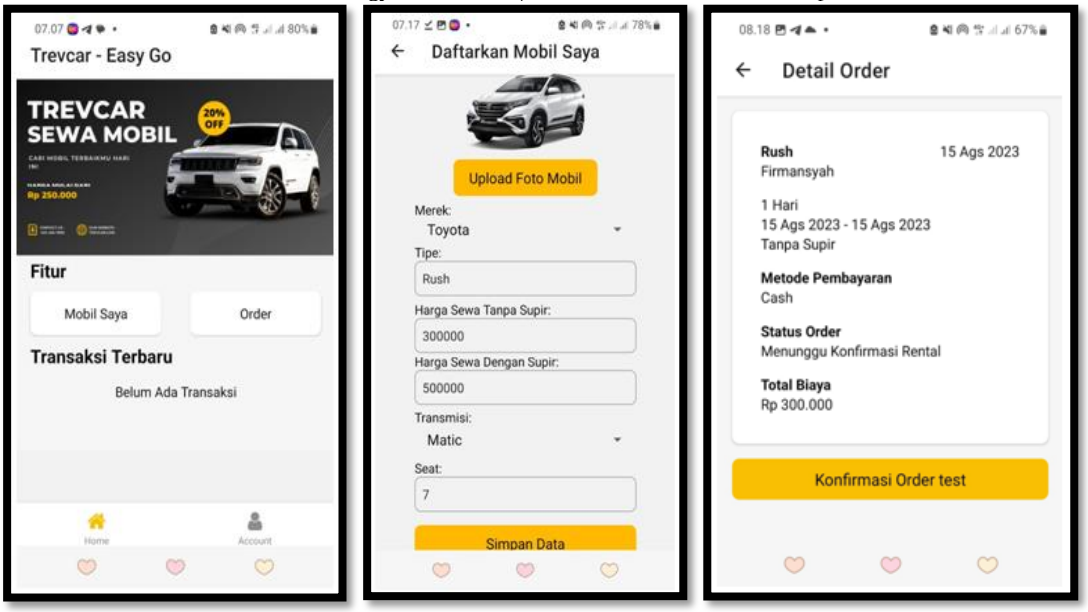


(a) (b) (c)

Figure 18. Search Results: a. List of Cars, b. Car Details, c. Prototype of Order Confirmation

Figure 18 illustrates the implementation of the design for search results on Trevcar. a. The list of searched cars displays the owners and rental costs for one day. b. The car details show a breakdown of the selected vehicle, including explanations about the car, the rental dates, and whether the rental is with or without a driver, which will incur an additional cost. c. The order confirmation image represents the lessee's decision to rent or not; when the "rent" option is clicked, a rental transaction is automatically initiated.

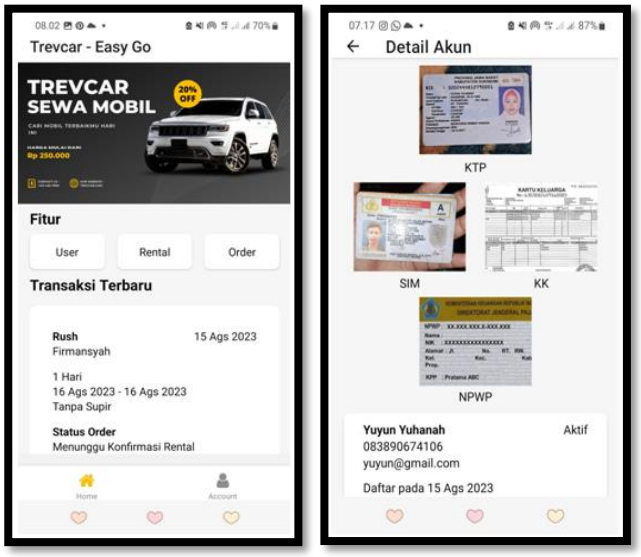
2. For the rental party, it includes: login, registration, rental homepage, types of cars, list of cars, order list, and rental order details.



(a) (b) (c)

Figure 19. a. Rental Homepage, b. Types of Cars for Rent, c. Order Details

3. For the Trevcar party, the features include: login, Trevcar homepage, list of lessee accounts, account details, list of rental accounts, rental account details, and Trevcar order list.



(a) (b)

Figure 20. a. Trevcar Homepage, b. Lessee Account Details

i. Testing

The purpose of this system testing is to ensure that the information system developed is reliable and can accurately represent the core aspects of the specifications, analysis, design, and coding. This testing employs the black box method.

Table 2. Testing Results for Lessee Page

Testing Items	Testing Scenario	Expected Results	Application Testing Results	Testing Status
Login Menu	The username and password are not filled in; click the login button	The system denies access and displays "Your Username and Password are incorrect"	The system denies access if the username and password are not entered and displays the message "Your Username and Password are incorrect"	Successful
	The username and password are entered correctly, and the	The system will log in and display the main page	The system logs in and displays the main page	Successful

	login button is clicked			
Menu Register as a Renter	The registration form is not filled out; click the "Register as a Renter" button	The system denies access and will return to the registration form	The system denies access if the registration form is not filled out, displaying the message "Please fill out your registration form"	Successful
	The registration form is filled out	The system will proceed to the main page	The system directly navigates to the main page for the renter	Successful
Menu Search for Rental Cars	The "Search Rental Cars" menu is clicked	It will display a screen for entering location, budget, transmission type, and the number of seats	The system displays the form for entering location, budget, transmission type, and the number of seats	Successful
	The "Search Rental Cars" menu is clicked, and the "Search" button is pressed without filling out the form	It will then display a list of all rental locations in the city of Cianjur	The system displays the search results for all rental locations in Cianjur	Successful
	The "Search Rental Cars" menu is clicked, and the form is filled out before pressing the "Search" button	It will then display the types and locations of the desired cars	The system displays the types and locations of the cars	Successful
My Orders	The "My Orders / My Transactions" menu is clicked	It will display the order details with information including the renter's name, type of vehicle rented, rental date, and confirmation status from the rental company	The system displays the order details, including the unit, renter's name, rental date, and confirmation status from the rental company	Successful

Table 3. Test Results for the Rental Page

Testing Items	Testing Scenario	Expected Results	Application Testing Results	Testing Status
Login Menu	If the username and password are not filled in, click the login button	The application will display a warning text on the login page	The application system displays a notification on the login page stating, "Your username or password is incorrect"	Successful
	The username and password are filled in correctly, then click the login button	The system will proceed to the main page	The application system displays the main page, which includes the feature menu and the latest order transaction menu	Successful
My Cars Menu	The "My Cars" menu is clicked	The system will navigate to the list of registered cars and the new car registration menu	The application system displays the main page, which includes the feature menu and the latest order transaction menu	Successful
Register My Car Menu	The "Register My Car" menu is clicked	The system will navigate to the page for entering the car type, model, and rental price	The application system displays the list of registered cars and the option to register a new car	Successful
Order	The "Order" menu is clicked	The system will navigate to the page displaying the transactions that have been recorded	The application system displays all incoming order transactions	Successful

Table 4. Test Results for the Trevcar Page

Testing Items	Testing Scenario	Expected Results	Application Testing Results	Testing Status

Login Menu	Username and password are entered correctly, then click login	The system will navigate to the main menu page, displaying features for users, rentals, and orders	The application system navigates to the main page	Successful
User Menu	The user menu is clicked	This will display the list of renter accounts	The system displays a list of registered renter accounts	Successful
Menu Rental	The rental menu is clicked	This will navigate to the page listing all rental accounts	The system displays a list of all rental accounts	Successful
Menu Order	The order menu is clicked	This will lead to a page displaying all rental transaction records for each rental party	The system application displays all rental transaction records intended for the rental parties	Successful

4. DISCUSSION

This research on the development of this application is limited to the environment of Cianjur City only. Therefore, in terms of the quantity of issues addressed, it is certainly not as complex as those that would be resolved over a wider scope. Additionally, the technical planning for development differs as well; handling a larger amount of data would require a different approach compared to applications addressing broader issues. At the very least, the storage system would need to accommodate a larger capacity to be provided by the developers.

5. CONCLUSION

Based on the research findings and implementation discussion regarding the "Trevcar Application," the researcher draws several conclusions as follows: a. The Trevcar application serves as a solution for car rental businesses, allowing them to provide more detailed information about their services. b. The Trevcar application offers convenience to the community by providing information on locations and transportation services (car rentals). c. The Trevcar application includes features that cater to both renters and rental providers, effectively accommodating both parties within the application.

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