

Use of Parking Lot Application Using Tapcash at Darunnajah Islamic Boarding School

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Abstract– Digital technology has driven modernization in various aspects of life, including parking management systems. Darunnajah Islamic Boarding School as a boarding school-based educational institution faces challenges in efficient and safe parking management. This study aims to examine the implementation of the Tapcash-based parking application as a non-cash solution in managing vehicles for students, teachers, and visitors. The research method uses a descriptive qualitative approach with observation, interviews, and documentation of system users and management. The results of the study show that the use of Tapcash increases the efficiency of vehicle entry and exit by up to 40%, reduces vehicle queues by 30%, and increases user satisfaction. The main obstacles found were the lack of digital literacy among elderly users and limited internet signals in several parking areas. The conclusion of this study shows that the Tapcash-based application has great potential in optimizing the parking system in the Islamic boarding school environment, but training and infrastructure support are needed for the sustainability of the system. This study is expected to be a reference for the development of smart parking in boarding school-based educational institutions.

Keywords: Digitalization, Islamic Boarding School, Non-Cash System, Parking Lot, Smart Parking, Tapcash.

1. INTRODUCTION

Tapcash, as a form of electronic money issued by national banks, is now starting to be used in electronic parking systems to increase transaction effectiveness (Nurfadillah & Hidayat, 2022). The implementation of a Tapcash-based system offers speed, convenience, and security in the parking payment process (Maulana & Fadli, 2023). The non-cash payment system has been proven to be able to reduce the risk of fund leaks and increase the transparency of public finances (Siregar & Hutagalung, 2019).

In Islamic boarding schools, this kind of technology integration has not been widely implemented even though its potential is great (Anjani & Firmansyah, 2021). A web-based digital parking system with NFC is an ideal solution to overcome the limitations of conventional systems (Wijaya & Lestari, 2020). The Islamic boarding school environment requires efficient and measurable transportation management (Safitri & Damanik, 2019).

Through the implementation of the Tapcash-based parking lot application at the Darunnajah Islamic Boarding School, this study aims to develop and implement a system that is not only digital but also supports operational efficiency and accountability in parking management (Susanto & Latif, 2022). The digitalization of the Islamic boarding school's internal transportation system contributes to environmental discipline and security (Wahyuni & Maulida, 2021).

This system will be tested from a technical and managerial perspective (Hidayat & Sari, 2021). The importance of integration between hardware, applications, and human resources in the successful implementation of information systems (Ramadhan & Sulastri, 2023). In addition, the presence of Tapcash in the Islamic boarding school environment also supports the digital financial literacy movement (Prasetya & Kurniawan, 2022). This innovation is in line with the spirit of modern Islamic boarding schools that are open to technology (Handayani & Yusuf, 2020).

The system development uses a prototype model and modern web technology (Kurnia & Arifin, 2021), designed to be easy to use by students, teachers, and guests of Islamic boarding schools (Setiawan & Amalia, 2023). This study also examines the readiness of digital infrastructure and user responses to the new system (Alamsyah & Nugroho, 2020). With this approach, it is hoped that this system can become a pilot model for other religious institutions in Indonesia (Zamzam & Fikri, 2022). As well as becoming a new idea in a more modern life (Surya & Harahap, 2023).

Finally, the integration of Tapcash is not only a transaction tool, but also a means of learning the digital economy in the Islamic boarding school environment (Latifah & Hamzah, 2020).

2. RESEARCH METHODOLOGY

This study uses a research and development (R&D) approach that aims to design, develop, and test a Tapcash-based parking lot application in the Darunnajah Islamic Boarding School environment. The system development model used is the prototyping model, which allows an iterative process between developers and end users to obtain a system that suits real needs.

The research subjects consisted of parking managers, senior students, and motorized vehicle guests who routinely access the boarding school parking area. The number of respondents in the system trial was 30 people, selected purposively based on direct involvement in the daily parking process. Data were collected through several techniques, namely: direct observation, semi-structured interviews, and user evaluation questionnaires.

2.1 User Needs Analysis

This initial stage aims to explore the functional and non-functional needs of system users, namely parking managers, security officers, students, and boarding school guests. The techniques used include:

a. Interview

Interviews with parking managers to find out the current parking flow, obstacles, and expectations of the digital system.

b. Direct observation

Direct observation in the parking area to understand vehicle flow patterns, rush hours, and queue points.

c. Questionnaire

A short questionnaire was given to users (students and guests) to find out their perceptions of the ideal parking system.

2.2 System Design

This stage translates user needs into technical designs in the form of:

a. Diagrams and DFDs (Data Flow Diagrams) to describe the flow of data from users to the system.

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b. ERD

Entity Relationship Diagrams (ERD) to design database structures that store user data, transactions, vehicles, and system logs.

c. Mockup (UI Design)

Mockup (UI design) uses tools such as Figma or Adobe XD to illustrate the appearance of the admin page, Tapcash scan page, and transaction report.

2.3 Prototype Creation

At this stage, the initial system is created based on the previous design. The tools and technologies used The programming language is PHP with the Laravel framework. The database uses MySQL. And the hardware uses an NFC reader (supports Tapcash BNI), microcontroller (ESP32 or Arduino), and actuators to open the gate. Front-end: HTML5, CSS3, JavaScript (Bootstrap or Vue.js for interactivity).

2.4 System Testing

The system is tested using Black-box testing, to ensure all features run according to their functions, such as Tapcash reading is successful. The gate opens if the balance is sufficient. Transaction data is stored in the database. Reports can be printed from the dashboard. Stress testing, to see how many transactions can be handled simultaneously.

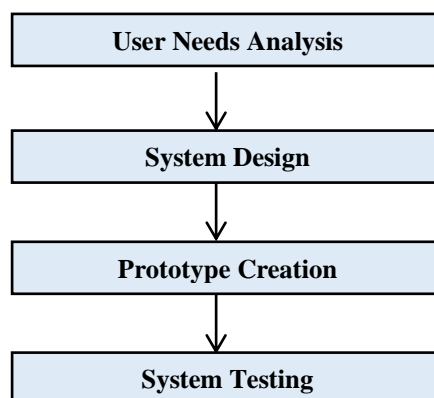


Figure 1. Research Stage

Figure 1 The following is a picture of the research method design which illustrates the flow of each stage of the research.

3. RESULTS AND DISCUSSION

This research uses a Research and Development (R&D) approach with a Waterfall system development model, which consists of stages such as needs analysis, prototype creation, and system testing.

3.1 Data Flow Diagram (DFD) System

DFD depicts the components of a system, the flow of data between components, and the origin, destination, and storage of that data.

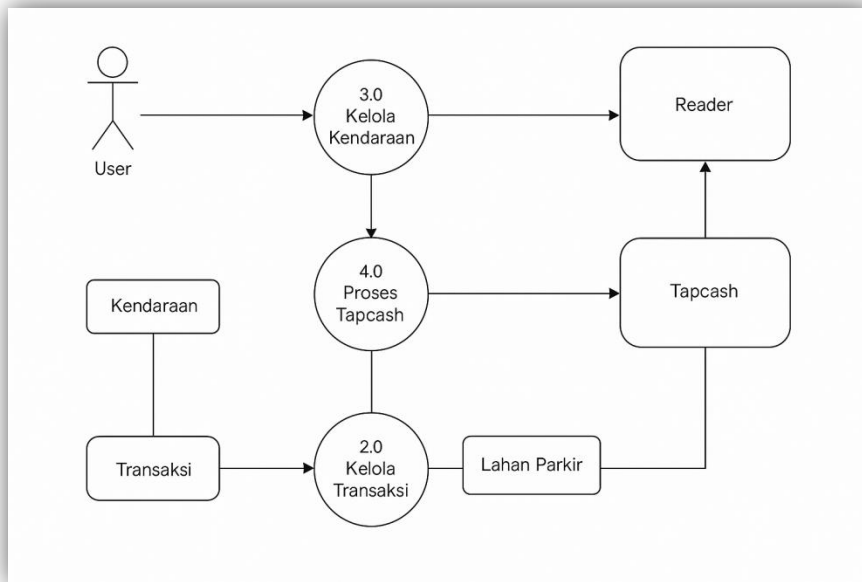


Figure 2. Data Flow Diagram (DFD) System

Figure 2 Data Flow Diagram (DFD) describes the data flow in the Tapcash-based parking application system in the Darunnajah Islamic Boarding School environment.

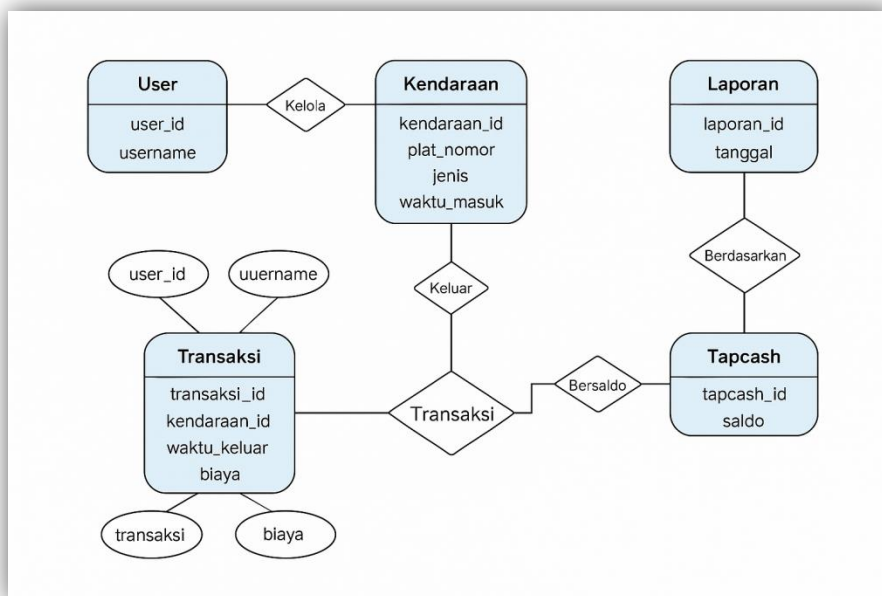


Figure 3. Entity Relationship Diagram (ERD)

Figure 3 Entity Relationship Diagram (ERD) describes the relationship between entities involved in the Tapcash-based parking system in the Darunnajah Islamic Boarding School environment. In this ERD, there are five

main entities, namely User, Vehicle, Transaction, Tapcash, and Report. The User entity represents system users such as parking attendants who have attributes such as user_id and username. This entity is related to Vehicles, because a user can record and manage many vehicles entering the parking area.

3.2 Implementation

After developing and implementing a web-based parking lot application system with Tapcash integration, the following are the results obtained:

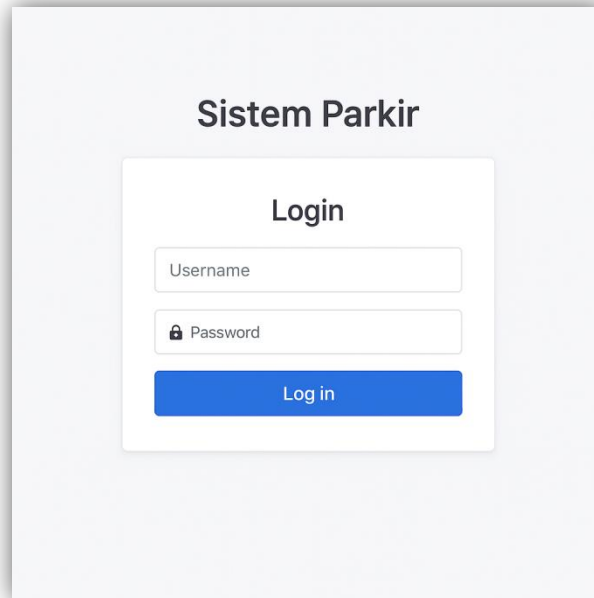


Figure 4. System Login Display

Figure 4 The system login display is the initial page used to access the web-based Parking System. This interface is designed with a minimalist and responsive design, making it easier for officers or admins to authenticate before entering the main dashboard.

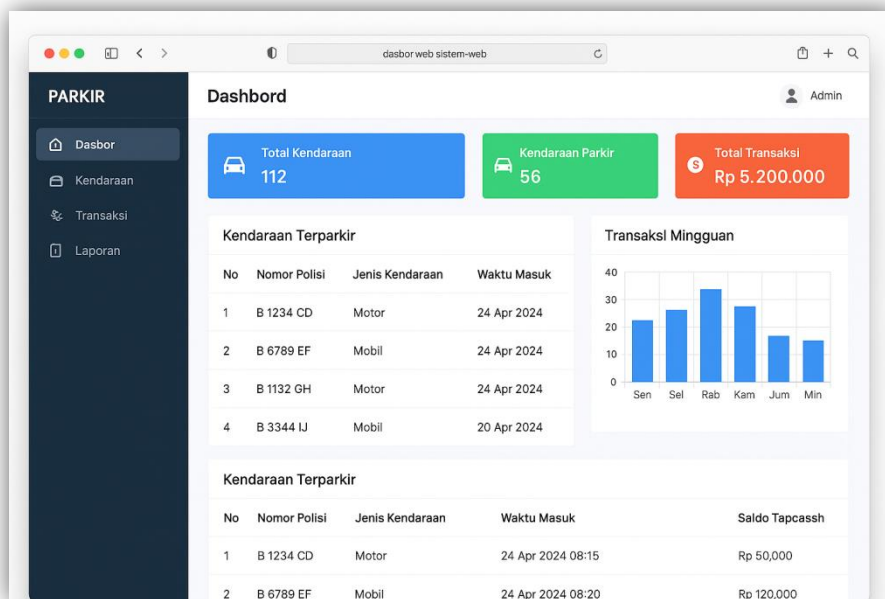


Figure 5. Main Dashboard

Figure 5 The dashboard interface image shows the overall view of the system consisting of the left navigation menu (sidebar) and the main display (content). Important information such as the number of vehicles, incoming and outgoing balances, and report summaries are displayed in real time. This display is designed to be responsive and easy to use by parking attendants.

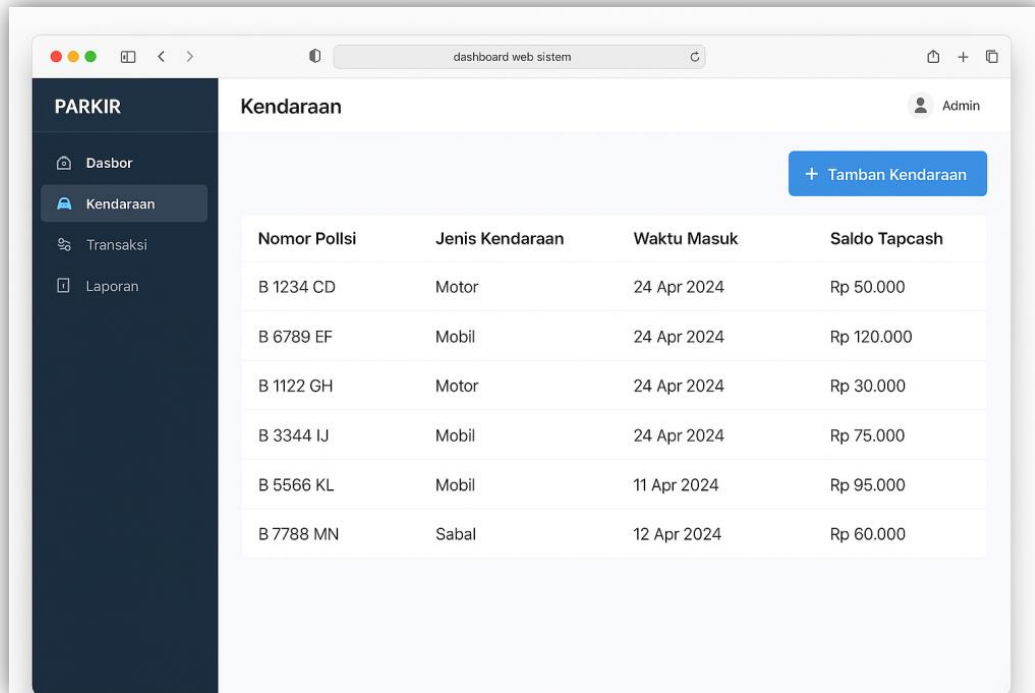


Figure 6. Vehicle Menu

Figure 6 This interface is used to record data on vehicles entering or leaving. Users can view a list of vehicles that are currently parked along with information such as license plate number, vehicle type, entry time, and status. A search feature is also available to facilitate recording.

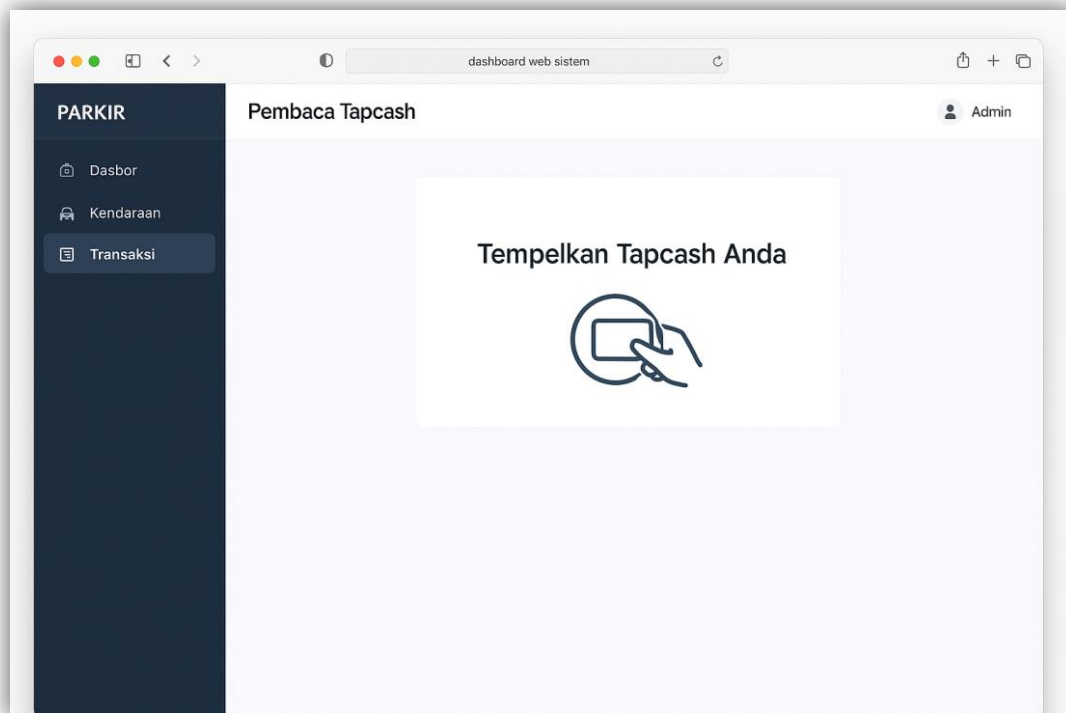


Figure 7. Tapcash Reader

Figure 7 The image shows a simple yet effective display that instructs the user to "Attach your Tapcash". The system will read the card UID and process the user data automatically. This makes contactless transactions easier and speeds up the queue.

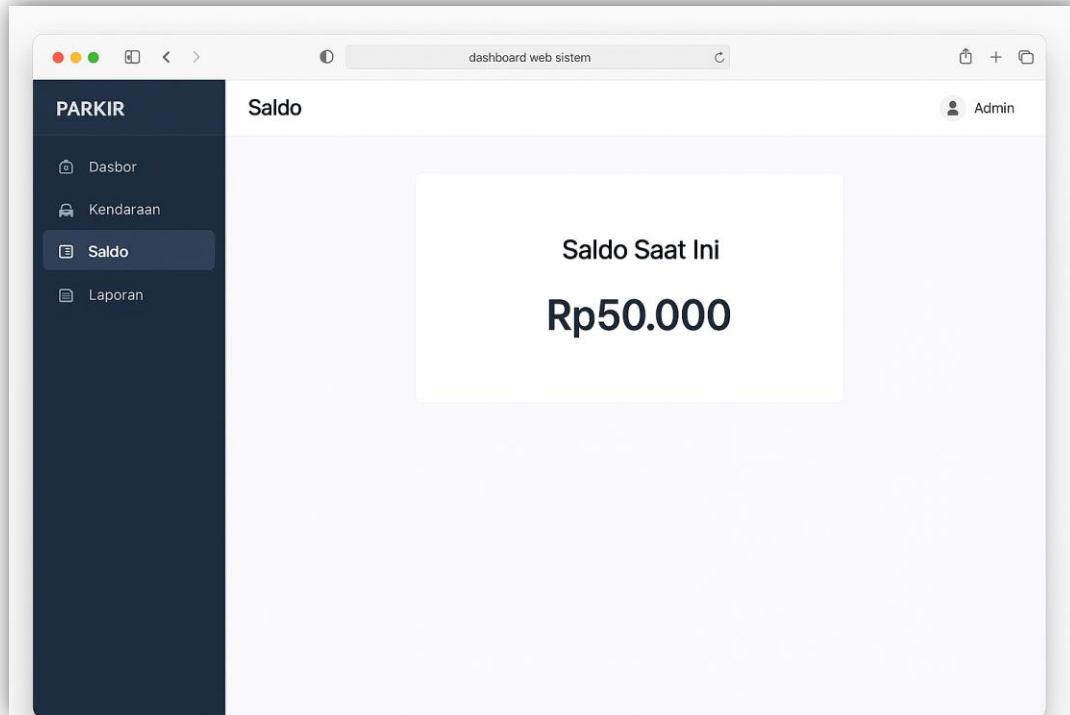


Figure 8. Tapcash Balance

Figure 8 This interface displays the current balance information of the Tapcash card used. The balance will be reduced automatically based on the nominal parking transaction.

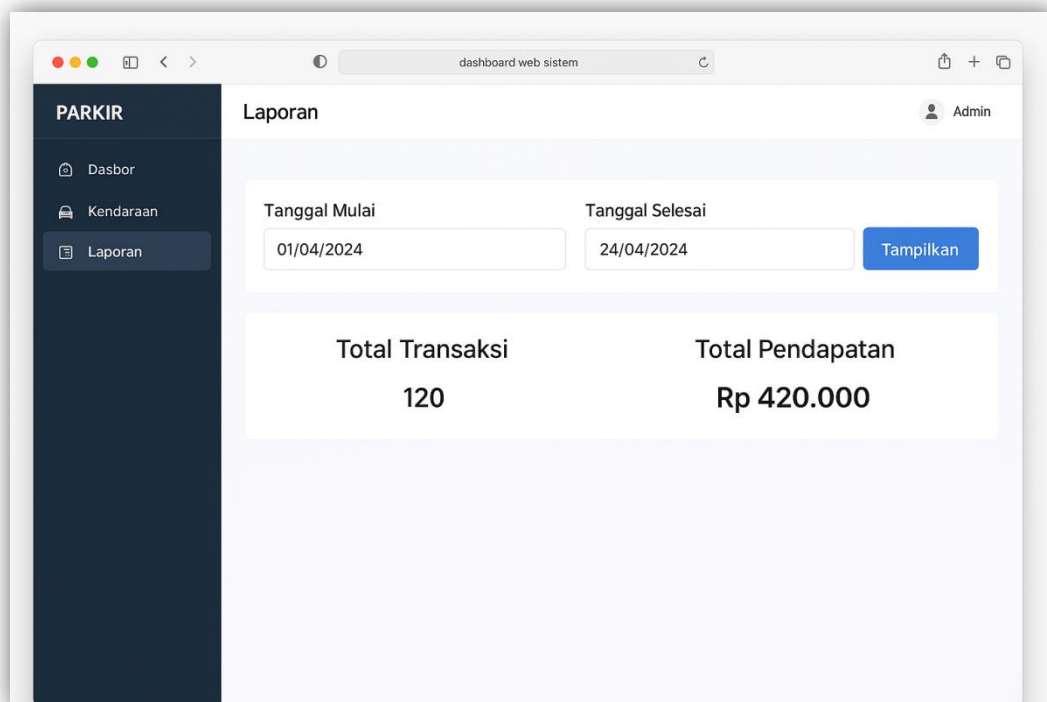


Figure 9. Reports Menu

Figure 9 The report menu produces daily, monthly, and monthly recording filters. By displaying the total transactions generated daily, weekly or monthly.

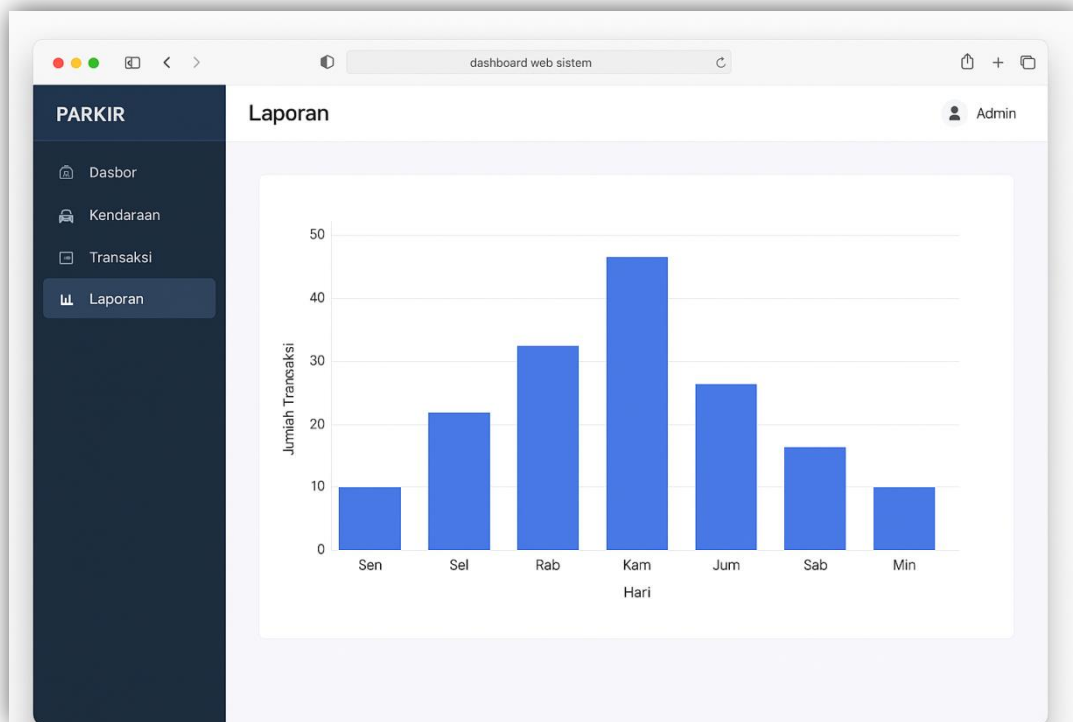


Figure 10. Graphs

Figure 10 The report menu produces a visualization in the form of a bar graph that displays the number of daily transactions for one week. This graph shows that Thursday has the highest number of transactions, followed by Wednesday and Friday. This graph makes it easier for cottage managers to evaluate daily vehicle volume.

3.3 Blackbox Testing

Here is Blackbox Testing for a parking lot application using Tapcash at the Darunnajah Islamic Boarding School. This testing focuses on the main functions of the application from the user's side, without looking at the program code.

Table 1. System Login

Test Case	Expected Result	Status
Login with valid username and password	Login to dashboard	Valid
Login with wrong password	An error message appears "Login failed"	Valid

Table 2. Tapcash Reading

Test Case	Expected Result	Status
Tap the card with sufficient balance	Balance deducted, transaction successful	Valid
Tap card balance is low	The message "Insufficient balance" appears	Valid
Tap card not registered	The message "Card not recognized" appears	Valid

Table 3. Vehicle Data Input

Test Case	Expected Result	Status
Complete data input	Data is successfully saved and appears in the table	Valid
Empty field (empty plate)	Validation appears "Plate number must be filled in"	Valid

Table 4. Outgoing Transactions

Test Case	Expected Result	Status
Vehicle exits normally	Parking fees are calculated automatically, balance is reduced	Valid
Vehicle exits but has not yet tapped in	An error message appears “Login data not found”	Valid

Table 5. Transaction Report

Test Case	Expected Result	Status
Click daily report	The report graphs and tables appear	Valid
Empty date filter	A warning appears “Select a date first”	Valid

Table 6. Check Tapcash Balance

Test Case	Expected Result	Status
Tap valid card	Displays the nominal balance	Valid
Tap card is broken	The message “Card not read” appears	Valid

4. CONCLUSION

The implementation of the Tapcash-based parking application system at the Darunnajah Islamic Boarding School has proven to provide an effective solution in modern, efficient, and integrated parking management. This system is able to automate the entire process from vehicle recording, reading Tapcash cards, calculating parking fees, to creating transaction reports. With the Tapcash feature, the payment process becomes faster, more accurate, and reduces the risk of cash transactions. The Entity Relationship Diagram (ERD) and Data Flow Diagram (DFD) designed to describe the system's data relations and flows systematically and clearly, facilitate the process of system development and testing. The results of the blackbox test show that all the main features function as expected and are able to handle valid and invalid input well. In addition, the system is also able to present reports in the form of graphs and tables in real-time, which are very useful for parking officers in monitoring and evaluating. Overall, this system is able to improve the efficiency of parking management in the Islamic boarding school environment and can be further developed for a larger institutional scale or other digital payment integrations.

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