

Web-Based Cashier Information System with Royalty Feature at FA Playground

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Abstract

FA Playground is a children's play-area business located in Tembilahan City. Sales transaction records and bookkeeping at this business are still carried out conventionally, which frequently causes customer-data duplication, damaged or lost vouchers, and difficulty for cashiers in tracing customer transaction history. This research aims to design and build a web-based cashier information system equipped with a royalty feature, which grants customers a bonus play session after reaching a certain number of visits, in order to increase customer retention. The system development method used is the Waterfall model, with the requirement-analysis stage using the PIECES (Performance, Information, Economics, Control, Efficiency, Service) approach, system design using the Unified Modeling Language (UML), implementation using the PHP programming language and MySQL database, and testing using the black-box method covering functionality and usability aspects. The functionality test on 37 system functions involving 10 respondents showed a success rate of 100% (X=1), while the usability test obtained a feasibility percentage of 96.86%, which falls into the very good category. Thus, this web-based cashier information system with a royalty feature has proven capable of speeding up the transaction process, reducing customer-data duplication, securing voucher data, and simplifying bookkeeping and sales reporting at FA Playground.

Keywords: cashier information system; PIECES; royalty; UML; waterfall

1. Introduction

Sales transaction management is a series of activities aimed at recording, processing, and controlling all sales activities of goods or services carried out by a business unit, including recording transaction data from the identification of the service ordered by the customer to the calculation of the total price. FA Playground is a venue that provides a play area for children in Tembilahan City, which to date still uses conventional methods for recording transactions and bookkeeping. This conventional recording practice creates several problems, including frequent duplication of customer data, damaged or lost customer vouchers, and difficulty for cashiers in checking customers' transaction history.

A tool widely used by traders or business operators to facilitate transaction reporting is the point-of-sale (POS) application system, which functions as a recorder of business transactions. A cashier information system is designed to help business owners manage product data, monitor products, and record transaction data, thereby making it easier for users to carry out transactions. However, the utilization of information technology among many small and medium enterprises is still not optimal, so that sales data recording remains incomplete and hinders business development.

A number of previous studies have developed cashier information systems using various approaches and case studies, ranging from a desktop-based cashier application using Java, a point-of-sale system for a boutique using PHP and MySQL, a web-based cashier system developed with the Spiral model for a general store, a QR-code-based ordering system for a café using the Rational Unified Process, to grocery and minimarket cashier systems developed with the Waterfall method and the Laravel framework [1]–[9]. These studies generally produced systems capable of speeding up transactions, managing stock, automatically printing receipts, and compiling periodic financial reports, making business processes in various types of retail businesses more efficient and accurate [10].

Beyond the retail business sector, the need for reliable and secure information systems is also a concern in various other types of systems. The security aspect of information systems, for instance, needs to be tested periodically using a vulnerability assessment approach so that the managed data remains protected from potential leaks or cyberattacks (Rianto et al., 2024). This confirms that the development of the web-based cashier information system in this study also needs to pay attention to the reliability and security of transaction and customer data management. On the other hand, the implementation of web-based sales information systems in retail businesses has proven capable of simplifying transaction recording, product data management, and sales report preparation more quickly and accurately compared to manual processes (Samsudin, 2020).

Based on a review of these previous studies, the novelty offered by this research is the addition of a Royalty feature, namely a feature that grants a bonus play session to child customers after five play visits. This feature is intended to increase customer retention so that FA Playground is more frequently revisited by the same customers. In the rapidly developing digital era, the need for an effective and efficient

information system is crucial, particularly in business operations. Therefore, developing an information-technology-based cashier information system is important to improve work efficiency, transaction transparency, and financial accountability.

This research focuses on the design and implementation of an integrated cashier system that is not only able to handle the transaction process automatically, but also supports accurate and structured reporting as well as the management of a customer loyalty program through the royalty feature. The problem formulation of this study includes: (1) customer data duplication due to repeated manual recording; (2) damaged or lost customer vouchers, requiring the cashier to issue new vouchers; (3) difficulty for cashiers in tracing customers' transaction history for voucher-issuance purposes; and (4) sales transaction bookkeeping that is still conventional.

This research aims to: (1) eliminate the possibility of customer data duplication through the development of a cashier information system; (2) improve the security of customer vouchers against damage or loss; (3) make it easier for cashiers to view customers' transaction history; and (4) simplify the cashier's bookkeeping process. This research is limited to the operational scope of FA Playground Tembilahan during the January 2025 period, with a system scope covering daily sales transaction recording without an accounting module, use by cashier operators, and a web-based development platform that has not yet been adapted for general implementation in similar businesses.

2. Research Methodology

2.1. Research Approach

This study employed a combination of qualitative and quantitative approaches to obtain a comprehensive understanding of the transaction and bookkeeping processes at FA Playground. Data were collected through observation, interviews, and a literature study, enabling the researchers to identify existing problems, formulate system requirements, and evaluate the resulting system through structured black-box testing procedures.

2.2. Research Framework

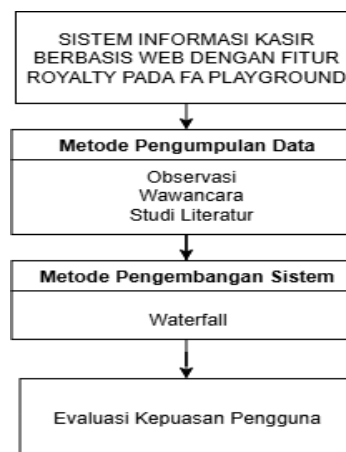


Fig 1 : Research Framework

The research framework illustrates the sequence of activities carried out in this study, starting from the identification of problems in the existing manual system, followed by data collection, system analysis, system development, and ending with system testing. The main methods employed in this research are described as follows:

1. Data Collection

- Observation, conducted on the cashier's work process at FA Playground, particularly when recording transactions, issuing vouchers to customers, and printing sales reports.
- Interviews, conducted with the business owner and cashier operators to identify system requirements, challenges faced, and expectations for the new system.
- Literature Study, carried out by collecting and reviewing ten relevant previous research journals on cashier information system development to strengthen the theoretical foundation and research methodology.

2. System Analysis (PIECES)

System analysis was carried out using the PIECES approach to identify the problems of the manual system running at FA Playground from six aspects: Performance (the speed of the transaction and reporting process), Information (the way customer and transaction data are recorded and stored), Economics (the potential waste of time and labor), Control (data security and access rights), Efficiency (the comparison between workload and resources used), and Service (the impact of the manual system on the quality of customer service). The results of this analysis form the basis for designing a more effective and efficient web-based cashier information system.

3. System Design and Development

The system design was modeled using the Unified Modeling Language (UML), consisting of a Use Case Diagram, Activity Diagram, Sequence Diagram, and Class Diagram, to model the interaction between the Admin actor and the system as well as the managed data

structure. System implementation was carried out using the PHP programming language with a MySQL database, following the Waterfall software development model, and the system was uploaded to a hosting server so that it could be accessed online.

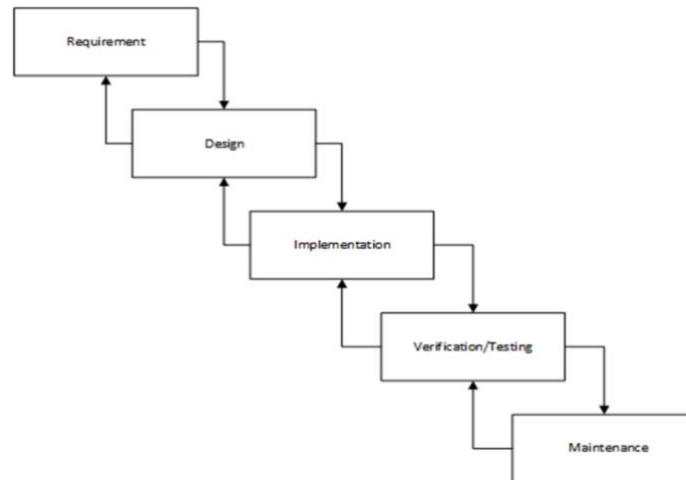


Fig. 2: Waterfall Development Model

4. System Testing

System testing was carried out using the black-box testing method, which focuses on system functions without examining the internal structure of the program code, covering two main aspects. The Functionality Test aims to ensure that all main system features run as intended, involving 10 respondents who carried out test scenarios; the result is calculated using the formula $X = 1 - (A/B)$, where A is the number of functions that did not work correctly and B is the total number of functions evaluated. The Usability Test aims to evaluate the ease of use of the system by cashier operators, involving 10 respondents who filled out a questionnaire using a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree); the result is calculated by comparing the total score obtained against the maximum achievable score, then converting it into a system feasibility percentage based on a 0%–100% interpretation scale. Test data were collected through Google Forms for efficiency and ease of analysis.

3. Results and Discussion

3.1. Introduction

This section presents the results of the development of the Web-Based Cashier Information System with Royalty Feature at FA Playground. The research was carried out through the stages of requirements analysis, system design, implementation, and system testing. The results demonstrate the effectiveness of the proposed system in supporting transaction recording, customer data management, royalty distribution, and sales reporting in a more efficient and organized manner.

3.2. Requirements Analysis

The requirements analysis was conducted to ensure that the developed system meets the actual conditions and operational needs of FA Playground. The results of observations and interviews with the owner show that all transactions are still recorded using a daily cash book, and sales data are written separately by staff. This condition has the potential to cause recording errors, make daily report preparation difficult, and slow down decision-making. There is also no system that supports direct recording of royalty distribution, so the owner has to calculate it separately without detailed data per transaction or per product. The recording of stock and price per item has also not been documented digitally, making it difficult to monitor available and sold items. The PIECES framework was employed to identify these existing problems and determine the improvements provided through the implementation of the proposed system.

3.2.1. PIECES Analysis

A comparison between the old system and the proposed system based on the PIECES approach is summarized as follows:

- Performance:** the cashier transaction process is carried out conventionally, is time-consuming, and is not integrated with the royalty system, whereas the new system automatically records transactions directly in the web-based cashier system, speeding up service and royalty calculation.
- Information:** sales, stock, and royalty-distribution reports must currently be calculated and recorded conventionally with no automatic recap, whereas the new system presents this information in real time and in a structured manner on the system dashboard.
- Economics:** the manual process requires greater labor cost and time for administration and carries a risk of calculation errors, whereas the new system reduces operational costs through better time efficiency and data accuracy via process automation.
- Control:** there is currently no real-time control over transactions and royalty distribution, and stock is not monitored systematically, whereas the new system allows the owner to monitor all transactions, stock, and royalty reports at any time through a secure, centralized web-based dashboard.
- Efficiency:** cashier processing, recording, and reporting are currently carried out separately, whereas in the new system all transaction processes and royalty distribution are recorded automatically, reducing duplicate work and speeding up financial evaluation.

- f) Service: cashier service is currently slow and inflexible, and royalty data is difficult to know, whereas the new system makes service faster and more accurate, allowing the owner and partners to access royalty reports independently and transparently.

Based on this analysis, it can be concluded that the conventional system used at FA Playground has a number of weaknesses, such as a slow transaction process, an unintegrated royalty system, and difficulty in presenting sales and stock reports directly. The new web-based system provides a solution to these problems by recording transactions directly, managing stock automatically, and presenting royalty-distribution reports transparently through a single integrated dashboard.

3.2.2. Functional Requirements

The system was designed to provide the following functionalities:

1. Provide admin authentication (login) to access the system.
2. Display a dashboard summarizing the number of items, stock, sales, categories, and recent revenue trends.
3. Manage customer data, including parent and child (member) records.
4. Manage master data, including product/service items and categories.
5. Process sales transactions and play transactions, including automatic royalty calculation.
6. Automatically accumulate customer visit counts and grant a bonus play session (royalty) after a defined number of visits.
7. Record daily operational expenses.
8. Generate sales reports and play/royalty reports based on a specified time period.
9. Manage store profile and system settings.

3.2.3. Non-Functional Requirements

The system is required to satisfy several non-functional characteristics, including online availability, data security, responsiveness, usability, scalability, cross-platform compatibility, and ease of maintenance.

3.3. System Design (UML)

The system design phase was carried out using Unified Modeling Language (UML) to visualize the structure and interactions of the proposed system. The system was modeled using a Use Case Diagram, Activity Diagram, Sequence Diagram, and Class Diagram to define business processes, data structures, and interactions between users and the system.

a) Use Case Diagram

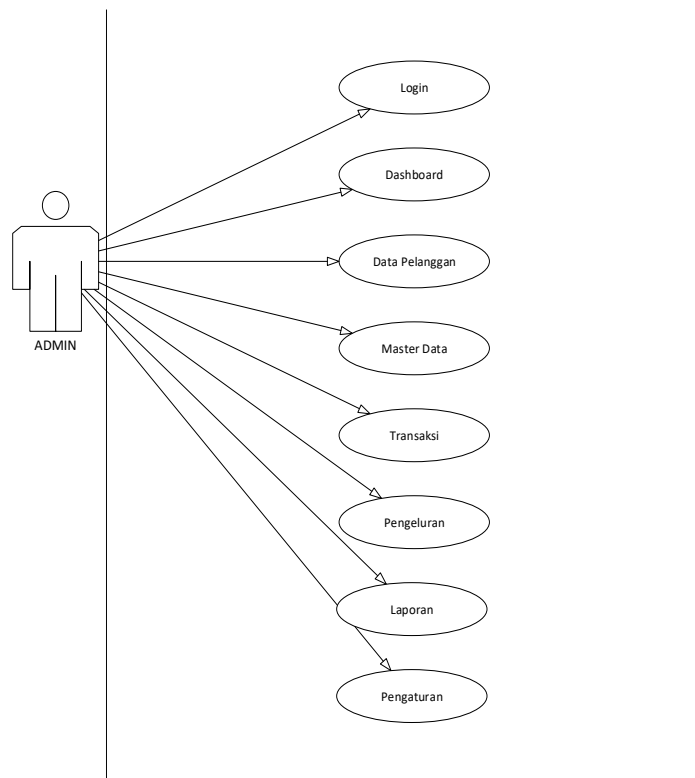


Fig. 3: Use Case Diagram

Figure 3 illustrates the Use Case Diagram of the Web-Based Cashier Information System with Royalty Feature at FA Playground. The system involves a single actor, the Admin, who is authorized to manage the full range of system features, including authentication (Login), the Dashboard, Customer Data management, Master Data (products and categories), Transactions (sales and play sessions), Expenses, Reports, and system Settings.

b) Sequence Diagram

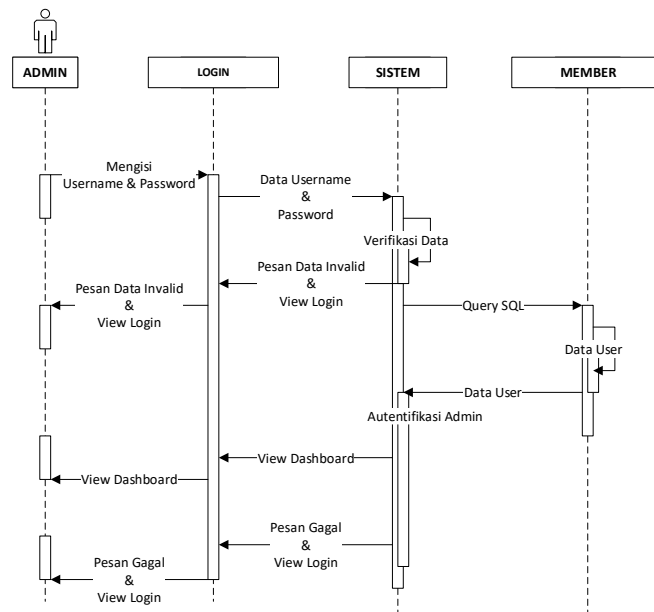


Fig. 4 : Sequence Diagram

Figure 4 illustrates the interaction between objects in the Login process, the addition of categories and items, report generation, expense recording, and the cashier transaction process, from the sending of a request by the Admin to the saving of data into the database through an SQL query.

c) Class Diagram

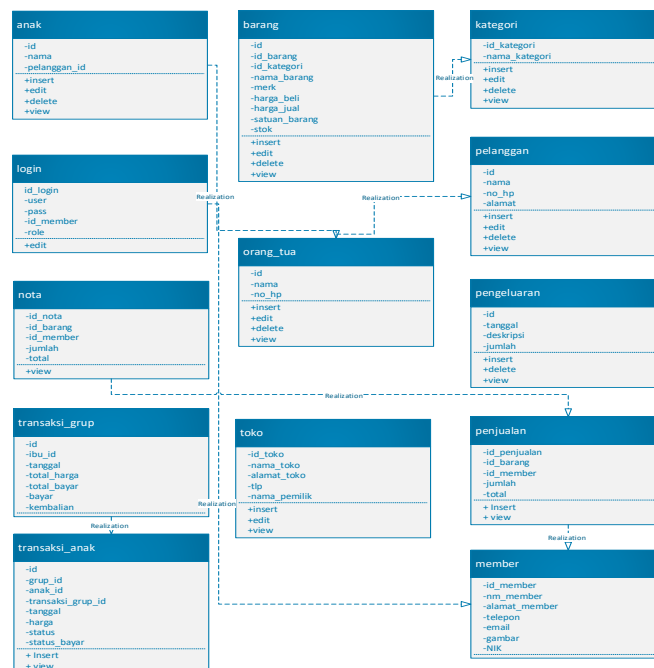


Fig. 5: Class Diagram

Figure 5 illustrates the system's database structure, consisting of the Item, Category, Member, Login, Receipt, Group Transaction, Child Transaction, Store, Sale, Expense, Child, Parent, and Customer entities, which are interrelated to support centralized transaction recording, stock management, and reporting operations. All classes are equipped with insert, edit, delete, and view methods to support CRUD operations.

3.4. System Implementation

The FA Playground cashier information system was implemented using the PHP programming language with a MySQL database, and was uploaded to a hosting server so that it could be accessed online. The implemented system interface includes a Login page for admin authentication; a Dashboard displaying a summary of the number of items, stock, sales, and categories along with a revenue chart for the last seven days; Master Data for managing items and categories; Customer Data for recording parent and child data; Sales Transactions

and Play Transactions that record the play-visit history while applying the royalty feature in the form of a free visit on the sixth visit; Expenses for recording daily operational costs; and Store Settings and Profile Settings.

a) Login Page

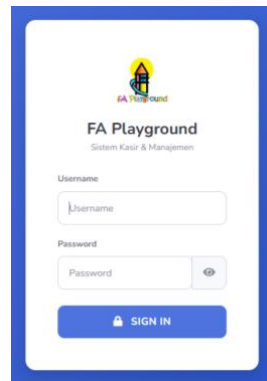


Fig. 6: Login Page

Figure 6 presents the Login page, which is the entry point of the system. The Admin enters a username and password, and the system verifies the credentials against the database before granting access to the dashboard. This page is designed with a simple layout to make the authentication process quick and easy for cashier operators.

b) Dashboard Page

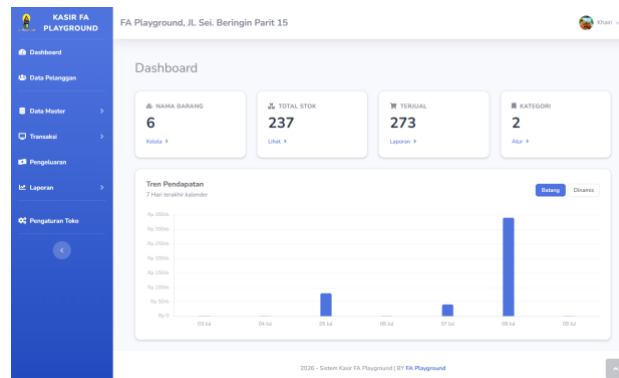


Fig. 7: Dashboard Page

Figure 7 presents the Dashboard page, which is displayed immediately after the Admin logs in. This page summarizes the total number of items, available stock, total sales, and number of categories in the form of summary cards, and is equipped with a chart showing the revenue trend over the last seven days. This dashboard allows the owner and cashier to quickly monitor the store's overall condition without having to open each menu individually.

c) Master Data – Category Page

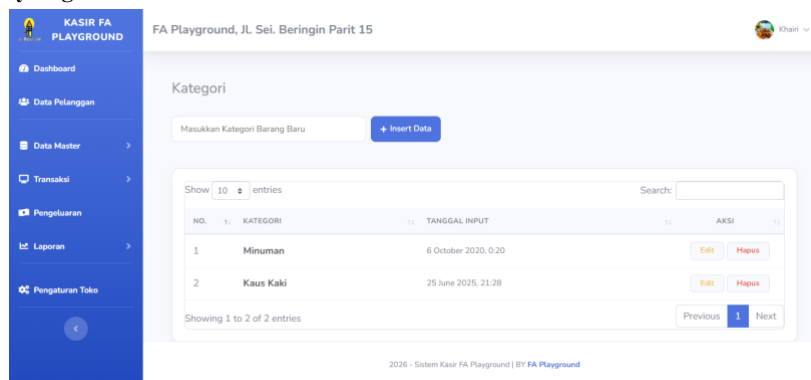


Fig. 8: Master Data – Category Page

Figure 8 presents the category management page, where the Admin can add, edit, and delete product/service categories, such as play-session packages and food or beverage items. This page is equipped with a category list table and a form for adding new categories, so that item classification can be managed in a structured manner.

d) Master Data – Item Page

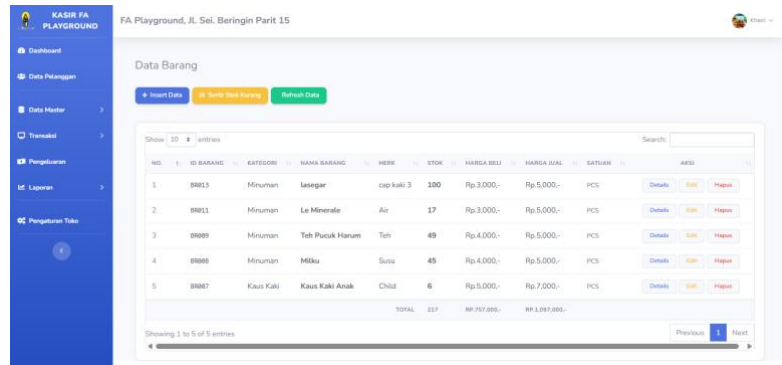


Fig. 9: Master Data – Item Page

Figure 9 presents the item management page, which is used to record the name, price, category, and stock of each item sold. The Admin can add new items, update prices or stock, and remove items that are no longer sold, so that the data used in the transaction process always remains up to date.

e) Customer Data Page

Fig. 10: Customer Data Page

Figure 10 presents the customer data page, which is used to record parent and child (member) information, including the child's name, their parent and the number of accumulated play visits. This page replaces the previous manual, paper-based customer recording method and serves as the primary reference for calculating the royalty feature.

f) Sales Transaction Page

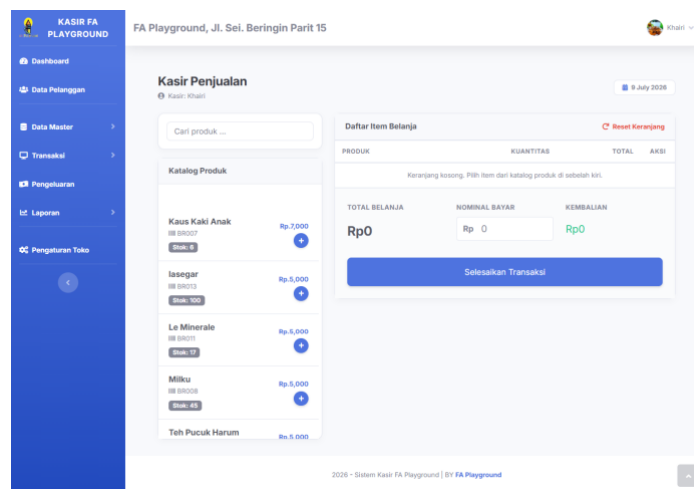


Fig. 11: Sales Transaction Page

Figure 11 presents the sales transaction page, used to record the purchase of food, beverages, or other items by the customer. The Admin selects the items purchased, and the system automatically calculates the total price to be paid, records the transaction into the database, and generates a receipt that can be printed or displayed to the customer.

g) Play Transaction Page

Fig. 12: Play Transaction Page

Figure 12 presents the play transaction page, which records each child's play visit along with the implementation of the royalty feature. The system automatically tracks the customer's accumulated visit count; once a child reaches the fifth visit, the sixth visit is marked as a free session with a payment status of Rp0, which is displayed through a distinct colored label in the transaction history table. This feature replaces the previous physical voucher system, which was prone to damage or loss.

h) Expense Page

Fig. 13: Expense Page

Figure 13 presents the expense page, used to record daily operational costs, such as the purchase of supplies or equipment maintenance. The Admin enters the expense description, nominal amount, and date, so that the store's operational costs can be tracked and compared against revenue.

i) Sales Report Page

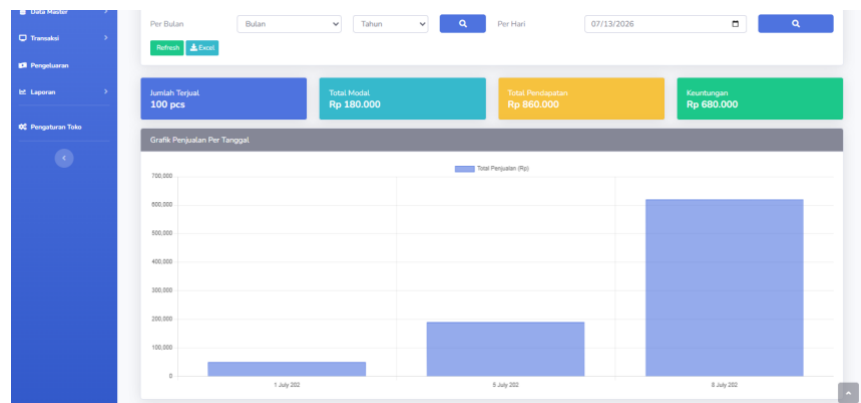


Fig. 14: Sales Report Page

Figure 14 presents the sales report page, which displays a recap of sales transactions based on a period selected by the Admin, either daily, weekly, or monthly. This report presents information on the total transactions, total revenue, and best-selling items, which is useful as a basis for business evaluation and decision-making.

j) Play/Royalty Report Page

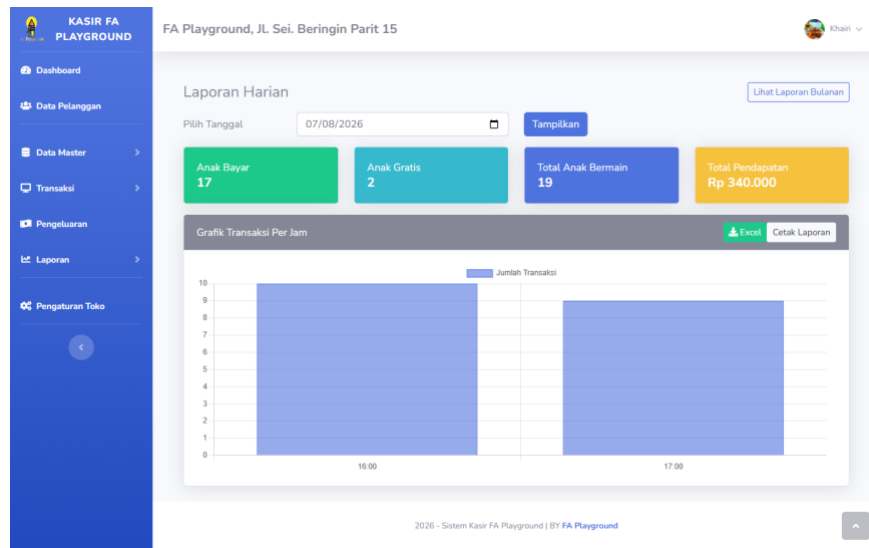


Fig. 15: Play/Royalty Report Page

Figure 15 presents the play and royalty report page, which displays a recap of the number of play visits per customer along with the number of free sessions (royalty) that have been granted. This report allows the owner to monitor the effectiveness of the loyalty program and evaluate its impact on customer visit frequency.

k) Store Settings Page

Fig. 16: Store Settings Page

Figure 16 presents the store settings page, used to manage general store information, such as the store name, address, and contact number, which is displayed on receipts and reports. This page allows the owner to update the store's identity information without needing to make changes directly through the database.

l) Profile Settings Page

Fig. 17: Profile Settings Page

Figure 17 presents the profile settings page, used by the Admin to update account information, including the username and password. This feature supports account security by allowing the Admin to periodically change the login password.

Overall, the implementation results above show that the system is able to run the entire main business process of FA Playground, ranging from authentication, transaction recording, customer data management, up to the automatic royalty feature and sales/play reporting, in an integrated manner through a single web-based platform.

The royalty feature in this system works by automatically recording the number of play visits for each child. Once a child has reached the fifth visit, the system marks the next visit as a free visit with a payment status of Rp0, which is displayed visually through a colored label in the play-transaction history table, as shown in Figure 14. This mechanism replaces the previous physical voucher system, which was prone to damage or loss, while also making it easier for cashiers to accurately and in real time trace each customer's visit history.

3.5. System Testing

No	Function	Testing Question	Yes	No
1	Login Admin	Admin can successfully log into the system with valid credentials.	√	
2	Tambah Master Data	Admin can correctly add new categories and items to the menu list.	√	
3	Ubah Master Data	Admin can correctly edit information for existing categories and items.	√	
4	Tambah Data Pelanggan	Admin can correctly edit information for existing categories and items. Admin can correctly add new customer data.	√	
5	Edit Data Pelanggan	Admin can quickly search for and find products/services during a transaction.	√	
6	Memproses Transaksi Penjualan	Admin can correctly complete a sales transaction (including total calculation).	√	
7	Penerapan Fitur Royalty (Akumulasi)	Customer royalty points are correctly accumulated according to the rules after a sales transaction is completed.	√	
8	Lihat Riwayat Transaksi	Admin can view the list and details of past transaction history.	√	
9	Tambah Data Pengeluaran	Admin can correctly record operational expense data.	√	
10	Lihat Laporan Penjualan	Admin can accurately display sales reports based on a specified time period.	√	
11	Lihat Laporan Permainan	Admin can display reports related to the accumulation and redemption of customer royalty points.	√	
12	Pengaturan Profil Toko	Admin can correctly add, edit, and delete the store profile.	√	
13	Logout	Admin can successfully log out of the system securely.	√	

System testing was conducted to ensure that the Web-Based Cashier Information System with Royalty Feature at FA Playground operates according to the development objectives and can be effectively used by its intended users. The evaluation consisted of two main aspects: functionality testing and usability testing.

Functionality testing, involving 10 respondents across 37 system functions, showed that all functions ran well and correctly. With $A = 0$ (no failed functions) and $B = 370$ (total tests from 10 respondents multiplied by 37 functions), the result was $X = 1 - (0/370) = 1$. Referring to the ISO/IEC standard, an X value close to 1 indicates that the system has excellent functionality.

Usability testing, involving 10 respondents with 15 questions on a 5-point Likert scale, produced a total score of 678 out of a maximum possible score of 700, resulting in a usability percentage of 96.86%. Based on the feasibility interpretation standard (81%–100%), this system falls into the Very Good category, indicating that the system is easy to use, useful, easy to learn, and provides overall satisfaction for its users.

Based on the testing results, all tested functionalities achieved positive outcomes and every core feature was successfully implemented without any significant technical issues. These results are consistent with the findings of previous studies showing that web-based cashier information systems are able to improve operational efficiency, speed up the transaction process, and increase the accuracy of financial record-keeping for small and medium enterprises [1]–[10]. The novelty offered by this research, namely a visit-accumulation-based royalty feature, provides added value in the form of a customer loyalty program that has not been widely applied in similar previous studies, while also strengthening the customer-retention aspect for the FA Playground business.

4. Conclusion

This research successfully designed and implemented a Web-Based Cashier Information System with a Royalty Feature at FA Playground using the Waterfall development model, the PIECES analysis approach, and UML modeling. The functionality test results, involving 10 respondents across 37 system functions, showed a success rate of 100% ($X = 1$), while the usability test results obtained a feasibility percentage of 96.86%, which falls into the Very Good category. The implementation of the royalty feature has proven to function well in automatically recording customer visit accumulation and granting a bonus play session after the fifth visit, thereby replacing the previous physical voucher system, which was prone to damage or loss. Overall, this system has proven capable of eliminating customer data duplication, improving voucher data security, making it easier for cashiers to trace transaction history, and simplifying the bookkeeping and sales reporting process at FA Playground.

For future development, it is recommended that the system be equipped with more dynamic and flexible reporting features, including report customization options and more interactive data visualization; integration with digital payment systems such as QRIS or e-wallets; strengthening of data security through two-factor authentication and stronger encryption; the addition of automatic notification features for

admins and cashiers; and the implementation of load testing to ensure the system remains reliable under high transaction volumes and large numbers of users.

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