Car Rental System

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Abstract— **The goal of this project is to develop and build a data management system for a car rental company. This solution improves customer loyalty while also simplifies vehicle and staff management. This application collects information from users by having them fill out their information. Agile methodology has been chosen as the methodology and layered architecture pattern as the architectural design pattern. This project used PHP language with MySQL as a database. This system is an online system that is entirely integrated. It effectively and efficiently automates manual procedures. This automated method assists consumers by allowing them to fill up the specifics based on their needs. It specifies the sort of car they are attempting to rent as well as the rental date.**

I. INTRODUCTION

This project will help the rental process of Khaimal Rental Car more convenience which is all the operations is carried out automatically in web-based application of Car Rental System. By using these applications, the business will be available for 24 hours per day which is the customer can make the booking anytime. Car Rental System also help the staff to manage multiple booking at one time without hassle. The status of car has been updated by the system within minutes which can helps the staff deal with the replacements and cancellation efficiently. To ensure the satisfaction with the services, the system provide a feedback part that customer can give their feedback after done renting the car with this company. The staff will know their rate of service and can come up with better service in future. Type Style and Fonts

Wherever Times is specified, Times Roman or Times New Roman may be used. If neither is available on your word processor, please use the font closest in appearance to Times. Avoid using bit-mapped fonts. True Type 1 or Open Type fonts are required. Please embed all fonts, in particular symbol fonts, as well, for math, etc.

II. PROBLEM BACKGROUND

The Khaimal Car Rental used applications such as WhatsApp, Facebook, Telegram and etc. in order to exchange information about the car rental with their customers. This process is quite a hassle as the staff, or the admin have to reply to each one of the customers' queries. They also need to answer the same questions such as the rate of car rentals, the availability of the car and more. The customer needs to wait for their reply to know the car is available or not for that time. There is no platform for customer to know the availability of the car that they want to rent.

In this study, a Car Rental System a web-based application which is in the e-commerce domain is proposed. This technology is intended to assist the organization in enabling auto rentals via an internet system. It allows users to browse for available cars, edit their profiles, and reserve a car for a certain time period. It includes an easy-to-use interface that allows the user to search for car and rent it for the time period selected. They have the option of paying online as well. By using these systems, the customer can make their booking anytime and anywhere.

III. COMPARISON BETWEEN EXISTING SYSTEM

The study's findings are reported in this section, which includes a system comparison.

Table 1 Comparison the proposed system with existing system

Application Features	Khaimal Car Rental	Car Rental System
Customer can register an account	✓	✓
Login into the system	✓	✓
View user profile	✓	✓
Edit user profile	✗	✓
Customers give feedback	✗	✓
Customer can choose pickup and return date. The previous date is not available to pick	✗	✓

Customer can edit the return and pickup date	✘	✓
Customers pick available car based on the date	✘	✓
Customer can send query about booking	✓	✓

Table above shown the comparison the proposed system with existing system. Based on the analysis above about the comparison with the existing system, to improve the user experience, the proposed system would incorporate some of the present systems functionalities. In the existing systems, the system does not allow the user to edit the profile or update the profile. Hence, there is no feedback or rating section that the customer can give their feedback in the system. Besides, the customer also cannot reschedule the booking date in the system.

IV. METHODOLOGY AND DESIGN

Among various software development methodologies, for this project I choose Agile methodology. The Agile software development technique is one of the easiest and most successful techniques to transform a business requirement vision into software solutions. Agile software development is a concept that refers to methods that include continuous planning, learning, improvement, team participation, evolutionary development, and early delivery [2]. It increases adaptability in the face of change.
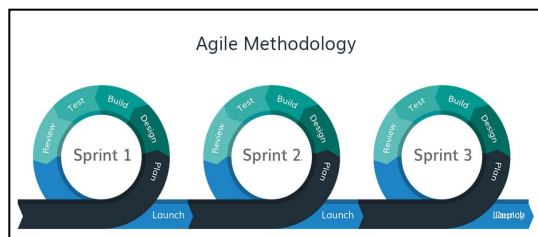

Figure 1 Agile Methodology

Figure 1 shown the agile methodology. By using this method, the projects will be broken down into sprints or iterations that are the repeatable phases in a within the time. The number and duration of sprints should be defined at the start of the project, and each sprint should provide a draft, prototype, or viable version of the ultimate output. Implementing agile technique has a number of benefits, one of which is that it is flexible that helps to plan the altered elements for the next iteration.

A. Phases of the Chosen Methodology

Agile development is based on an iterative approach to technology design and development that accepts continual change. The Agile lifecycle adds structure to the fluid and flexible way a particular task is supplied. There are 6 phases involved which are

- Phase 1: Requirements/Planning
- Phase 2: Design
- Phase 3: Development
- Phase 4: Testing
- Phase 5: Implementation and deployment
- Phase 6: Review

Figure 2 shown the cycle of these six phases of agile methodology. All these phases will be discussed in this section.
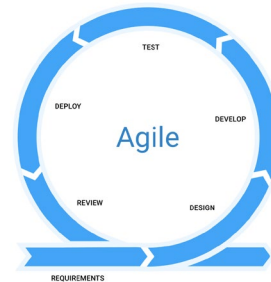

Figure 2 Six Phases of Agile Methodology

1) Phase 1: Requirements/Planning

Release planning starting when the stakeholder has been identified and specifies precisely what they want. Discuss how this is feasible through growing the tale backlog. One useful approach to think about stories is to explain the feature or product by the end user. The requirements needed from the Mr. Abu; the manager of Khaimal Car Rental have been collected during the virtual meeting with him.

The problem background, goal, objectives, and scope of the project were established based on the meeting. Following that, a use case diagram was created for each step to illustrate the present workflow for managing bookings. A study of the management's current manual system was used to conduct a study of the problem's background. The backdrop of the issue, the objective, the goals, and the scope of the project were all revised as a result of the review. In addition, a list of possible functions that may be implemented has been compiled.

Furthermore, the problem domain was thoroughly examined in order to acquire a deeper knowledge of the issue. The users for the Car Rental System have been identified, as well as their interactions with the use cases. Then, to provide an overview of the system's features, a use case model was constructed. Following that, use case descriptions for each use case were recorded for each feature's comprehensive procedure. To illustrate the flow, each use case description was paired with a sequence diagram and an activity diagram. Furthermore, the state diagram was created to depict all of the various states as well as the transition that happens when a certain event happens.

2) Phase 2: Design

A review of various architectural patterns was carried out at this phase in order to select the best architecture for the CRS. Based on the information in Software Requirements Specification (SRS), the system's software architecture pattern was then established. To demonstrate the database architecture of the CRS, an Entity Relationship Diagram (ERD) was created. The Software Design Document (SDD) have been built during this phase which is consist of the design of the purpose system. Following that, the data structure design was used to build the characteristics in each table.

3) Phase 3: Development

The development phase consists of the creation of code and the transformation of design documents into the real program in the development process. Begin building the first version of the product with the goal of having a functional, useable product by the conclusion of the sprint. This is not the final version and will go through many modifications, thus it should only provide the bare minimum of functionality. The code is done following the sprints.

Once a fixed time interval is determined for a sprint, it must be constant throughout the development cycle. For the sprint 1, there are 4 use cases that will be done which are register account, login, view profile and edit profile. For sprint 2, it is focus on the booking module which the use case consists of booking, choose car, select pickup and return date & time and location, edit return date & time and location, cancel booking, make payment and booking status. All these use case will be done during this sprint. Sprint 3 is for the owner car manage their car. The use cases are managed car, delete car, edit car details, add car, check car status, update vehicle status and view booking. These use cases will be completed throughout this sprint. For the last sprint focus on feedback module that include give feedback, view feedback, and remove feedback.

4) Phase 4: Testing

In this phase, the test cases created were reviewed and refined to ensure the test case cover the importance features in the system. Testing will be conducted by modules to make sure that all the features are functioning and free from errors. All the outcomes will be recorded in software testing documentation (STD).

5) Phase 5: Implementation and deployment

This phase is essential to the functioning of the created system that will assessed by the stakeholder. This ensures the entire satisfaction of customers. In this phase the software has been released to the market.

6) Phase 6: Review

When the system goes through all phases without problems, a maintenance actions were taken, wherein modifications will be updated and maintained from time to time.

V. REQUIREMENT ANALYSIS

To ensure the system run smoothly, the system requirements has been analyzed. There are two categories that will be analyzed in this section which are system hardware requirements and system software requirements. Table below describes the minimum system requirements to develop Car Rental System.

Table 2 System Requirements

Hardware	
Windows	10
Processor	Intel(R) Core (TM) i5-11300H CPU @ 3.10GHz
System Type	64-bit Operating System
Random Access Memory (RAM)	4 GB
Software	
Enterprise Architect	Create UML diagrams
Xampp server	Consists Apache server to run MySQL database.
Visual Studio Code	Used as coding environment
System Requirements	
Language Used	PHP
Database	MySQL
User Interface Design	HTML, AJAX, JQUERY, JAVASCRIPT

One of the successful requirements gathering is interview. Interviews with stakeholders and end users are important to the development of excellent software. Unable to comprehend and meet the aims and expectations of users and stakeholders. This will allow us to appropriately weigh and handle the inputs of each interviewee. Good listeners get more out of interviews than ordinary listeners. The online meeting has been setting up to gather all the requirements that needed by the stakeholder.

A. Functional Requirements

A case diagram is a technique to summarize the details of a system and its users. It is usually displayed as a visual representation of the interactions between distinct parts in a system. Using case diagrams, the events in a system are specified and the flow of such occurrences is not described by case graphs. Figure above shows the use case diagram of CRS.
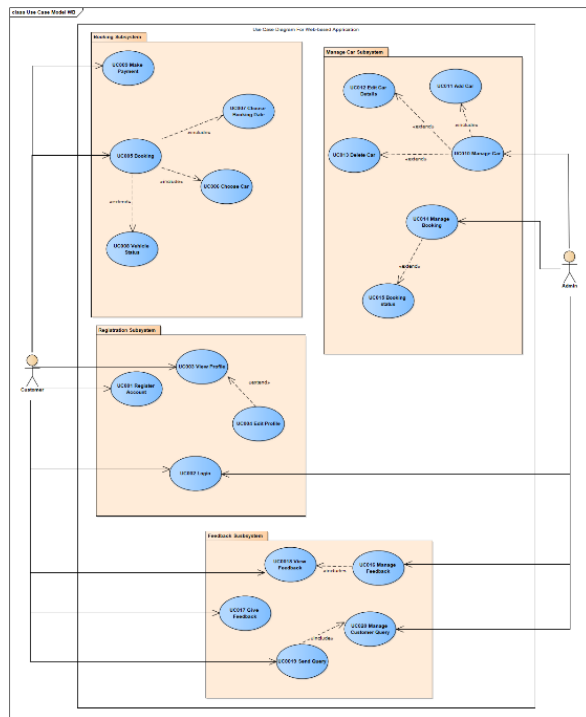
Figure 3 Use Case Diagram of CRS

1) *Actor Description*

  a) *Customer*

- This is a group of users that must be assumed that they do not have any technical background regarding CRS application. Hence, all the user interface operations must be easily recognized.

  b) *Admin*

- This is also another group of users who are responsible for generating contents for the CRS that must be assumed that they do not have any technical background regarding CRS application. Functions and operations involving this group of users must be easy to learn without any manuals or instructions in order to save time and energy for them.

2) *Use Case Description*

    Table below show the description of each test cases for the development of the system.

Table 3 Use Case Description

UC001: Register Account	This function is for customer to register an account to enter authorized pages in CRS application. The customer required to fill in the registration details.
UC002: Login	This function is for users to authenticate their identities and be directed to the respective pages. This process will require to enter the email and password supplied during the registration process.

UC003: View Profile	This function is for customer to view their profile.
UC004: Edit Profile	The customer can edit their details here. This function requires the customer to edit their details and update it.
UC005: Booking	This function is for customer to rent a car.
UC006: Choose Car	The customer can choose their car based on the details after the system give the available car to choose within the time and date that they already choose.
UC007: Choose Booking Date	The customer needs to enter booking date, the pickup and return date.
UC008: Vehicle Status	The customer needs to update their booking status through this function whether they already take the car or has return the car.
UC009: Make Payment	After the customer have done choose their car, they will be directed to the payment page which is the system will display booking info, their personal info and also the customer need to fill in their billing address and the payment type. If the payment successful, the system will display the successful message with booking details.
UC010: Manage Car	This function is for the admin to manage the car in the system.
UC011: Add Car	The admin can add new car into the system by using this function.
UC012: Edit Car Details	The admin can edit the car details and update the details into the system through this function
UC013: Delete Car	The listed car can be deleted by the admin through this function. The system will update the list of cars
UC014: Manage Booking	This function is for the admin to manage the booking in the system.
UC015: Booking status	This function is for the admin to manage to update status of the booking either confirm or cancel the booking
UC016: Manage Feedback	This function allows the admin to manage the feedback that has been posted by the customer
UC017: Give Feedback	This function is for customer to give their feedback and rating on the service of the booking process.
UC018: View Feedback	This function is for admin to view all the feedback of their customer.
UC019: Send Query	This function is for the customer who has query about their booking.
UC020: Manage Customer Query	This function is for admin to view the query that has been send by the customer.

VI. SYSTEM DESIGN AND ANALYSIS

A. System interfaces

The figures above will represent the entire system's user interface. The system must display the main page before allowing the user to log in. The user can access the system through the login page, where they must enter their email address and password. If the user is a first-time visitor, they must first create an account. The system will display the system's main page after they have successfully logged in. Figure above show the interface of the system for the login page, register page and the main page.

Figure 4 Login Page

Figure 5 Register Page

Figure 6 Main Page

B. System testing

1) Black Box Testing

Black box testing analyzes system functionalities without referring to the system's internal structure. It ensures that the system responds to each input with the desired results. The tester merely needs to know the information to be input and compare the output with the expected output during the test. Testing documents were written in plain English so that they could be easily understood. Table below show one test cases that using the black box testing.

Table 4 Test TC001 for UC001 Register account

Variable	Status	Input data	T01	T02	T03	T04	T05
Full name	valid	Hasliana Amiza	X			X	X
	invalid	Hs&*!		X			
	invalid	" "			X		
Email	valid	hasliana@gmail.com	X	X			
	invalid	hasliana			X		X
	invalid	" "				X	
Password	valid	haSLiana99*	X	X			
	invalid	123			X		
	invalid	" "				X	X
Contact No	valid	0123456789	X			X	X
	invalid	0af012w		X			
	invalid	" "			X		
EXPECTED RESULT							

Account registered to the system	X				
Display error message		X	X	X	X
ACTUAL RESULT					
Account registered to the system	X				
Display error message		X	X	X	X
Pass/Fail	**PASS**	**PASS**	**PASS**	**PASS**	**PASS**

Table above shows the test case for user to register an account before login into the system. this test case is to validate that the user can register an account after fill in all the fields' forms. The test data provided to be input to the system then verify the expected output. After submitted the form, the data of the user will be saved in the database.

VII. CONCLUSION

Through the development of car rental system, the project objectives have been achieved. Elicitation and analysis of Khaimal Car Rental has been done during "Projek Sarjana Muda 1" (PSM1). For "Projek Sarjana Muda 2" (PSM2), I have successfully design and develop the car rental system for Khaimal Car Rental. All the documentation for the design of the system has been recorded in Software Design Document (SDD) and Software Requirements Specification (SRS). Furthermore, the testing and validation of the functional requirements of the system has been completed. User acceptance has been conducted and STD has been producing that contained the details of the testing.

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