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The Development of a Web-based Car Rental Business Management System

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Abstract: A car rental service is essential, especially in areas with less available public transport. For example, out-campus students need transportation to attend classes in campus areas. Even in a tourism area, car rental service is crucial. Despite relying on public transport, tourists can rent a car and enjoy their trips without being tied to the public transport schedule. However, manual car rental booking is risky for car owners and customers. In case of accidents or a car being stolen, it would be difficult for the car owner to track the customers' data. On the customers' side, it is crucial to protect their rights by getting the best-expected service from money spent. This includes their preferred choice of car, price, and the car's condition. In this article, a one-stop center web-based car rental system is proposed to assist car owners in managing their car rental business while providing customers with an easy booking process.

Keywords: Transport, Car rental, Web-based, One-stop center

1 Introduction

In small cities or rural areas, public transport availability is limited; if available, the service frequency is far less than that found in the city areas [1][2]. This would be a significant problem for those who need transport to commute from one place to another. Among those who fall under this category are students who rely upon public transport to attend classes (especially those who stay out of campus). Advertisements or promotions by car owners are usually done by placing pieces of paper at places where they think the target users will see them, usually at bus stops or noticeboards within campuses. However, such a promotional approach might only reach some target customers. A more efficient approach can be made due to the advancement of Information and Communication Technology (ICT). A one-stop center should be created that allows car rental business owners to register their cars for rent [3]. On the other hand, potential customers who need a car for rent might also record themselves and view the available vehicles according to their preferences and expected budget. This approach seems to have better target users' accessibility since anyone can access the system anywhere and anytime at their comfort [4].

Therefore, in this project, the proposed system aims to develop a one-stop web-based platform for users who want to find cars for rent and car owners who offer rental services. The method may not only ease the promotion of vehicles for rent to reach the target customers, but car owners can keep track of their customer's details and history of bookings in case of an accident or stolen cars [5]. This system may indirectly help car owners minimize their risks since the system database is more efficient than the manual approach of keeping customers' data. On the customers' side, they may place the booking by just scrolling their device at any time, anywhere convenient to them, not being tied to the operation hours of a physical store or the need to communicate with the owners via text messaging applications or phone calls.

2 Method

This project was developed based on the Software Development Life Cycle (SDLC) utilizing an iterative model as shown in Figure 1. The iterative model was considered for this project due to its cyclical process, unlike the traditional waterfall model, which concentrates on a strict step-by-step process of developmental phases [6]. After the initial planning stage, a few steps can be repeated, with each cycle's completion resulting in a slight improvement and iteration of the software. The next iteration can be slightly better than the previous one since improvements are easily identified and implemented during each iteration. The iterative model involves initial planning, planning, requirements, analysis and design, implementation, deployment, testing, and evaluation phases.

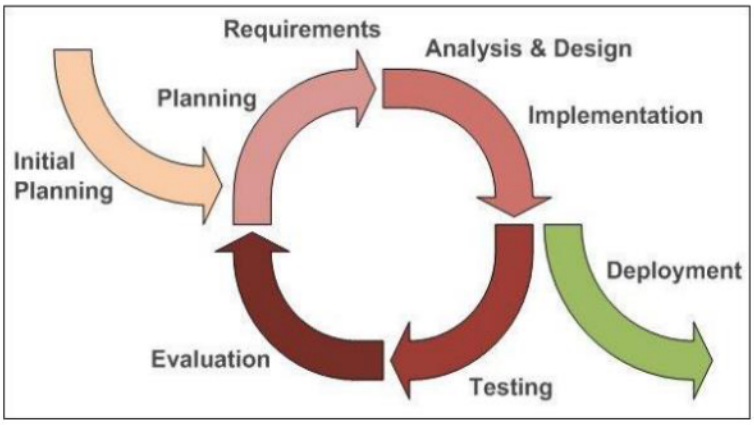

Figure 1: Phases in an Iterative Model

This project started with initial planning, which involved identifying issues in the current car rental process. To achieve this purpose, a feasibility study was performed to assess and determine the viability of this project, including all related aspects, technically, operationally, and economically [7]. A set of questionnaires was distributed to assess customers' satisfaction with the current car rental booking process. Table 1 shows the questions in the questionnaire that respondents need to answer. Most respondents were students of Universiti Teknologi MARA Cawangan Kelantan and people nearby. The survey found that most users usually book a car by walk-in to the car rental company, while others might use applications such as WhatsApp and Telegrams. Although some online messaging applications are used, the overall booking process is still considered manual because the car owner must manually write down each user and the booking details. This process can be tedious if many bookings need to be managed. More than 70% of the respondents answered that they have difficulty finding a car for rent and most respondents were concerned about the type of car (either manual or automatic), rental price, and the car's condition when booking a car.

Table 1: Questionnaire for pre-analysis of the car rental process

No	Questions
1	Have you ever rented a car?
2	Why do you usually need to rent a car?
3	How do you rent a car? (Phone call, walk-in, or others?)
4	Do you have specific criteria while selecting a car for booking?
5	Do you find any difficulty in renting a car?
6	What kind of difficulties do you face while renting a car?
7	Are you satisfied with the current car renting process?

The next phase, planning, was performed by defining problems in the existing car rental process and determining the objectives of this project and its scope. All system requirements were then gathered from the literature survey and adequately documented. In the analysis and design phase, the prototype of the system to be developed was designed.

3 Design

The design phase involves the development of a context diagram and entity relationship diagram. The context diagram will show who are the users using the system, and the Entity Relationship Diagram (ERD) will show how the data are stored in the database [6].

A Context Diagram

Figure 2 shows the context diagram who are the users using the system. This one-stop web-based car rental system is accessed by customers to search for car preferences, book the car, check their booking status, and provide feedback on the service. The owner is the person who owns and manages all the cars available for rental. The owner will also manage all the booking requests from the customers and update the booking status. The owner can also view the feedback given by their customers for improvement in the future. The administrator is the person who will be in charge of the one-stop web-based car rental system management such as accessibility by new users and reporting.

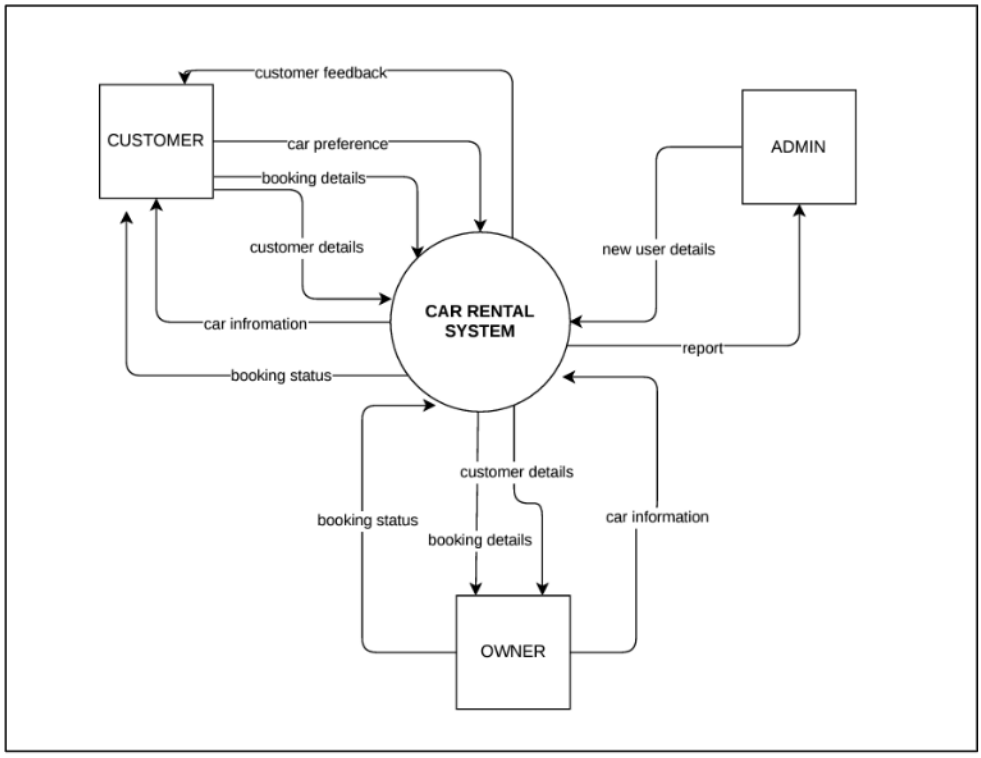

Figure 2: Context Diagram

B Entity Relationship Diagram

The database of this car rental system consists of CUSTOMER, BOOKING, CAR, OWNER, and FEEDBACK entities as shown in Figure 3 below. A customer can either sign up as a user of the system or not. Each customer can make many bookings for different cars from different owners. An owner can own many cars available for rental. Many owners can register with this system. Customer feedback is provided to guarantee the quality of the service. Customers can give feedback on each of their bookings such as the condition of the car, the system itself, and others. This will help future customers to book the correct vehicle and avoid cars with specific problems. On the owners' side, the feedback will help them identify a current vehicle issue and improvise them for customer satisfaction.

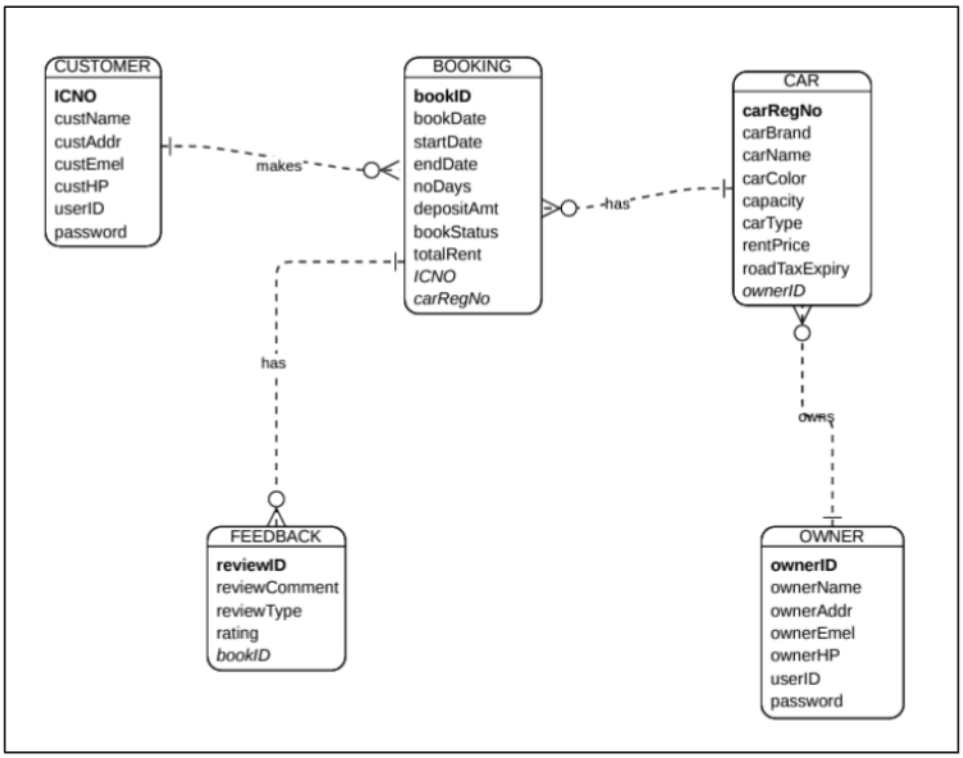

Figure 3: Entity Relationship Diagram

4 Implementation

The actual implementation occurred once the technical design requirement was outlined and adequately reviewed. This phase involves extensive coding to produce the output interface of the existing system. The Keyword Searching Technique was implemented in the coding part to allow users to place bookings based on their car preferences. This technique was used to tackle the high cost of searching for structured results that span several sources, which can be decreased by sending keywords exclusively to relevant authorities [8].

There is a variety of programming languages used in developing web-based systems. In the development of a one-stop web-based car rental system, Hypertext Preprocessor (PHP), Hypertext Markup Language (HTML), Cascading Style Sheet (CSS), and JavaScript were used. PHP is a general-purpose scripting language that is used specifically in web development. It is a powerful scripting language for developing dynamic and interactive web applications. Moreover, PHP has a faster development cycle which allows developers to work with HTML code and does not have much programming knowledge [9][10].

MySQL database server is used to store data in a database so that it can be managed accordingly since it is easy to install, configure, and manage [9][10].

5 Testing Phase

Once the implementation part had been completed, the system was tested to check for errors and bugs. A usability acceptance test (UAT) evaluates how easily the users can understand and use the system and whether technical assistance is needed [11]. The UAT questions as shown in Table 3, were assessed by users who are using the system.

Table 3: UAT Questions

No	Questions
1	Can you successfully create a new customer account on the website?
2	Were you able to search and view available cars for rental?
3	Did the system accurately display car details such as make, model, year, and rental price?
4	Were you able to make a reservation for a specific car?
5	Did you receive a confirmation email after making a reservation?
6	Were you able to modify or cancel a reservation?
7	Did the system accurately display the rental duration and cost for your reservation?
8	Were you able to view your past rental history?
9	Did the system accurately calculate and display the total cost of a rental, including any additional charges or discounts?
10	Were you able to pay for a rental using the provided payment options?
11	Did you receive a payment confirmation after completing a transaction?
12	Were you able to generate and print an invoice or rental receipt?
13	Were you able to provide feedback or rate your rental experience through the system?
14	Did the system accurately handle multiple concurrent reservations and prevent double bookings?
15	Were you able to access the system securely through user authentication and authorization?
16	Did the system provide an intuitive and user-friendly interface for easy navigation?
17	Were you able to access and update your personal information, such as contact details or payment preferences?

Based on the feedback from users, it can be concluded that most users provided positive feedback. Respondents reported the successful creation of customer accounts, ease in searching and viewing available cars, and accurate display of car details such as the make, model, year, and rental price. Users could make reservations, modify or cancel bookings, and receive timely confirmation emails and payment notifications. The system effectively handled rental calculations, additional charges, and discounts, providing users with accurate rental costs. Users appreciate the availability of past rental history, the ability to generate invoices or rental receipts, and the system's handling of multiple concurrent reservations to prevent double bookings. The interface was deemed user-friendly, allowing easy navigation and access to personal information updates. Overall, the positive feedback from respondents demonstrates that the car rental management system met the expectations and requirements of users during the UAT phase.

6 Deployment

The system was deployed to the work environment where the system is ready to be used by users. Figure 4 shows the homepage of the system, where users can choose their role before the appropriate options are displayed. Once successfully logged in, users can then choose any function for their action in the car rental system. Figure 5 shows the functions available for each user of the system.

Admin user will manage the users of the car rental system, do housekeeping on car details managed by the owners, and also the reporting needed to be printed. Owners will manage their car details available for rental, list all the bookings made, and update the status. Owners can also view all the feedback given by customers and improvise their cars and services. Customers need to provide their details for booking purposes, search for the preferred car using a keyword as shown in Figure 6 below, and make bookings for the selected car.

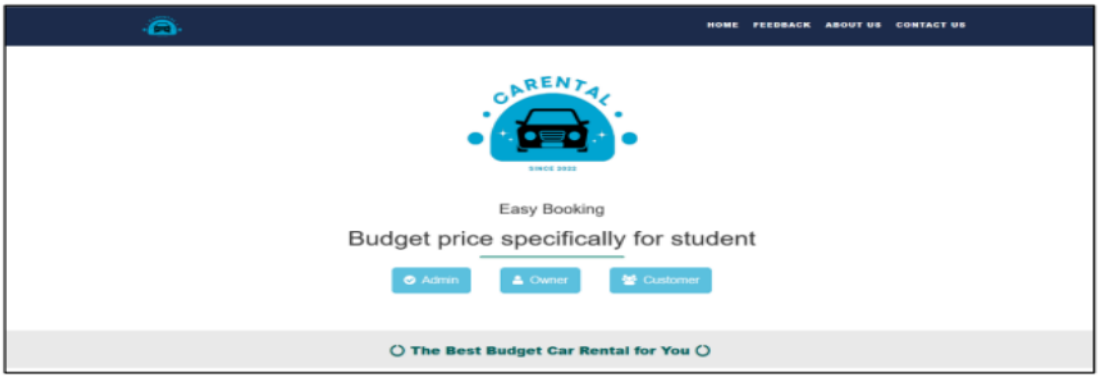

Figure 4: The home page of the car rental system

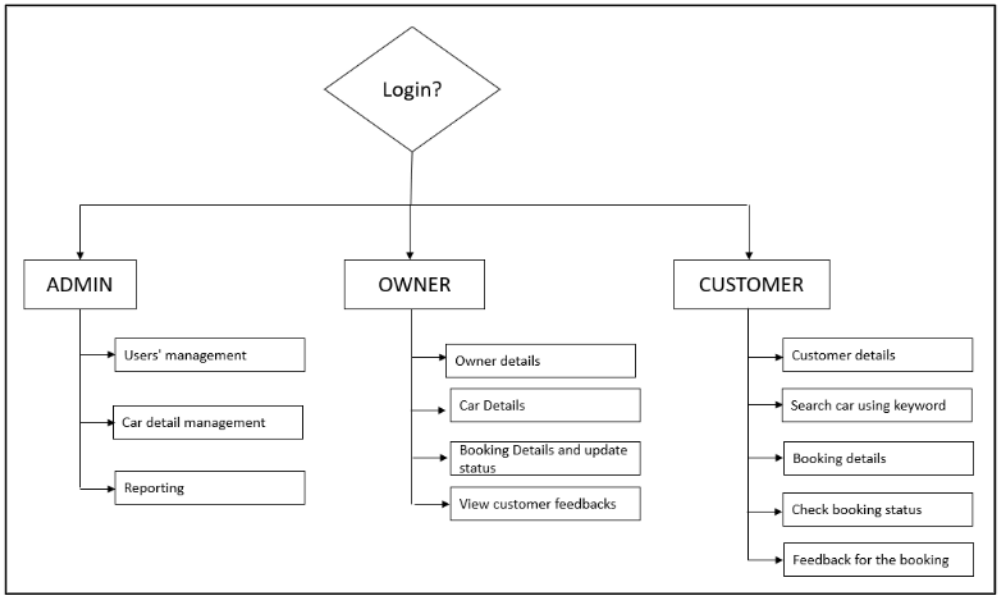

Figure 5: Functions available for each user of the car rental system

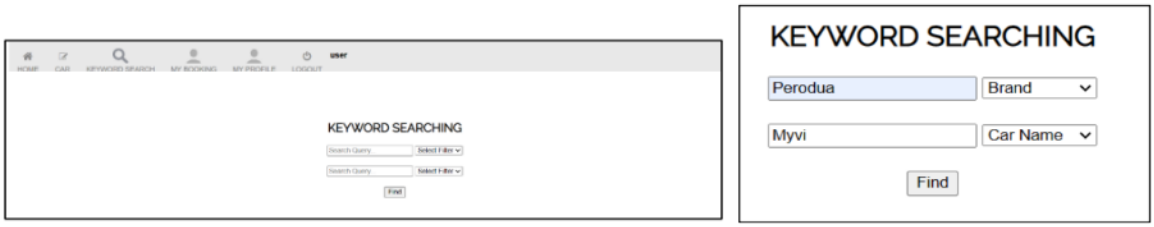

Figure 6: Keyword search and example screen interface

Feedback on a rented car can be given by filling in the feedback details. Customers can provide more than one feedback for each booking such as a review on the car condition and the rental service system by giving the rating for each feedback. This feedback can be viewed by the owner of the rented car for further improvements in the future. The history of bookings is also kept so that customers can view them later for reference purposes.

7 Conclusion

The one-stop web-based car rental system is beneficial for car rental business owners to efficiently manage booking from their customers since everything will be handled by the system and secured. The

system allows many owners to showcase their available cars to be rented, therefore, customers will have more variety of availability of cars to be selected. Customer details, cars rented, and owner details can be easily tracked. Rental cars can be returned anytime, anywhere, and without walking in or going through time-consuming communication with the owners via text messaging applications or phone calls. The main advantage of implementing a one-stop web-based car rental system is that it can significantly enhance the profitability and visibility of small businesses in the car rental industry, empowering them to increase their profits and expand their reach among their target users.

7 Future Work

Integrating automated approval, user geolocation detection, and various payment methods should be considered to improve user experience and boost their satisfaction. Nowadays, people have excellent choices to perform their online transactions, limited to FPX online banking, debit and credit cards, and a variety of e-wallet choices. Having these options in the developed system would increase users' experience as they can choose any payment that suits them best. Further, the mobile version of this system (compatible with different operating systems) should be developed as everybody is now comfortable assessing and completing their tasks through smartphones. On the other hand, geolocation integration will enable users to accurately pinpoint the location of the nearest car rental company according to their real-time site.

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