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Design Point of Sales and Inventory System at Cafe Youth Creatino

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Abstract

Cafe Youth Creatino is a food and beverage MSME that just started operating in early 202134. The author used the System Development Life Cycle (SDLC) system development method to help the cafe overcome its recording problems4. Based on the results of the user needs analysis, a computerized system is needed to assist in recording transactions and controlling inventory4. The analysis resulted in a website-based Point of Sales (POS) and Inventory System that is accessed online using the PHP, Javascript, and MySQL database45. Through Black Box testing, this system has been proven to successfully carry out all its functions as expected, minimize calculation errors, and facilitate the management of sales transactions, purchases, adjustments, item masters, inventory, transaction history, and transaction reports.

Keyword: Point of Sales System, Inventory System, Website, Food and Beverage Business

1. Introduction

Today, the growth and development of information technology in the global community is experiencing significant acceleration. Society's dependence on the use of information technology is increasing, driven by the demands of a more dynamic, efficient, and modern era in all aspects of life. This phenomenon directly forces various business sectors to adopt digital technology to maintain their business relevance (Sulaeman et al., 2024; Yani et al., 2025). This pressure to adapt to technology also applies to the Micro, Small, and Medium Enterprises (MSMEs) sector, particularly in implementing the digitalization of retail transaction processes to simplify and streamline daily operations (Handayani et al., 2024; Hendrawan et al., 2024). One business entity facing this digitalization challenge is Cafe Youth Creatino, an MSME business operating in the food and beverage (F&B) industry that began pioneering operations in early 2022. As a newly developing micro-enterprise, Cafe Youth Creatino currently does not have a computerized system to support its daily operational activities. The entire business management process, from product data collection and recording purchase and sales transactions to inventory control, still relies on conventional methods or traditional paper-based record keeping.

For MSMEs, implementing a manual, paper-based payment system is highly ineffective and inefficient, and prone to human error. In addition to hampering cashier service, this traditional record keeping makes it difficult for management to precisely control inventory and hinders the rapid and accurate preparation of daily transaction reports. Yet, the availability of reliable inventory information and transaction recording is

crucial to ensuring a smooth supply chain and maintaining quality customer service. Therefore, the provision of a computerized information system at Cafe Youth Creatino has become an urgent need. This technology is expected to function not only as a transaction aid at the cashier, but also to process all data from purchasing transactions, direct sales (dine-in), delivery orders, inventory adjustments, inventory control, and the preparation of financial reports quickly, precisely, and accurately.

The results of the operational constraint identification presented have formulated the research problem, including: how to design and build a Point of Sales (POS) and inventory application at Cafe Youth Creatino. To ensure the design and implementation of this information system are focused, the author limits the scope of the problem discussion to the following aspects:

1. Development of a dedicated Point of Sales module to handle the flow of purchasing transactions for goods or raw materials to replenish the cafe's inventory.
2. Development of a Point of Sales system to process inventory adjustment transactions, specifically to handle damaged, lost, or expired products.
3. Development of a systematic inventory function to control and monitor the amount of product stock available.
4. Provision of a web-based online purchasing system feature that facilitates delivery orders for customers outside the cafe area.
5. Development of a daily and periodic sales transaction reporting module over a specific time period to assist in evaluating business performance.

The primary objective of this final project research is to develop a functional and well-structured Point of Sales (POS) and inventory application for implementation at Cafe Youth Creatino. This research is expected to provide positive contributions as described below: One) The author's real contribution to the community and MSMEs through the creation of solution-based software, as well as a means to test the technical competencies possessed. Two) Expanding the author's knowledge horizon by comparing and testing the relevance of academic theories of software engineering that have been studied in college with the dynamics of obstacles that occur in the field. Three) Facilitating the management of Cafe Youth Creatino in controlling the flow of goods in and out and maintaining the stability of product stock availability accurately and dynamically. Four) Accelerating the cashier transaction service process, both for direct sales on the spot (dine-in) and online ordering.

2. Literature Review

2.1 Point of Sale (POS)

Point of Sale (POS) is defined as a specialized graphical interface specifically designed to process sales transactions (Andry et al., 2019). Initially, the term POS was used only to refer to conventional cash registers. However, with the advancement of information technology, the POS concept has evolved into a comprehensive ecosystem that integrates sales transaction management, inventory management, product category classification, user authorization, and the compilation of tactical reports for managerial purposes (Azhari & Sutarman, 2024; Kotha, 2023). POS is a harmonious combination of hardware and software that acts as a gateway for receiving money from customers, making this system a vital indicator in measuring a business's daily profitability (Cote, 2015; Ramadhani et al., 2025). Theoretically, POS systems can be classified into three main configuration models (Ramadhani et al., 2025): 1) POS with local recording capabilities, utilizing multiple decentralized self-service cashier terminals that act as both collectors and local transaction data stores. 2) Centralized POS through cashier system integration utilizing an in-store

controller to simultaneously monitor all data terminal activity. 3) Remote, online, and interactive POS, such as a dynamically integrated cashier control system where cashier terminals can be located in one or more online-connected shopping centers.

2.2 Inventory

Inventory is a collection of physical assets or stock of goods systematically managed by a company to support the smooth running of business processes, both during the production phase and in the distribution of sales to customers (Mohsen, 2023). Digital inventory is defined as a reserve of valuable resources held by an organization to anticipate future consumer demand (Davis et al., 2015). According to Attaran (2020), digital inventory has ten essential operational functions that provide high flexibility for companies. To carry out all inventory functions, companies generally categorize inventory into four physical types (Khan et al., 2023): raw materials that have not yet entered the manufacturing process; work-in-process (WIP) that is still in the production cycle; and maintenance, repair, and operating supplies (MROs).

2.3 Database

The word "database" is formed from two syllables: "basis," meaning warehouse or gathering place; and "data," representing a collection of raw information recorded from real objects in the physical world (such as customer profiles, product data, purchase and sales transactions) in the form of numbers, text, letters, symbols, images, and audio recordings (Shekhar & Vatsavai, 2008). Patni et al. (2022) state that a database is a collection of interrelated files or tables stored in an electronic storage medium in an organized manner for easy retrieval. A computerized database system is tasked with managing data circulation to avoid unnecessary overlapping of data storage (redundancy), so that maintenance, processing, and retrieval of information can run instantly, safely, and efficiently when needed by users (Ahmed et al., 2017; Carney et al., 2002).

2.4 Unified Modeling Language (UML)

Unified Modeling Language (UML) is an industry-standard visualization methodology used to model, design, structure, and document object-oriented software systems (Booch, 2005). UML provides standard notation to simplify the visualization of complex software system architectures, making them easily understood by developers and stakeholders (Khaiter & Erechtchoukova, 2019). Based on the UML version 2.3 specification, modeling diagrams are classified into 13 types of diagrams spread across three broad categories: Structure Diagrams, Behavior Diagrams, and Interaction Diagrams. This final project research specifically applies the following three types of UML diagrams:

- Use Case Diagram: A behavior diagram that maps the functional interactions between one or more external actors and the designed information system. This diagram visualizes the system's functionality (what the system can do) along with the access rights limitations of each user. Its main components include Use Case (a system function represented by a verb), Actor (a user, business process, or other system outside the application), Association (communication between the actor and the use case), Extend (an optional extension relationship from the parent use case), Generalization (a specific-general hierarchical relationship), and Include (an absolute prerequisite that must be met for the parent use case function to run).
- Activity Diagram: A dynamic diagram that describes the workflow, business process, or sequence of activities executed internally by a software system. Unlike use case diagrams, activity diagrams focus entirely on the logical sequence executed by the system engine. Its core notations include Initial State (starting point), Activity (representing system actions), Decision (if-else branching

logic), Join (combining multiple parallel workflows), Final State (end of process execution), and Swimlane (delimiting the department/actor's responsibility for a particular activity).

- Class Diagram: A static structural diagram that maps the architectural structure of a software system by defining all the classes to be built. Each class object is equipped with internal characteristics in the form of attributes (data variables) and operations or methods (class behavior). The notations in this diagram include Class, Interface, Association (relationships between classes with multiplicity ratios), Directed Association, Generalization (inheritance of properties from superclass to subclass), Dependency (dependency between classes), and Aggregation (relationships regarding ownership of parts of a whole).

2.5 Entity Relationship Diagram (ERD)

An Entity Relationship Diagram (ERD) is a relational database modeling technique based on real-world assumptions, where the business environment is always composed of a collection of basic objects (entities) that interact with each other (Frantiska Jr, 2017). An E-R diagram translates these data relationships into a systematic, geometric graphical notation to facilitate understanding of the database relationship flow (Song et al., 1995).

2.6 System Development Life Cycle (SDLC) - Waterfall

The System Development Life Cycle (SDLC) is a systematic methodological framework based on best practices that serves as a guide for designing, building, testing, modifying, and maintaining software application systems (Langer, 2008). According to Ruparelia (2010), one of the most popular classical models used in SDLC software architecture is the Waterfall Model, introduced by Royce (1970). The Waterfall Model proposes a linear, sequential software engineering approach that flows gradually downward, similar to a waterfall, where work on the next stage can only begin after the previous stage has been fully executed (Iman et al., 2025; Olorunshola & Ogwueleka, 2021).

2.7 Black Box Testing

Black Box Testing is a software quality testing methodology that focuses evaluation on the external functional specifications of a cash register system without the need to examine the internal program code structure (source code) or backend database architecture (Bernardo et al., 2024). Through this testing technique, developers or testers construct specific functional input scenarios to determine whether the system produces output that meets the expected functional constraints. The advantage of this method is that testing is conducted purely from the end-user perspective, so the tester does not need to master a specific programming language (Alshamaa & Saleem, 2025). However, its disadvantages lie in the potential for redundancy in test scenarios between developers and testers, the difficulty of designing test cases without clearly documented specifications, and the omission of testing crucial backend functionality.

2.8 First Expired First Out (FEFO)

The First Expired First Out (FEFO) method is a perishable goods inventory management concept that stipulates that products with the closest expiration date must be released or sold first (Haijema, 2014). This method is highly effective in the food and beverage (F&B) industry to minimize losses due to raw materials or merchandise that are damaged or expire before they can be sold (Camilleri, 2021; Selly, 2023). Unlike the First In First Out (FIFO) method, which rigidly releases goods in the order of first arrival at the warehouse, the FEFO method operates dynamically, prioritizing the actual quality of the goods and the

expiration date printed on the product packaging as the absolute parameters for logistics distribution decisions.

3. Method

3.1 Location, Time, and Organizational Structure

This research was conducted directly at the Creatino Youth Cafe, located at Satya Negara Indonesia University, Kebayoran Lama, South Jakarta. The research period lasted for five months, from March 1, 2022, to July 31, 2022. The cafe's organizational structure consists of a Director, Manager, Accounting, and Sales Division (Cashier, Waiters, and Stock/Warehouse).

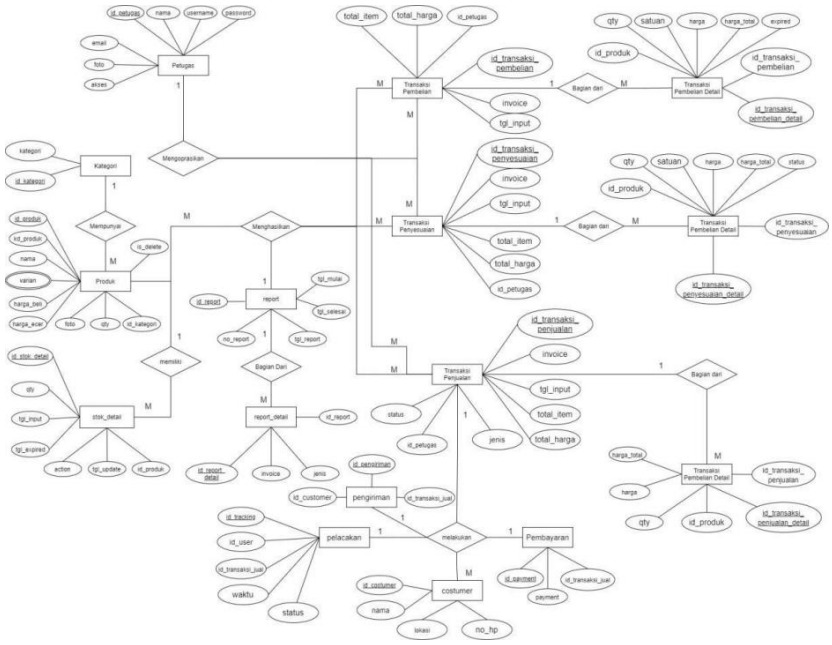

Figure 1. ERD design

3.2 Data Collection Methods

Data was collected through three main techniques: 1) Literature Review: Studying relevant literature and journals. 2) Interviews: Direct question and answer sessions with the cafe manager. 3) Observation: Direct observation of the cafe's business model in the field.

3.3 System Development Method (Analysis & Design)

The development method used the Waterfall SDLC. Based on the analysis, a POS and inventory system was designed with five main user access rights: 1) Admin: Manages users, access rights, product masters, and views periodic reports. 2) Warehouse: Responsible for managing products, updating stock, and conducting inventory purchase transactions and adjusting items (lost/damaged/expired). 3) Cashier: Manages direct sales transactions (dine-in), processes payments, manages delivery services, and assigns couriers. 4) Waiter: Delivers delivery orders in the field and receives invoices from customers. 5) Customer: Registers, orders food online (delivery), and tracks order preparation status.

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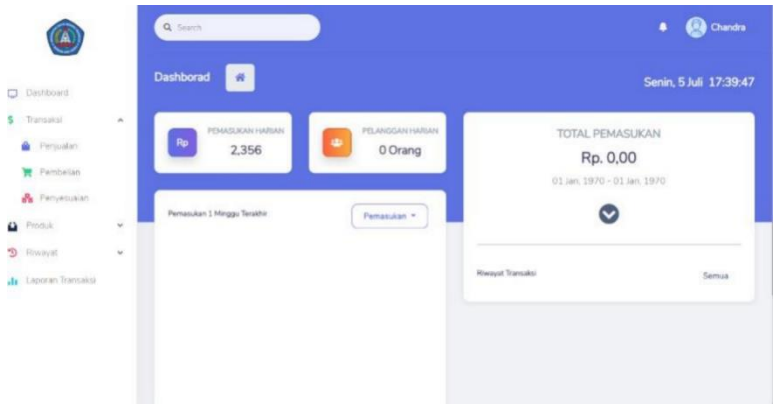

Figure 2. Dashboard Menu Design Display

3.4 Database Design

The database schema was designed using an Entity Relationship Diagram (ERD) (see Figure 1) and is implemented in 16 main tables, including: category (category_id, category), product (product_id, product_kd, name, variant, purchase_price, retail_price, photo, qty, retail_unit, category_id, is_delete), stock_detail (stock_detail_id, qty, input_date, expiration, action, update_date, product_id), officer (officer_id, name, username, password, email, photo, access), purchase_transaction & purchase_transaction_detail, sale_transaction & sale_transaction_detail, adjustment & adjustment_detail, customer, report, report_detail, payment, tracking, and shipping.

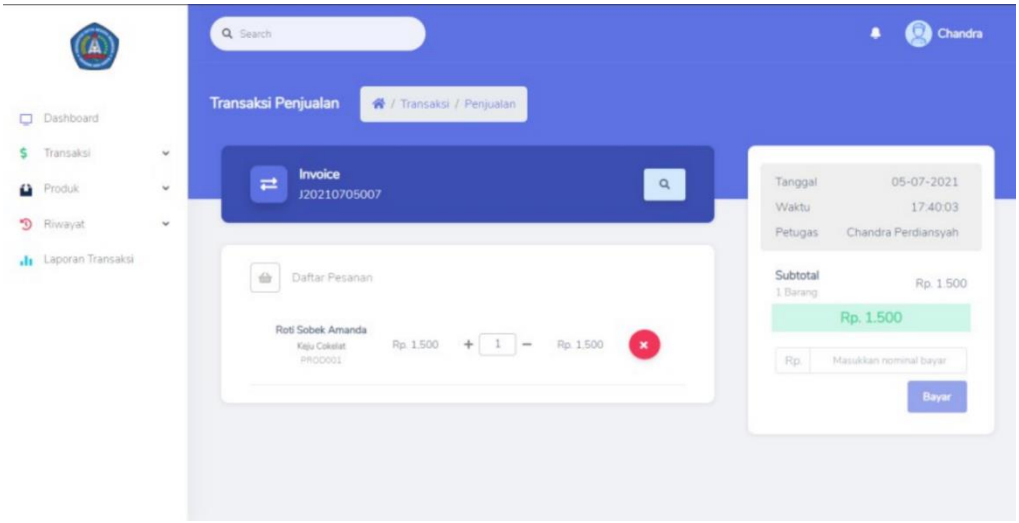

Figure 3. Transaction Menu Design Display

4. Result

4.1 System Implementation Results

The system was implemented using a MySQL database with SQL queries. The user interface design was built using the Bootstrap framework, CSS, JavaScript, and Ajax for interactivity.

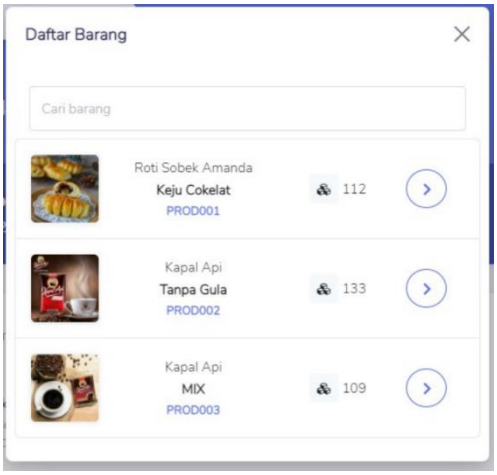

Figure 4. Product Menu Design Display

- Staff-Side System
  Provides a Dashboard menu (summary information on daily income and daily orders) (see Figure 2), a Transaction menu (sales for Cashiers; purchases and adjustments for Warehouse) (see Figure 3), a Product menu (item list, FEFO stock management, and categories) (see Figure 4), and a Transaction History and Report menu for Managers (see Figure 4). The system automatically detects products that are nearing expiration and displays an "Expired" button for processing into stock adjustment transactions.

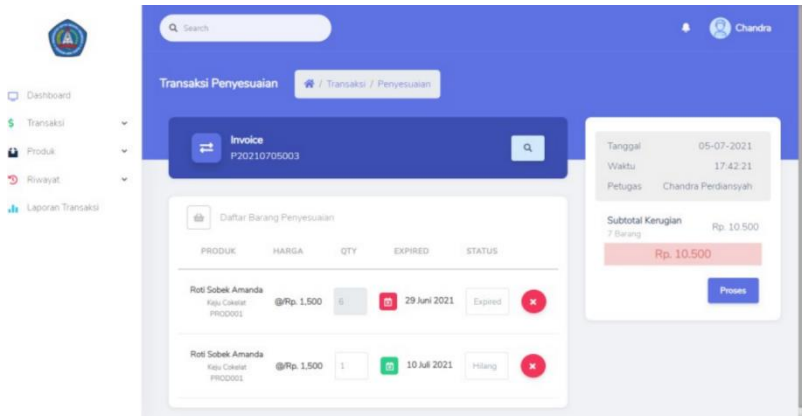

Figure 5. Account Menu Design View

- Customer-Side System (Mobile-first)
  Assists with delivery transactions. Consists of the Account menu (courier/customer registration) (see Figure 5), Order (real-time product ordering) (see Figure 6), and Track (track order location based on unique invoice codes) (see Figure 7).

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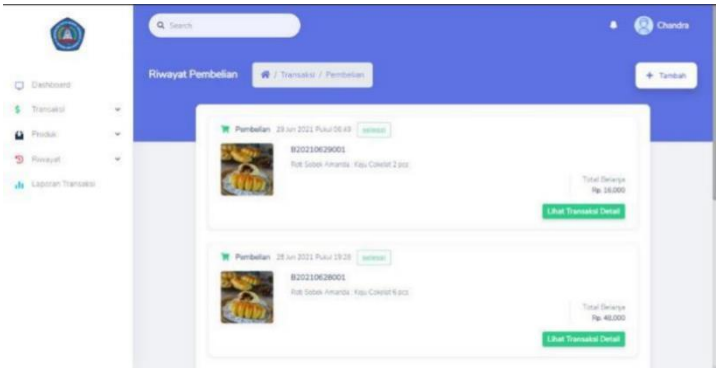

Figure 6. Product Menu Design Display

Figure 7. Product Tracking Menu Design View

4.2 System Testing (Black Box Testing)

Comprehensive system functionality testing was conducted on each module, as shown in Table 1 below. This system design was proven capable of rejecting sales transactions if the payment amount is insufficient or if the clerk attempts to insert an empty product during the purchase.

Table 1. System Testing Using the Black Box Method

No	Test Module	Scenario	Expected Results	Status
1	Login Staff	Enter a valid username/password	Access the main menu based on the employee's access rights	Success
2	Sales Transaction	Enter the payment amount less than the invoice amount	The order cannot be processed and a failure message appears. Success	Success
3	Purchase Transaction	Add a product with all input fields blank	An error message appears and the action is rejected	Success
4	Adjustment	Select an expired product	Add it to the adjustment cart with the	Success

	Transaction		status "expired"	
5	Manage Stock	Change the stock quantity of a product that has not yet expired	The product stock is updated in the system based on the input	Success
6	Customer Tracking	Track orders using invoice codes	Display the shipping process status in real-time	Success

5. Discussion

The implementation of a website-based Point of Sales (POS) and inventory information system at Cafe Youth Creatino is a strategic step in optimizing the operational efficiency of micro-enterprises in the food and beverage sector. Developed using the System Development Life Cycle (SDLC) methodology with a linear sequential or Waterfall model, this system architecture is structured using Unified Modeling Language (UML) modeling and Entity Relationship Diagrams (ERDs) to map relational database relationships logically. The use of PHP and JavaScript programming languages integrated with a MySQL database facilitates functional data circulation for five user access rights—Admin, Warehouse, Cashier, Waiter, and Customer—to transform traditional paper-based retail management, which is considered ineffective and prone to human error.

The main functional advantage of this computerized system lies in its ability to control inventory based on dynamic quality of goods using the First Expired First Out (FEFO) method. The system automatically groups product stock by expiration date and displays an "Expired" warning button to facilitate warehouse staff in quickly processing adjustments for damaged, lost, or expired items.1 Based on functional evaluation results using the Black Box Testing method, all core modules—including recording purchase transactions, adjustment transactions, and online and in-person sales transactions (dine-in)—proven to perform their functions effectively. This system not only minimizes cashier errors, such as automatic rejections when the customer's payment amount is less than the invoice amount, but also provides transparency in shipping for customers through visualization of real-time order status tracking.

Practically, the implementation of the web-based Point of Sales (POS) and inventory system at Cafe Youth Creatino has had a direct impact in the form of comprehensive digitization of daily operations, eliminating conventional paper-based bookkeeping. Through automated cashier transactions, this system functionally minimizes the risk of human error and can automatically reject transactions if the cashier's payment amount is less than the total invoice amount. In terms of warehouse management, the implementation of the First Expired First Out (FEFO) method, accompanied by an automatic "Expired" warning button, helps staff effectively rotate consumable raw material stocks, thereby significantly reducing financial losses due to damaged or expired goods before they are sold. 6more_horiz. Furthermore, the provision of a mobile-first delivery transaction feature expands customer accessibility beyond the cafe area while guaranteeing service transparency through tracking delivery status based on a unique invoice code. At the managerial level, the automation of the recapitulation of purchase transaction reports, daily sales, and stock adjustments greatly facilitates management in monitoring financial circulation and evaluating business developments instantly to formulate new, more optimal marketing strategies.

6. Conclusion

Based on the results of the needs analysis, design, and a series of trials, it can be concluded that this research has successfully developed a website-based Point of Sales (POS) and inventory information

system for Cafe Youth Creatino. Through functional evaluation using Black Box Testing, the system was proven to perform all its functions optimally according to the expected specifications. The implementation of this new system significantly minimized the potential for cashier errors in manual calculations and streamlined the entire transaction data recording and inventory control process, including processing sales transactions, purchasing transactions, inventory adjustment transactions, managing inventory master cards, monitoring consumables, tracking transaction history, and preparing periodic transaction reports quickly and accurately.

Although the designed system meets the cafe's basic operational needs, this research still faces several technical limitations in its implementation. For example, the POS and inventory system was built using PHP and JavaScript programming architecture without utilizing modern frameworks, either on the frontend or backend, resulting in rudimentary coding functionality. Furthermore, the system's security level in protecting data circulation from various external threats or attacks that threaten the confidentiality of the company's transaction data remains very basic. Other limitations are also evident in the backend aspect, where data exchange in the MySQL database is still accessed directly and the use of the Application Programming Interface (API) is not yet maximized. Furthermore, detailed technical documentation to facilitate software maintenance is not yet available.

To address these limitations and ensure the long-term sustainability of the system, several important recommendations are presented for future developers. First, the security aspects of the software system must be enhanced in layers to protect the confidentiality and integrity of the cafe's transaction data from the risk of hacking by external parties. Second, it is recommended to migrate the system using modern frameworks on both the frontend and backend, and to implement an object-oriented programming (OOP) paradigm to facilitate easier and faster maintenance and future feature updates. Finally, future developers are expected to implement the concept of secure data exchange through API integration to protect the main database from direct access, while still including clear and structured system development documentation to facilitate ongoing maintenance.

Acknowledgments

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