MOTORCYCLE RENTAL SMART SYSTEM DESIGN

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ABSTRAK

Kebutuhan transportasi di kampus Universitas Darussalam Gontor (UNIDA Gontor) saat ini sangat diminati. Oleh karena itu, pihak kampus menyediakan jasa sewa sepeda motor di unit usaha UNIDA Gontor (U3) sewa sepeda motor atau U3 Motor. Permasalahan dalam pengelolaan persewaan sepeda motor di U3 Motor saat ini adalah pencatatan transaksi persewaan yang masih menggunakan sistem manual dengan cara mencatat di buku catatan kemudian memasukkan datanya ke dalam format Excel. Dengan melihat fakta tersebut, peneliti merancang sistem informasi cerdas untuk penyewaan sepeda motor. Penelitian ini bertujuan untuk mempermudah proses reservasi bagi konsumen yang akan menyewa sepeda motor di U3 Motor. Selain itu, sistem cerdas ini akan memudahkan pihak manajemen U3 UNIDA Gontor dalam mengelola data transaksi dan mencatat peredaran uang masuk yang diperoleh dari proses reservasi. Metode perancangan sistem ini menggunakan model waterfall Software Development Life Cycle (SDLC) yang terdiri dari beberapa tahapan yaitu analisis, perancangan, implementasi, dan pengujian. Perancangan proses data menggunakan Use Case Diagram dan Data Flow Diagram. Sedangkan perancangan database menggunakan Conceptual Data Model (CDM) dan Physical Data Model (PDM). Sistem ini dikembangkan menggunakan bahasa pemrograman PHP dengan framework yii2 dan database menggunakan MySQL. Pengujian sistem ini dilakukan dengan menggunakan metode black-box pada aplikasi front-end dan back-end. Hasil pengujian pada setiap halaman aplikasi dan fungsi menunjukkan bahwa sistem bekerja 100 persen sesuai seperti yang diharapkan. Hasil penelitian ini menunjukkan bahwa sistem cerdas untuk persewaan sepeda motor ini layak digunakan untuk mengelola data transaksi dan mencatat peredaran uang masuk yang diperoleh dari proses reservasi dan layak untuk dikembangkan untuk mendukung jaringan sistem pintar perkotaan.
Kata Kunci: Sistem Cerdas, Sewa Motor, Php, Yii2, Gontor.

ABSTRACT

The need for transportation in the University of Darussalam Gontor (UNIDA Gontor) campus is currently in high demand. Therefore, the campus has provided motorbike rental services in the UNIDA Gontor Business Unit (U3) section of motorbike rental or U3 Motor. The problem in motorcycle rental management at U3 Motor at this time is the recording of rental transactions which still uses a manual system by recording in a notebook and then entering the data into Excel format. By looking at these facts, the researchers designed a smart information system for motorbike rental. This study aims to facilitate the reservation process for those who will rent a motorbike at U3 Motor. In addition, this smart system will facilitate the management of U3 UNIDA Gontor in managing transaction data and recording the circulation of incoming money obtained from the reservation process. This system design method uses the Software Development Life Cycle (SDLC) waterfall model which consists of several stages, which are requirements, analysis, design, implementation, and testing. The design of the data process design uses Use Case Diagrams and Data Flow Diagrams. While the database design uses Conceptual Data Model (CDM) and Physical Data Model (PDM). This system was developed using PHP programming language with yii2 framework and database using MySQL. Testing of this system is carried out using the black-box method on front-end and back-end applications. The test results on each page and function show that the system is working 100 percent as expected. The results of this study indicate that the smart motorbike rental system is feasible to use to manage transaction data and record the circulation of incoming money obtained from the reservation process and is feasible to be developed to support the urban smart system network.
Keywords: Smart System, Motorcycle Rental, Php, Yii2, Gontor.

1. INTRODUCTION

Transportation tool is currently a necessity for the majority of the academic community at the University of Darussalam Gontor campus. The number of activities on and off campus increased the need for the transportation used. The type of transportation that is often used is a motorbike. Therefore, one of the campus's efforts to accommodate this is by establishing U3 Motor (a motorcycle rental business unit) under the auspices of the UNIDA Gontor Business Unit (U3).

Constraints and problems faced by vehicle rental management at U3 Motor at this time are recording motorcycle rental transactions which still uses the manual method by writing rental transactions in a notebook and after that entering transaction report data in excel format. This has an impact on the high risk of inaccuracies or discrepancies in transaction data and untidy reporting and rental documentation.

By looking at the facts above, U3 Motor needs tools to support the performance and service of motorbike rental transactions. One tool that is a solution to improve service efficiency at U3 Motor is the procurement of a website-based motorbike smart rental system that can be accessed on various devices via the internet network. With this smart information system, it can facilitate the motorbike reservation process, can help manage motorbike rental services, and record documentation for compiling routine reports, so that it can be useful for those who want to need motorbike rental services, U3 Motor staff, and U3 Motor managers.

In fact, if an application such as this smart system is developed at various levels and in various fields, it will be able to trigger the acceleration of the realization of a smart city information system.[1]

2. LITERATURE REVIEW

Smart Information System

The system can be defined by a procedure approach and/or a component approach. With a procedural approach, the system can be defined as a collection of procedures that have a specific purpose. Through the component approach, the system can be defined as a collection of components that are interconnected with one another to form a single unit to achieve certain goals.[2]

Thus, the information system is a series of regulations to form a computerized system that has several commands to be run in a connected, integrated, and usable way for various organizations, companies, and even urban development management to become a smart city information system. Information systems also have various functionalities such as receiving various inputs, running various models, accessing various data, generating and integrating data and sending outputs that can help the system run effectively and efficiently.

Smart systems combine sensing, control and actuation functions to be able to describe and analyze situations so as to be able to make decisions based on available data with predictive or adaptive processing, to be able to take smart and effective actions. In most cases, "smart systems" can be associated with autonomous operation based on closed-loop control, effective utilization of technology in the network, and energy efficiency.

Website

According to Rahmat, basically, a website is a collection of hyperlinks that direct from one address to another in HTML (Hypertext Markup Language).[3] According to Shelly, the web is a service that is widely used on the internet, consisting of a collection of electronic documents from all countries. Every electronic document is stored on a web page, which is called a web page. The "www" is the work of someone named Tim Berners Lee who is credited as the creator of the server, the first web browser and URL address. Today, the web has become one of the most widely used in the world.[4] According to the understanding of some of the experts above, it can be concluded that the website is a collection of information pages that can be accessed via the internet by anyone, anywhere, anytime.

MySQL

MySQL is a relational database system, so users can group information into tables, or groups of related information. Each table contains separate fields, which represent each bit of information. Fields can contain various types of data, such as text, numbers, dates, and more. MySQL is developed, distributed, and supported by Oracle Corporation. The

advantage of MySQL is that the handling process is very fast, reliable, and easy to use.[5]

Yii2 Framework

Yii is a high-performance, component-based PHP framework used to quickly develop modern web applications. In the Yii documentation, it is stated that the name Yii in Chinese means "simple and evolutionary", Yii is an abbreviation of Yes, It Is!, which was originally created by a Chinese developer named Qiang Xue in 2008. Just like most other PHP frameworks, Yii also implements the Model-View-Controller (MVC) design pattern. In general, the workings of this framework are based on object-oriented programming (Object Oriented Programming).[6]

UNIDA Gontor Business Unit

UNIDA Gontor Business Unit (U3 Gontor) is a unit that provides various services and sells various needs for the UNIDA Gontor campus community. Over time, U3 Gontor continues to develop and improve services. Some of the business units managed by U3 include a canteen, mini market, laundry, motorbike rental, photocopying, bookstore, and refill drinking water. One of the services provided at U3 is motorbike rental which is managed by U3 Motor. One of the goals of the establishment of this motorbike rental business unit is to help the needs of the UNIDA Gontor academic community to rent a motorbike because not all campus communities have their own. This business unit was established in 2016 and is located in a building that is easily accessible from various locations on the UNIDA Gontor campus. The establishment of this business unit is also expected to help the improvement of the economic condition at the University of Darussalam Gontor because the potential is quite large and will continue to grow. The intended target customers are students, lecturers, and workers on campus.

3. METHOD AND SYSTEM DESIGN

Smart Information Systems Stages

In designing an information system, it is necessary to define the stages of system design first. This stage will determine the needs and problems of the smart information system that will be designed to suit the needs of the intended research object. This motorcycle

rental smart system uses the Waterfall Model Software Development Life Cycle method with stages consisting of requirements, analysis, design, implementation, and testing.[7]
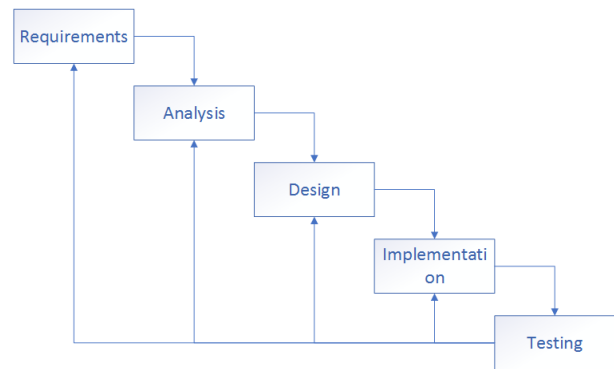

Figure 1. Waterfall Model[7]

Needs Analysis

In designing the system and how it will run, it is necessary to have a use-case diagram. Use-case diagrams describe the functionality of the system and how the system interacts.[7] Use-case diagrams show some actors, use-cases, and their relationships in a system. The use-case diagram for this information system is shown in Figure 2.
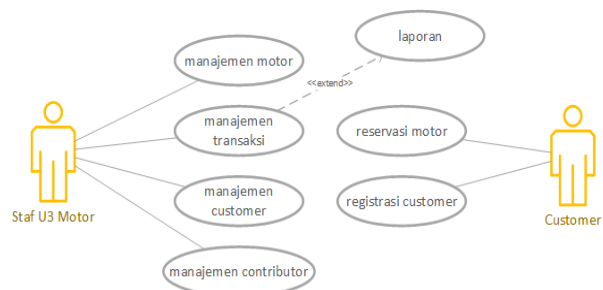

Figure 2. Use-Case Diagram

The use-case diagram of the motorcycle rental smart system has 2 actors, the first is the U3 Motor staff and the second is the customers. U3 Motor staff can access the functions of motorbike management, transaction management, customer management or parties who want to rent motorbikes, and contributor management or parties who entrust motorbikes for rent. Customers can access the registration function and motorbike reservation function.

System Flow

In designing the system flow of this motorcycle rental smart system using a flowchart that describes the sequence of process instructions and the relationship

between one process and another using certain symbols.[7] The flow diagrams in this smart system designed are as follows:
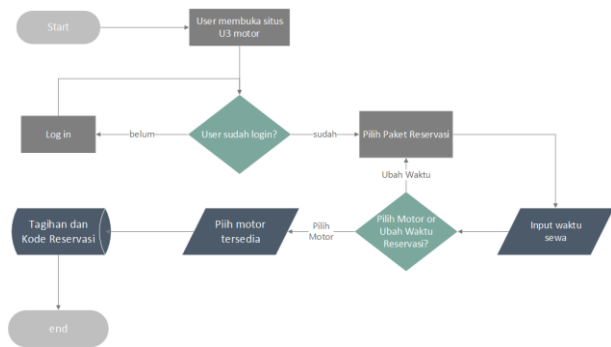
A. Motorcycle Reservation Flowchart

Figure 3. Motor Reservation Flowchart

The motorbike reservation flowchart shown in Figure 3 illustrates the customer process flow in making the motorbike reservation process. The first step is to open the U3 Motor website page. Before making a reservation, customers are required to log in first if they want to make a reservation. If they do not have an account, the customer must register first. After logging in, the customer selects the package to be used and determines the rental time. After the rental time is determined, the next step is to choose a motorbike. After that, the customer will be directed to the proof of transaction page to make a payment.

B. Smart System Management Flowchart
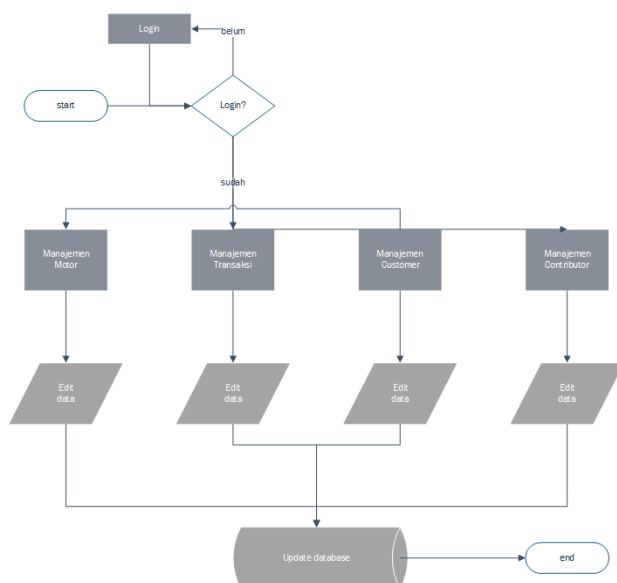
Figure 4. Flowchart of Smart System Management

The information system management flowchart presented in Figure 4 illustrates the smart system management process flow carried out by U3 Motor staff or system admins. Before processing data, the user is required to log in first as an admin to maintain system security. After successfully logging in, the admin will carry out 4 main processes, they are motorcycle management, transaction management, customer management or parties who want to rent motorbikes, and contributor management or parties who entrust motorbikes. If the data entered is valid and appropriate, then the data will be successfully saved into the database.

Data Process Flow

The design of the data process on the motorcycle rental smart system uses DFD (Data Flow Diagram). The following is an illustration in the context diagram of a motorcycle rental smart system contained in Figure 5.
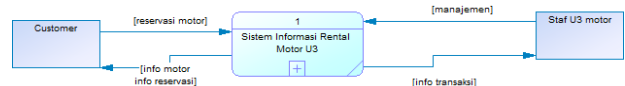
Figure 5. DFD Context

In the context diagram of this intelligent motorbike rental information system, there are 2 external entities involved, namely: customers and staff of U3 Motor. This context diagram also illustrates the general flow of motorcycle rental information system data. The processing subsystem of the motorcycle rental smart system is described in the overview diagram (level 0). The overview diagram is presented in Figure 6.
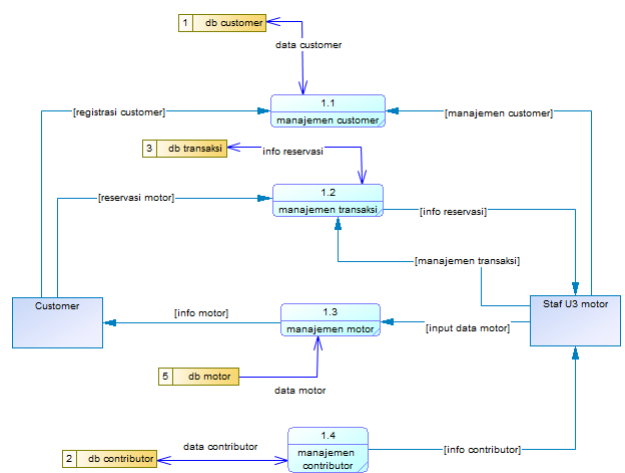

Figure 6. DFD Level 0

An overview diagram (level 0) describes or describes some activities or processes in a context diagram. This level 0 diagram is used to detail the processes that exist in the context diagram, namely, motor management, transaction management (motor reservation process), customer management, and contributor management. There are four (4) kinds of intelligent motorbike rental information system processes that explain the main data flow:

1. Motor management: process for managing the motors available in U3 Motor.
2. Transaction management: the process for managing the reservation of motorbikes to be rented.
3. Customer management: the process for managing customers registered in the intelligent information system.
4. Contributor management: process for managing motor contributors.

Database

A database is a place for storing our data by creating a program that contains tables, fields, and records, which are managed under the name DBMS (Database Management System).[8] Database design determines entities, attributes, relationships and other concepts in a database system. Mapping data on the database of this motorcycle rental smart system was made using CDM (Conceptual Data Model) and PDM (Physical Data Model). Conceptual Data Model is to model the logical structure of the entire data application.[9]
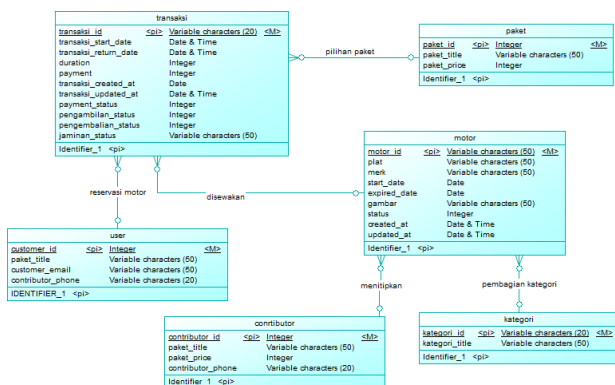
Figure 7. Conceptual Data Model

1. There are 6 table concepts that are related to each other in the CDM scheme of the intelligent motorbike rental information

system. The relations between tables are as follows:

2. Contributor table and motor table: one to many.
3. Category and motor table: one to many.
4. Motor and transaction table: one to many.
5. Customer and transaction table: one to many.
6. Package and transaction table: one to many.
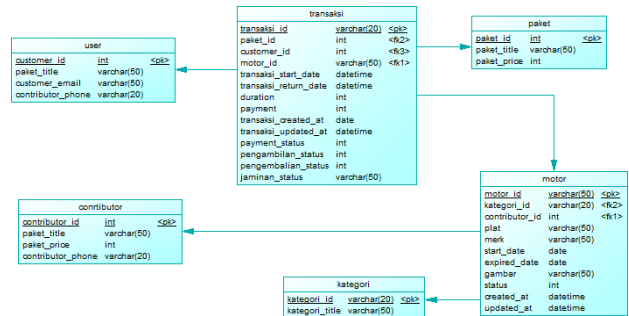
Figure 8. Physical Data Model

Physical Data Model (PDM) is a model that shows a detailed description of the database, where the relationships between tables are clearly visible. Figure 8 presents an overview of PDM which shows the database structure that will be applied to the system.

Interface

Interface design on a motorbike rental smart information system using a mockup. The login page mockup is presented in Figure 9.
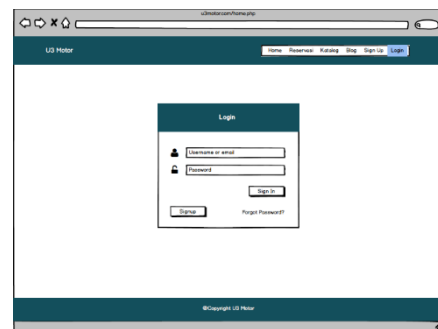

Figure 9. Login

The login page displays a form for filling in the username and password. Under the "Sign In" button, there is a "Register" button which can call up the "Registration" page with its form. Meanwhile, under the "Register" button there is a link to change the customer's password if the person has forgotten the previous password. The Home page mockup is presented in Figure 10.
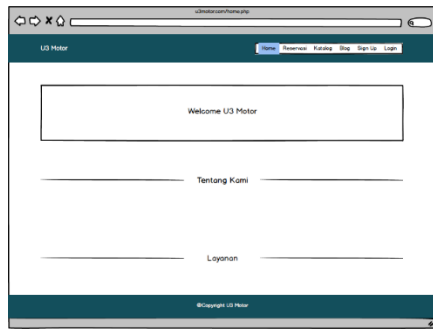
Figure 10. Home

The Home page will present brief information about U3 Motor to customers and the public. At the top right, there is the customer's name to indicate the user's information logging in with the customer account used to log in. The reservation page mockup is presented in Figure 11.
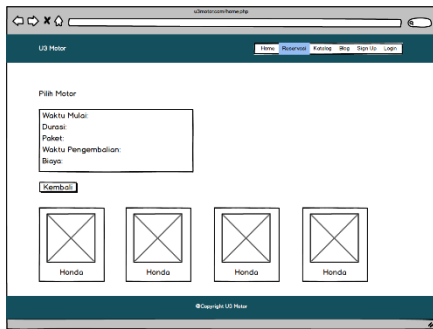

Figure 11. Reservation Choosing a Motorcycle

The reservation page for selecting a motorbike will display the motorbikes available for rent. After the customer enters the desired time and duration, the customer selects the available motor by pressing the desired motor type. If the customer wants to determine the return time, then simply press the "Return" button. The result of the reservation page mockup is presented in Figure 12.
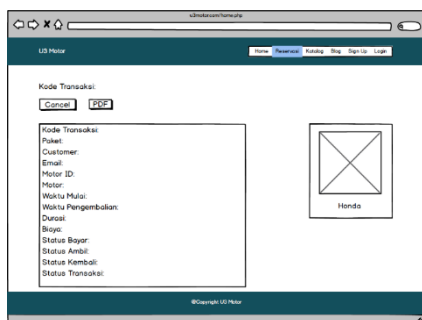
Figure 12. Reservation Results Page

The reservation results page displays detailed reservation information that has been made by the customer. The History page mockup is presented in Figure 13.
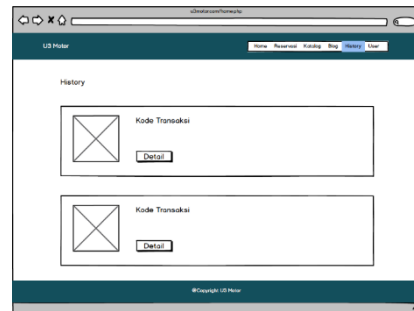
Figure 13. History

The history page will display the transaction history of each customer that has been done previously.

4. RESULTS AND TEST

Based on the smart system design that has been made, the implementation results consist of two parts, the front-end application and the back-end application. The results of the implementation of the front-end application for this motorcycle rental smart system consist of a Login, Home, Reservation Time, Type of Motorbike, and Reservation Results. The login page is presented in Figure 14.
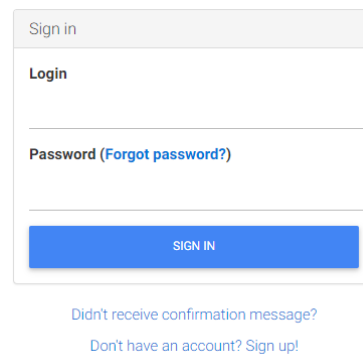
Figure 14. Login

The login page displays a form to input the customer username or email and password. The customers need to log into this motorcycle rental smart system, by entering the valid username and password data in the forms provided. If the data entered is valid, the user will enter the information system by being redirected to the Home page presented in Figure 15.
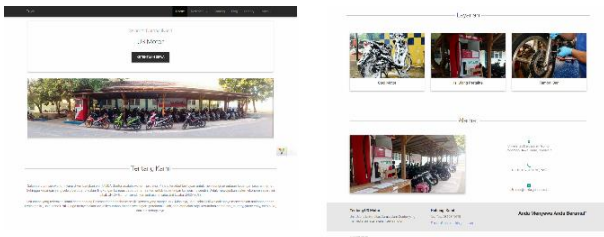
Figure 15. Home

The Home page is the starting page that provides general and brief information related to U3 Motor, U3 Motor services, and contact information. If the customer wants to make a motorbike reservation, then the customer presses the Reservation menu and selects the reservation package provided by U3 Motor, such as the hour package, daily package, weekly package, and monthly package. After that, the customer will be redirected to the form page to determine the time to pick up the motorbike or the initial rental time as shown in Figure 16.
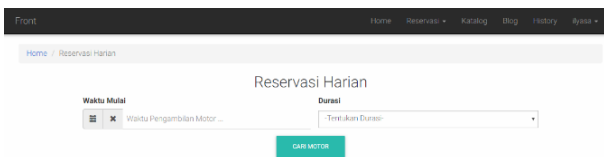
Figure 16. Reservation Time Form

The start time form determines the time to pick up the motorbike to be rented, and the duration determines the length of the rental period. The customer presses the date button that has been provided to determine the start date and select the desired duration option. After filling out all the forms, the customer presses the "Search for a Motorcycle" button and will be redirected to the "Select a Motorcycle" page as shown in Figure 17.
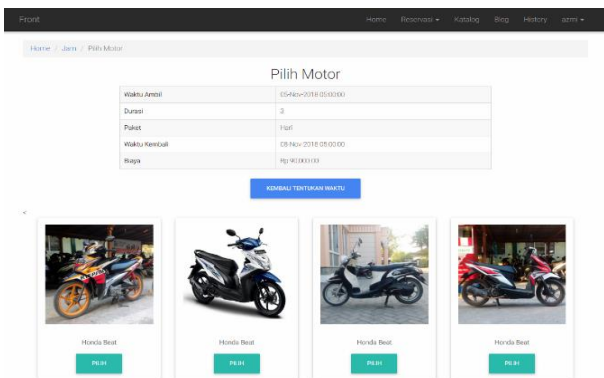
Figure 17. Select Motorcycle Reservation

On the "Choose a Motorcycle" page, the customer determines the type of motorbike that will be used in the rental. The customer presses the "Select" button on each of the available motorbikes according to their wishes. If you have selected a motorbike, the customer will be redirected to the "Reservation Results" page as presented in Figure 18.
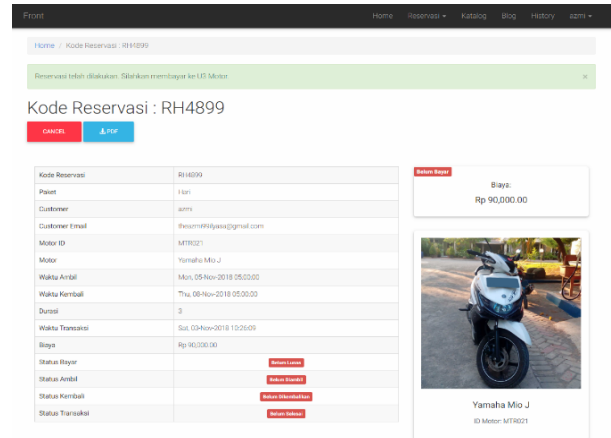

Figure 18. Reservation Results

The Reservation Results page displays detailed information related to reservations that have been made by customers. Thus, the reservation process has been completed, and the next step is to make payments to U3 Motor. The results of the back-end application are used for U3 Motor admin or staff. The results of the implementation on the back-end application are Overview page, Motor Management, Transaction Management, Customer Management, and Contributor Management. The Overview page is presented in Figure 19.
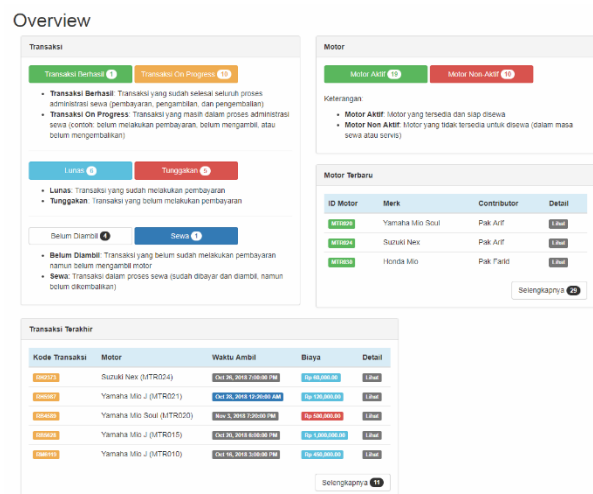

Figure 19. Overview

The overview page is the start page of the back-end application that displays general information regarding transactions that take place at U3 Motor. The information includes the number of transactions, the number of motorbikes, the last transaction table made, and the last motorbike table added to the U3 Motor system. In managing motor data, the admin can manage it on the Motor Management page as presented in Figure 20.

Figure 20. Motorcycle Management

The Motorcycle Management page displays a table that lists the motorbikes in the U3 Motor. Admin can view details, update, and delete motor data by pressing each symbol on the right side of the Motor table. The Motor Details page is presented in Figure 21.

Figure 21 Motorcycle Details

On the "Motor Details" page, the admin can change the motor status to active or inactive by pressing the "Change Status" button at the top of the motor detail table. To change the motor information data, the admin needs to go to the "Motor Update" page as shown in Figure 22.

Figure 22. Motor Information Update

The admin changes the data about motorcycles in each of the existing forms. In addition to managing motorcycle condition data, the admin also manages motorcycle transaction data made by customers through the reservation process on the front-end application. The transaction management page is presented in Figure 23.

Figure 23. Transaction Management

The Transaction Management page displays a table containing transactions made by customers. Admin can view details and change transaction status on the Motor Details page as shown in Figure 24.

Figure 24. Transaction Details

The Transaction Details page displays information containing transaction details. Admin can change the status by pressing the respective status button at the top of the table. To load a list of transactions per month, the admin can view it on the Monthly Recap page by pressing the Monthly Recap submenu on the Management menu. The admin will be redirected to a form to determine the month and year as shown in Figure 25.

Figure 25. Monthly Recap Form

Admin determines the time and month on the form provided and presses the Search button. After that, you will be redirected to the Monthly Recap Results page as shown in Figure 26.

Figure 26. Monthly Recap Results

The monthly recap results page displays transaction information that is loaded according to the month and year that has been determined on the monthly recap form. This page also displays the amount of incoming money from the monthly transaction.

After the system is successfully designed, the next step is testing. Tests are carried out to check that the system and functions are running properly and as desired. The trials carried out on the motorbike rental smart information system used a black-box test. The test includes front-end applications and back-end applications. A black-box method is testing the software in terms of functional specifications without testing the design and program code.[9] The test is done by doing input, process, and output. The front-end application trial includes the home page, motorbike reservation function, and history page. Back-end application testing includes an overview page, motor management page, and transaction management page. The results of the test that has been carried out on the motorbike rental smart system show that the system is working 100 percent as expected.

5. CONCLUSION

The design of an intelligent motorbike rental information system is a system that helps manage motorbike rental management and motorbike reservation processes for customers who want to rent motorbikes at U3 Motor. Reservation data that has been processed by the customer will be stored and processed by the management of U3 Motor. The implementation of this smart system can make it easier for various parties to process transactions. The incoming data is properly documented and will facilitate the management of U3 Motor in the reporting process within a certain period. This intelligent information system is website-based, so it can be accessed by various devices via a browser using an internet connection. Thus, a website-based motorbike rental information system can facilitate the management and process of motorbike reservations and the accuracy of rental transaction data properly.

The results of this study indicate that the smart motorbike rental system is feasible to use to manage transaction data and record the circulation of incoming money obtained from the reservation process and is feasible to be developed to support the urban smart system network.

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