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Design of a Vehicle Parking Management Information System in Tanjung Duren Central Park Area West Jakarta

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Abstract

Tanjung Duren Parking is a parking lot whose operational activities still use a manual system, so that parking officers often experience problems such as incorrectly calculating the total parking fee or incorrectly recording incoming and outgoing vehicles, which results in parking revenue anomalies and inaccurate parking space availability data. Therefore, in this research, a parking vehicle management information system was designed as a solution to existing problems. This information system was designed using the system development life cycle (SDLC) method and approach. Based on the results of research that has been carried out, it is known that the information system that has been designed is effective to implement because it is able to solve existing problems such as automatically calculating parking rates and recording vehicles both when entering and leaving.

Keywords: *Information System Design, Parking Management Information System, Tanjung Duren Parking*

I. Introduction

Parking is defined as the process of placing a vehicle with the aim of stopping or stopping the vehicle temporarily [1]. Parking is usually carried out by vehicle drivers in places such as public parking lots, parking lots in shopping centers, office buildings, or on the side of the road, where the purpose of parking can vary, from meeting temporary needs to being part of a long-term travel plan [2].

With the increasing number of motorized vehicle users, especially in urban areas, parking spaces have become an important element, this is because apart from being part of a safe and organized urban infrastructure, parking spaces can also help reduce road congestion, improve vehicle safety, and facilitate activities in urban centers [3]. Apart from that, parking lots can also support the use of public transportation and optimize the use of city space [4].

Parking lots are typically managed by various entities, including local governments, private companies, or independent parking operators. Local governments often have a role in regulating and managing parking in public spaces, such as on the side of the road or in public areas. They are responsible for establishing parking policies, setting parking rates, and ensuring safety and order in parking management. On the other hand, private companies or independent parking operators can manage parking in shopping centers, offices, or entertainment centers by providing parking services, maintenance, and security monitoring. In some cases, partnerships between local governments and the private sector can also be formed to manage parking more efficiently, such as the parking partnership carried out by an independent parking operator in the Tanjung Duren Central Park area, West Jakarta, which is named Tanjung Duren Parking [5].

Tanjung Duren Parking is a special parking area for motocycle, where in its operational activities the parking lot in this area can accommodate more than 500 motocycles with a plate fee of IDR 5,000 per day. Currently, the system used still uses a manual system where vehicles wishing to park will be given an entry parking ticket, then payment will be made when the vehicle is about to leave. Currently, the parking management system used is still conventionally based, where the calculation of the availability of empty parking areas is based on the number of tickets sold, incoming vehicles and also

outgoing vehicles [6]. When the intensity of vehicle entry and exit is quite high, parking officers often encounter problems such as incorrectly calculating the total parking fee or incorrectly recording the entry and exit of vehicles. The direct impact of this error, apart from causing anomalies in parking revenue, also causes parking space availability data to be inaccurate. As a result, it often takes drivers longer to look for an empty parking area, and this of course has an impact on long queues of vehicles that spill onto the main road, causing traffic jams [7]. Therefore, we need a parking management information system that can provide fast, precise and accurate information, and can be a solution to current problems.

II. Methods

Method is a systematic method used by a researcher to solve or find answers to the problems being faced in research. The method used in this research refers to the stages of the System Development Life Cycle (SDLC) method. In information systems engineering, SDLC is the process of creating and modifying systems as well as the models and methodologies used to develop these systems. This model is also a reference used as a framework in research [8], [9].

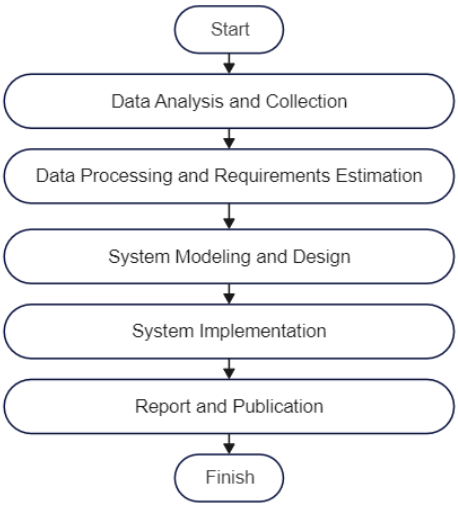


Figure 1. Research Concept Framework

Based on Figure 1, it can be seen that there are five stages that form the research framework. The details of each step are as follows:

1. **Data Analysis and Collection**
   At this stage, all necessary information is collected to understand the needs and requirements of the system to be built. This activity includes interviews with stakeholders, surveys, observations, and analysis of existing documents.
2. **Data Processing and Requirements Estimation**
   The data collected in the previous stage is then further analyzed to identify the technical and functional requirements of the system. Requirement estimation involves determining the necessary resources, such as time, cost, manpower, and the technology to be used.
3. **System Modeling and Design**
   Based on the specified requirements, this stage focuses on modeling and designing the system. This includes creating flow diagrams, entity-relationship diagrams, user interface designs, and system architecture designs.

4. System Implementation

After the design phase is completed, the next step is to build the system or application according to the specified design.

5. Report and Publication

This stage is where the system is implemented. It also involves documenting the project, including test results, user manuals, and the final project report.

III. Results and Discussions

1. Current System Analysis

Analysis is carried out with the aim of observing an object by breaking it down into smaller parts, looking for weaknesses and then proposing improvements. Based on the research that has been carried out, the current parking management system is as follows:

1. Upon entry into the parking area, the parking attendant will record the vehicle's license plate number and entry date on the parking ticket and then hand it to the driver.
2. The attendant will then log the vehicle's entry into the daily record book.
3. Upon exit, the parking attendant will check the driver's parking ticket, verify the entry date, and calculate the parking fee to be paid.
4. The driver will then pay the parking fee as charged.
5. Finally, the attendant will log the vehicle's exit into the daily record book.

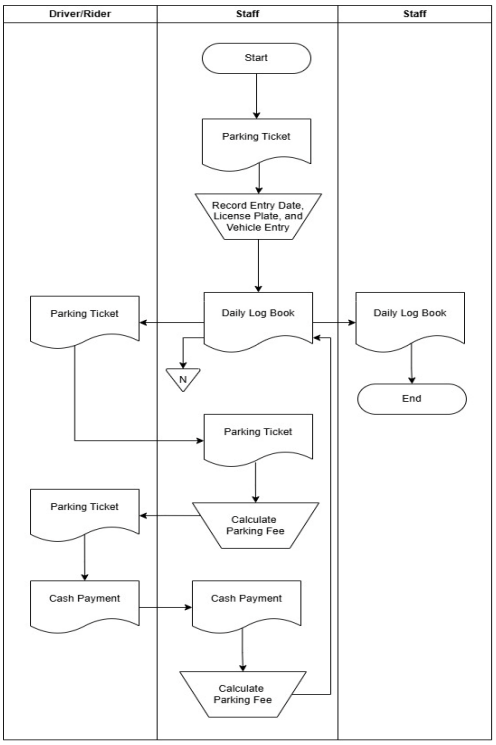


Figure 2. Current System Flowmap

Based on the flowmap above, several problems can be identified as follows:

1. *Staff* need time to calculate parking rates if the vehicle is parked for more than one day.
2. *Staff* have the potential to forget to check incoming or outgoing vehicles.
3. *Daily Log Book* or *Parking Ticket* are vulnerable to damage or loss.

2. Proposed Work System

Based on the analysis that has been carried out on the current system, and identification of existing problems, the proposed system has the following working procedures:

1. The attendant enters the vehicle's number into the system and saves it.
2. Afterward, the system automatically prints a parking ticket with the entry date and time, complete with a barcode, and hands it to the driver.
3. When the vehicle is ready to exit, the driver provides the parking ticket to the attendant for scanning, and the system calculates the parking fee based on the vehicle's entry date and time.
4. The driver then pays the parking fee as charged.
5. The attendant saves the vehicle's exit data while printing a payment receipt and hands it to the driver.
6. Reports can be generated daily, weekly, or monthly in two copies: one copy is given to the owner, and the second copy is kept as an archive.

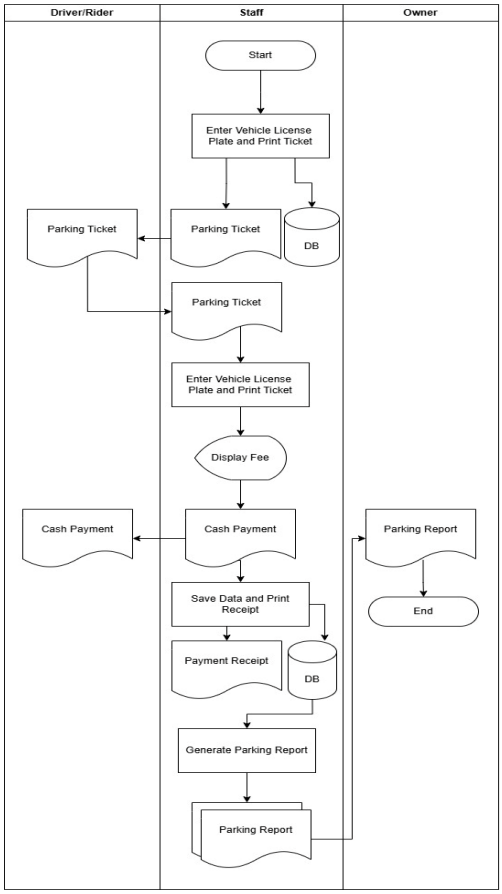


Figure 3. Proposed Work System Flowmap

3. Context Diagram

Context Diagram is a high-level, simplified visual representation of a system and its interactions with external entities. It provides an overview of how the system interfaces with outside actors like users, other systems, or external organizations. This diagram captures the system as a single process, highlighting its boundaries and the data flow between the system and external entities. The primary purpose is to establish the context and scope of the system, ensuring all external interactions are clearly identified [10]. Based on the flowmap in Figure 2, it can be seen that this parking

management information system has two external entities, namely *Pengendara* (Driver) and *Pemilik* (Owner), and one internal entity, namely *Petugas* (Officer).

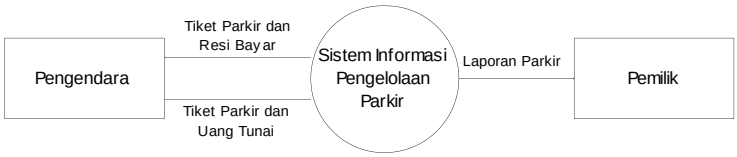


Figure 4. Context Diagram

4. Data Flow Diagram

Data Flow Diagram (DFD) is a graphical representation used to depict the flow of data within a system. It illustrates how data moves through the system, showing inputs, processes, data stores, and outputs [11]. The DFD breaks down the system into smaller components to display how data is processed and transferred at various stages. It helps in understanding the functional aspects of the system and how different components interact through the flow of data. DFDs are typically created at multiple levels, with high-level DFDs providing an overview and detailed DFDs depicting specific processes [12]. The DFD of this parking management information system looks like in Figure 4.

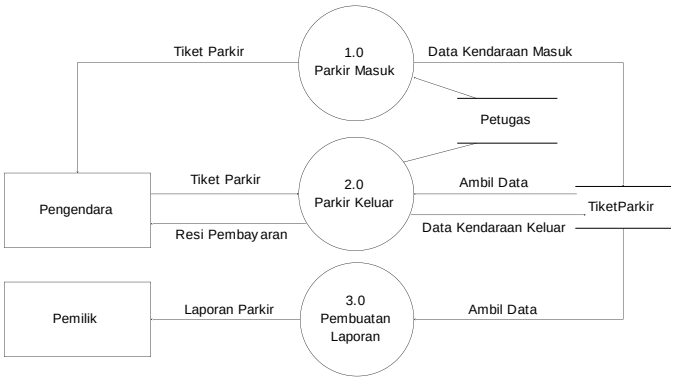


Figure 5. Data Flow Diagram

5. Entity Relationship Diagram

Entity-Relationship Diagram (ERD) is a structural diagram used to model the data relationships within a database [13]. It visually represents entities (objects or concepts) and the relationships between them. Relationships define how entities interact with each other.

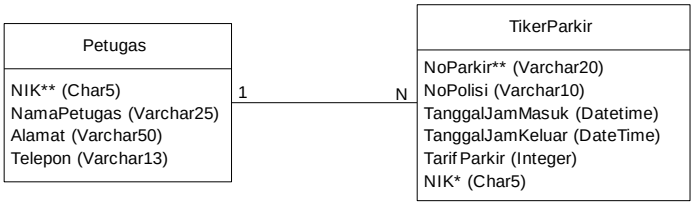


Figure 6. Entity Relationship Diagram

6. Program Menu Structure

Program Menu Structure is a hierarchical layout that organizes the menus and navigation paths within a software application. It outlines how menus and sub-menus are arranged, showing the structure of the user interface [14]. The main menu provides access to the primary functions or sections of the application, while sub-menus offer more specific options or features. Each menu item performs a particular action or command. The menu structure is designed to be intuitive, allowing users to navigate the software easily and access all necessary functions efficiently. This structure is

crucial for creating a user-friendly interface and improving overall usability. The application program menu structure of this parking management information system looks like in Figure 6.

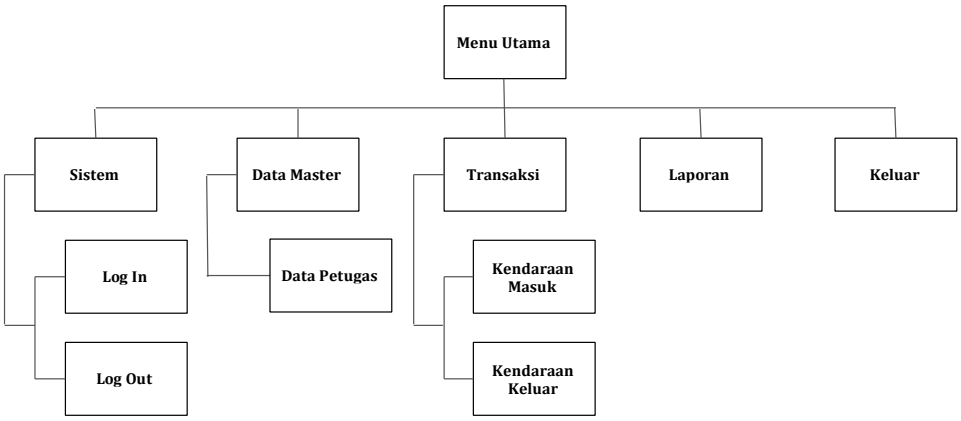


Figure 7. Program Menu Structure

7. Form Password

This form will be displayed for the first time. *Petugas* is required to enter their NIK and Password when logging into the application. This form is used as protection between one officer and another officer.

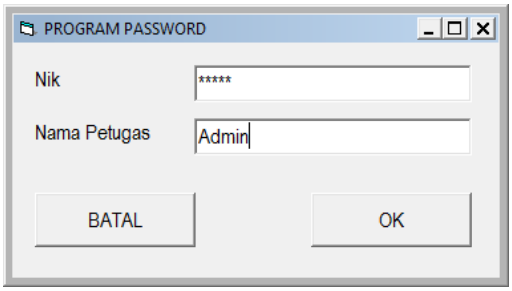


Figure 8. Form Password

8. Form Parkir Masuk dan Keluar Kendaraan

When the vehicle is about to enter, *Petugas* can enter the vehicle plate number or police number into the text box provided, then save it. The system will then print a *Tiket Parkir* according to the date and time of entry which is equipped with a barcode. Meanwhile, when leaving, *Petugas* can enter the *No. Parkir* by inputting it manually or using a scanner, then the program will calculate the parking rate that must be paid by *Pengendara*.

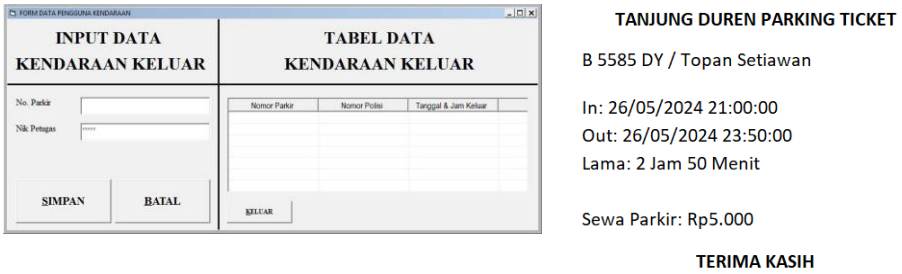
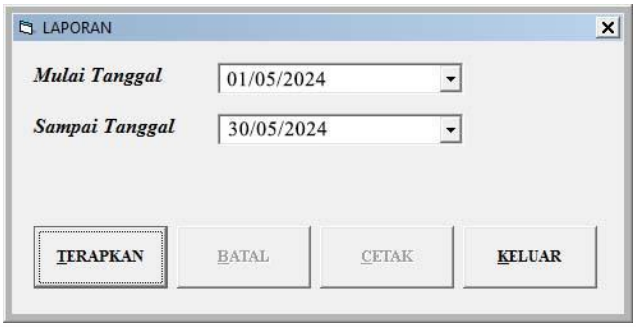


Figure 9. *Form Parkir Masuk dan Keluar dan Tiket Parkir*

9. Parking Report

The parking management report is an output that is processed by the application program and contains information that can be used as a basis for decisions both now and in the future [15].



LAPORAN PARKIR KENDARAAN

Periode : 01/05/2024 s.d. 30/05/2024 Halaman : 1

Dicetak : Tanggal 02/06/2024, Jam 11:16

Nomor Polisi	Nomor Parkir	Tgl. Masuk	Tgl. Keluar
B 5585 DY	20240526-B 5585 DY	26/05/2024 21:00:00	26/05/2024 23:50:00
B 2580 DS	20240527-B 2580 DS	27/05/2024 06:00:00	27/05/2024 22:30:00

Figure 10. Parking Report

IV. Conclution

Based on the research that has been carried out, it can be concluded that this vehicle parking management information system can be implemented as a solution to existing problems, such as being able to automatically calculate parking rates and being able to record vehicles both when entering and leaving. There are suggestions for future researchers so that the research can be developed by adding other features such as recording cases of loss, damage, and others.

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