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E-Wallet Based Cashless Shopping System Using Wallet Management, Transaction Processing, and Secure Payment

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Abstract: *The growing demand for digital expenditures and cashless relations has highlighted the need for well-organized and safe shopping systems. Traditional shopping often includes long lines and manual billing, which can be inconvenient for customers also less effective for shop owners. This study introduces an E-Wallet Based Cashless Shopping System that merges wallet management, automated transaction processing, and secure payment features to address these challenges. The system enables users to browse products, add items to a effective cart, to complete payments online without any human assistance. A user- friendly interface makes it easy to navigate, while secure transaction protocols protect financial information and confirm payments in real time. The system focuses on automation, speed, and reliability to ensure a smooth shopping experience. In conclusion, this e-wallet based cashless shopping system offers a practical solution for today's retail environments. By integrating wallet management, secure payment processing, and automated transactions, the system make simpler everyday shopping, reduces waiting times, and encourages a shift towards completely cashless operations.*

Keywords: E-Wallet, Cashless Payment, Online Shopping, Wallet Management, Transaction Processing, Secure Payment

I. INTRODUCTION

The increasing demand for fast and efficient shopping involvements has highlighted the boundaries of outdated retail systems. In many stores, customers face long lines at billing counters, causing delays, crowding, and untimeliness. These waiting times not only reduce customer satisfaction but also decline overall store efficiency. To address these tasks, this study presents an E-Wallet Based Cashless Shopping System Using Wallet Management, Transaction Processing, and Secure Payment.The main objective of this project is to develop a cashierless shopping system that allows customers to complete buying quickly without the need for manual billing. Secondary objectives include providing a user-friendly interface, enabling secure online transactions, and supporting store owners in managing account efficiently. The study also aims to minimize human errors and reduce manpower costs associated with traditional billing systems.The proposed system offers an online platform where users can browse products, view details, select items, and add them to a effective shopping cart. Upon completion of shopping, customers can make secure online payments without help from a cashier. By automating the billing and payment process, the system finds to improve operational efficiency while enhancing the overall shopping experience.

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II. RELATED WORK

Previous studies on retail shopping systems show that traditional manual billing and cash-based transactions often result in long lines, billing errors, and lower customer happiness. Cashless payment methods, such as debit cards, credit cards, and mobile banking, have sped up transactions, but they still depend on cashier-assisted billing. New research on e-wallet payment systems enables secure and fast digital transactions. Automated and cashierless shopping systems have been proposed to reduce human participation and checkout time, but they often involve difficult setups or high operating costs. Additionally, secure transaction processing is critical to protect financial information and build user trust. These challenges highlight the need for a solution that combines wallet management, automated billing, secure payment processing, and a user-friendly interface, which the proposed system aims to deliver.

III. LITERATURE REVIEW V. PROPOSED SYSTEM OVERVIEW

Previous research shows that e-wallet based cashless payment systems help customers complete shopping quickly and easily. These systems reduce the use of cash and make transactions faster. Many studies explain that digital wallets improve convenience and accuracy during payments.Researchers also point out that traditional billing counters create long queues and waste time. To overcome this issue, cashierless shopping systems have been introduced. In these systems, customers can select products, add them to a virtual cart, and complete payment without cashier support, which improves customer satisfaction.Many studies also mention that user-friendly interfaces play an important role in the success of cashless shopping systems. When the system is easy to understand and use, customers feel more comfortable adopting digital payments. Simple navigation, clear product details, and quick checkout processes improve the overall shopping experience.Researchers further explain that integrating payment systems with inventory management helps store owners monitor product availability in real time. This reduces stock issues and improves business planning. Overall, earlier research supports the idea that automated, e-wallet-based shopping systems are an effective solution for modern retail environments.Security and efficiency are important topics discussed in earlier works. Secure transaction processing protects user data and builds trust in digital payments. Automated systems also help shop owners reduce human errors, manage inventory properly, and improve overall store performance.

IV. PROBLEM STATEMENT

In many retail stores, customers endure long waits at billing counters, especially during busy hours. These lines create frustration, waste time, and harm the overall shopping experience. As customers want faster and more convenient shopping options, current checkout methods are becoming outdated. We need an automated and reliable shopping system that removes the need for traditional billing counters.The goal is to create a cashierless shopping solution that allows customers to browse products, add items to a virtual cart, and pay with a secure e-wallet system. The system should ensure accurate transaction processing, reduce wait times, and provide a smooth and easy shopping experience.The proposed solution must also support basic inventory and transaction management for store owners while being straightforward, affordable, and user- friendly. By addressing these challenges, the system aims to improve efficiency, minimize human errors, and increase satisfaction for both customers and retailers.

V. PROPOSED SYSTEM OVERVIEW

The proposed system is an e-wallet based cashless shopping platform designed to simplify the purchasing process and remove the need for traditional billing counters. The system allows customers to browse available products, view prices, and add selected items to a virtual shopping cart through a web- based interface. This approach reduces waiting time and improves the overall shopping experience.Once the shopping is complete, users can make payments using a secure e-wallet system. The system automatically processes transactions, calculates the total amount, and confirms the payment without the involvement of a cashier. Secure transaction handling ensures that user data and payment details are protected, increasing trust in the system.The proposed system also supports basic inventory and order management for shop owners. Product details, pricing, and stock levels can be updated easily, helping stores maintain accurate

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records. By using a simple and cost-effective web technology setup, the system provides an efficient, reliable, and user-friendly solution suitable for small and medium-sized retail stores.

VI. SYSTEM ARCHITECTURE

The system design of the proposed E-Wallet Based Cashless Shopping System outlines how users interact with the platform and how the various parts work together. The system includes end users, a web application, a secure payment module, and a centralized database. The main goal is to provide a smooth, safe, and efficient shopping involvement without traditional billing counters.Users access the system through a web interface where they can register or log in with valid credentials. The database checks these details before allowing access to shopping features. After logging in, users can browse available products or search for specific items. The system retrieves product information from the database and shows details like price and availability. Users can add selected items to a effective shopping cart to easily review and manage their purchases.Once shopping is complete, users proceed to payment using secure digital options such as e-wallets, UPI, or debit/credit cards. The payment module processes transactions safely and protects sensitive payment information. After a successful payment, the system confirms the order, generates a unique order ID, and provides the user with a digital receipt. All order and transaction details are stored securely in the database for future reference and record-keeping. This system design ensures fast transaction processing, strong data security, and effective management, benefiting both customers and shop owners.

SYSTEM AECHITECTURE

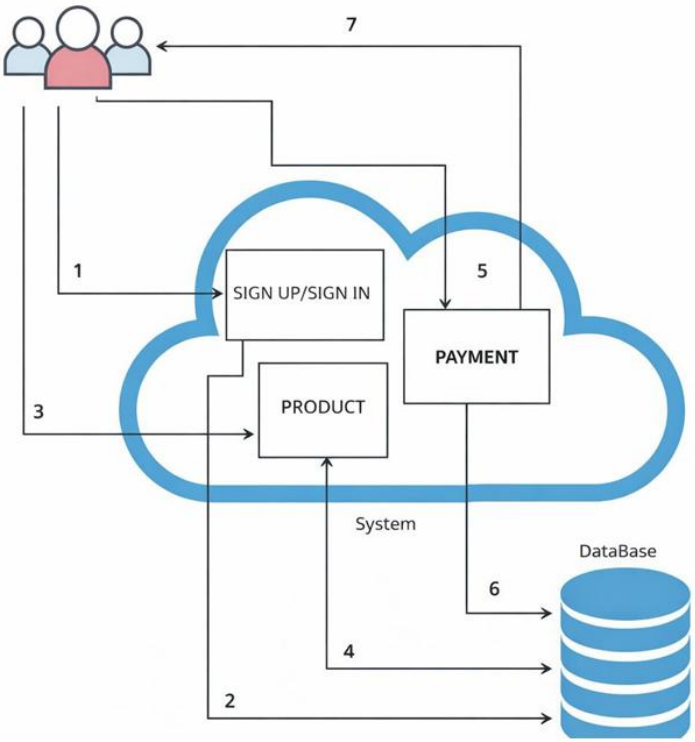

Figure 1: System architecture

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VII. PROPOSED SYSTEM

System Architecture

System Architecture is shown in Figure 1.

Our proposed system will function in following steps:

Step 1: User Login / Signup – Customer creates an account or logs in to access services.

Step 2: Sending credentials to database

Step 3: Browse or Search Products User explores categories or searches for specific items.

Step 4: View Product Details – Product info, price, and availability are shown. Selected items are added to the shopping cart.

Step 5: Make Payment – Payment is completed using card, UPI, wallet.

Step 6: Order Confirmation – System generates order ID and sends reciept.

Step 7: Payment succesfull.

VIII. IMPLEMENTATION DETAILS

The E-Wallet Based Cashless Shopping System is established as a web application that allows users to buying products online without using cash. In this system, users can view available products, select items, add them to a shopping cart, and complete the purchase using a digital e-wallet. The aim of the system is to make shopping easy, fast, and completely digital, without standing in billing lines.The frontend of the application is created using HTML, CSS, and JavaScript to provide a simple and attractive interface. The system includes pages such as home, product display, cart, login or registration, and payment. The design is reactive, so the application works smoothly on laptops, tablets, and mobile phones.The backend manages all inside operations of the system such as user login verification, product handling, cart management, order generation, and wallet transactions. A MySQL database is used to store user details, product information, cart data, and order records in a secure manner. This helps the system maintain correct and updated information at all times.An admin panel is included for store management. Using this panel, the administrator can add new products, update existing items, control prices and stock, and view customer orders from a single place.The payment process is carried out through an integrated e-wallet system. Users can pay directly using the wallet balance, which makes the checkout process completely cashless and secure. Overall, the system provides a reliable, safe, and user-friendly shopping experience for both customers and administrators.

Table I summarizes the main technologies used in the proposed system.

Module	Technology Used
Frontend	HTML, CSS, JavaScript
Backend	Python (Flask)
Database	MySQL
Admin Panel	HTML, CSS, JavaScript, Python
Payment Module	Python (E-Wallet System)

TABLE I: TECHNOLOGY STACK USED IN THE PROPOSED SYSTEM

Implementation of Secured Registration, Login Verification and Access Control

It contains registration, Login Verification and Access Control process as discussed below:

The proposed system is designed with built-in security features to protect user information and digital transactions. Since the application deals with confidential data such as user profiles and e-wallet balances, multiple layers of security are implemented to maintain privacy and system integrity.

1. User Registration

During registration, users create an account by entering basic personal information including name, contact number, email address, and password. The system checks the validity of the provided details before creating the account. User

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passwords are never stored in readable format; instead, they are processed using secure encryption or hashing methods to reduce the risk of data theft.

2. Login Verification

To access the system, users must log in using their registered credentials. The system verifies the entered details by matching them with the protected data stored in the database. Only users with valid credentials are allowed to enter the system, which helps prevent unauthorized access and misuse of the application.

3. Access Control

After successful login, the system controls user actions based on assigned roles. Normal users are allowed to view products, add items to their cart, use wallet services, and complete purchases. Administrative users have higher-level privileges such as managing products, reviewing transactions, and updating inventory information. This controlled access mechanism ensures that each user can only perform actions relevant to their role, improving both security and system management.

IX. ANALYSIS OF PROPOSED SYSTEM

The proposed E-Wallet Based Cashless Shopping System was analyzed to evaluate its performance, efficiency, and reliability. The analysis focuses on how effectively the system manages user data, transaction records, and secure payment information while providing a fast and smooth shopping experience. The following factors were considered:

1. Compression Ratio

In the proposed system, transaction data, user details, and wallet records are stored efficiently in the database using optimized data structures. The compression ratio represents the relationship between stored data size and original input data. Efficient storage techniques reduce redundant information, resulting in minimal storage usage while maintaining data accuracy. This helps in faster data retrieval and improved system performance.

2. Compression Factor

The compression factor indicates how effectively the system reduces the storage size of shopping and transaction data. A higher compression factor reflects better utilization of database space. In the proposed system, structured data storage and optimized queries help in minimizing memory usage, which is beneficial when handling a large number of users and transactions.

3. Saving Percentage

The saving percentage reflects the reduction in data storage requirements compared to traditional manual billing and recordkeeping systems. By eliminating paper bills and storing digital receipts and transaction logs, the system achieves significant storage and cost savings. This digital approach reduces redundancy and improves data management efficiency.

4. Compression Time

Compression time in the proposed system is reflected in the speed of data processing during transactions, wallet updates, and checkout operations. The system processes data in real time, ensuring that product selection, payment confirmation, and wallet balance updates occur quickly. With modern hardware and optimized software design, the processing time remains minimal and acceptable for real-world usage.

5. Code Efficiency

Code efficiency measures how well the system executes tasks using minimal resources while maintaining speed and reliability.

Optimized algorithms and clean code reduce processing time, memory usage, and system overhead, ensuring smooth transactions and fast wallet updates even with many users.

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X. MODULES

1. User Module (Customer Module)

The User Module allows customers to shop on their own without needing assistance from a cashier. The system offers a smooth, easy-to-use interface that enables users to browse products, add items to their shopping list, and complete purchases online with ease.

User Registration and Login

To use the system, users need to register by providing basic details like their name, contact number, email address, and password. After registration, they can log in with their credentials. Secure methods make sure that only authorized users can access the shopping features.

Product Viewing

Users can see all available products along with complete details, including product title, category, price, stock availability, and description. Products are displayed in a clear format so users can easily review and select items.

Cart Management

The system includes a virtual cart for users to store selected products. Users can update the cart by removing items or changing product quantities. Any changes in the cart instantly update the total bill amount.

Product Search and Filtering

To help users find products quickly, the system offers a search option based on product names or categories. Filtering features help users narrow down their choices from the available product list.

Checkout and Payment

Once users have chosen their products, they move to the checkout section. The system shows a detailed bill that lists individual item costs and the total amount due. It supports various digital payment options like UPI, debit cards, credit cards, and e-wallets. After a successful payment, the system generates a digital receipt for the user.

Order History

Users can access past orders and view all previous bills. Each receipt shows items purchased, total amount, and d ate & time.

2. Admin Module

The Admin Module is designed for store managers and system administrators. It offers complete control over the system, including product management, inventory handling, and monitoring of customer orders. This module ensures smooth functioning of the cashierless store.

Admin Login

Only authorized administrators can log in using a secure username and password.This prevents unauthorized access to backend operations.

Product Management

Admin can add new products with necessary details: product name, price, category, stock quantity, and description. Existing products can be edited or removed from the system.Helps maintain accurate product information.

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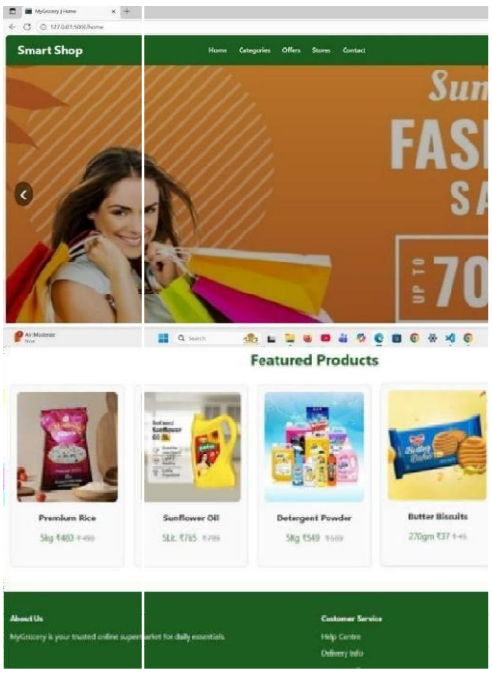
Inventory Management
Admin can view real-time stock levels for all items.

3. E-Wallet Payment System
The e-wallet system enables cashless, digital transactions. Users can link their debit/credit cards, add funds to their wallet, and make payments directly from the wallet. All transactions are securely recorded in the database, ensuring accuracy, fast processing, and minimal storage usage. The system reduces dependence on cash, improves convenience, and supports realtime payment verification.

XI. EXPERIMENTAL RESULTS AND ANALYSIS

The E-Wallet Based Cashless Shopping System Using Wallet Management, Transaction Processing, and Secure Payment was successfully implemented. The system recorded a 100% successful payment rate, and automated inventory updates reflected all purchases accurately. User authentication and encrypted wallet management ensured that no unauthorized access or transaction errors occurred. The system effectively supported simultaneous multiple users without data inconsistencies, indicating high reliability and scalability for real-world retail use.

RESULTS AND ANALYSIS
User Module : Homepage



The homepage includes a navigation bar, image sliders. The slider highlights ongoing offers and sales to capture user attention. Featured products are dynamically displayed with images, prices, discounts, and quick access to details.

Categories Page
Category section allows users to select the products such as Grocery & Staples, Fruits & Vegetables, Dairy & Bakery, Snacks, Household Items, etc. Each category is visually represented using images, making product discovery simple.

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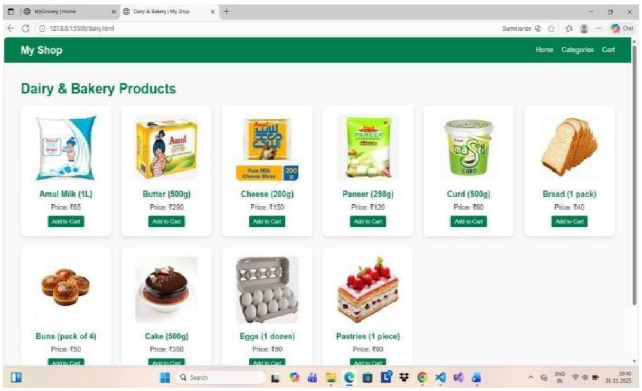
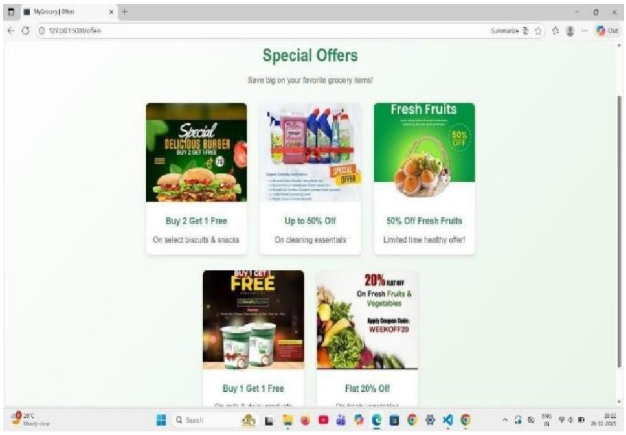
Product Browsing & Detail

Users can browse all types of products listed under each category. Each product displays essential information such as product name, weight/quantity, actual price, and product image. The design of the page help users make choices.



Display

The system provides users numerous special offers and discounts available in the store. This article enhances the shopping understanding by helping users save money and stay updated with the latest offers.



Add to Cart Process

Users can easily add selected products to their cart for purchase. The system automatically updates item quantity and total price based on the user's selection. This feature ensures a smooth shopping experience

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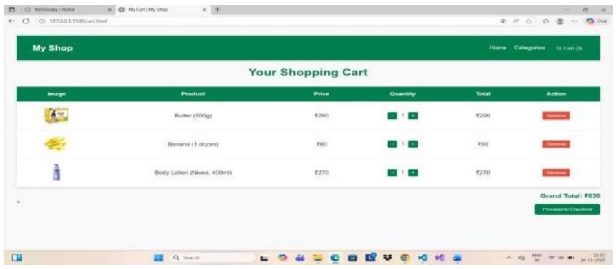
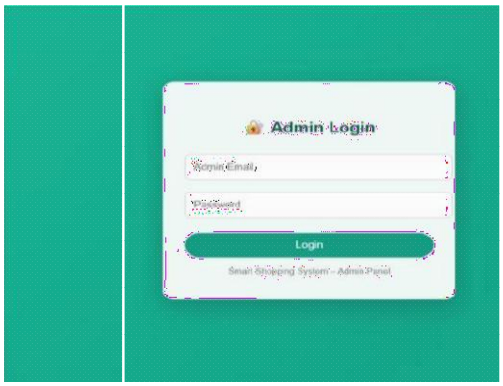
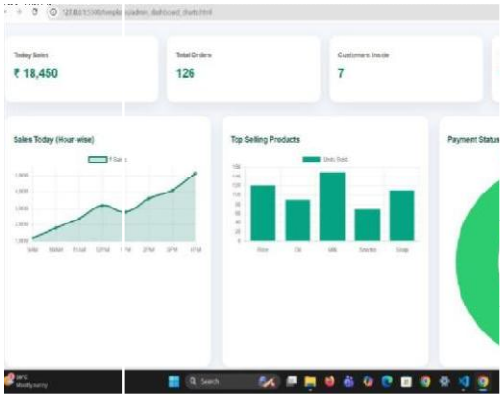


Admin Module

The admin login form allows authorized administrators to securely access the system using their email and password. It ensures that only verified personnel can manage users, monitor transactions, and maintain system security. Through this login, admins can control the e-wallet system, update records, and generate reports efficiently. This module is essential for smooth and safe management of all system operations.



Admin Dashboard



This dashboard monitors a retail store's daily operations through visual analytics. It displays key metrics such as sales revenue, order count, customer presence, and payment success rates. The interface includes three charts: a line graph tracking hourly sales trends, a bar chart comparing product category performance, and a pie chart showing payment transaction outcomes. This real-time visualization helps managers monitor business performance and make datadriven decisions.

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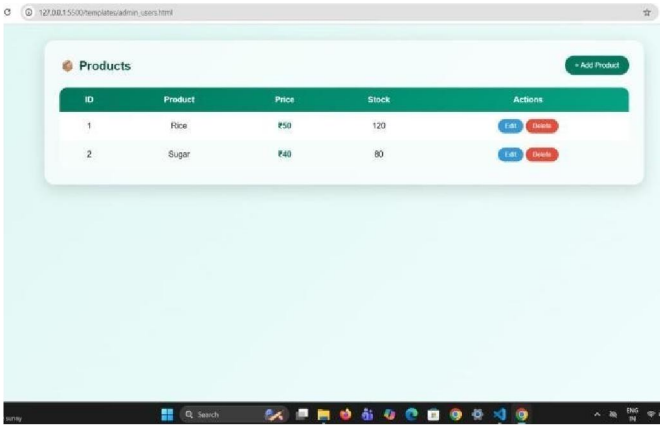
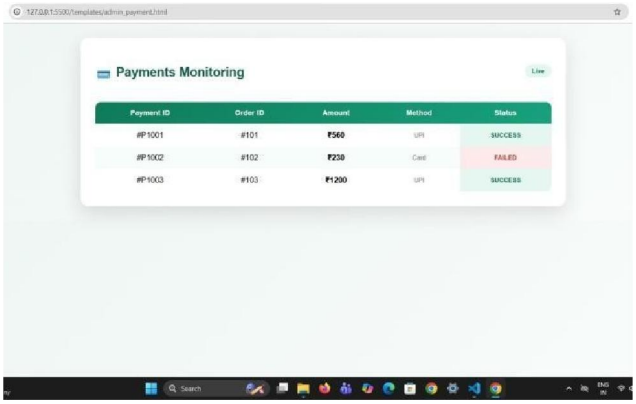
Product Management Interface



This is a product management interface that allows administrators to view and manage inventory items. The page displays a table with essential product information organized in columns: product ID, product name, price, available stock quantity, and action buttons. Each product entry includes Edit and Delete buttons for modifying or removing items from the inventory. The interface also features an Add Product button at the top right corner, enabling administrators to add new items to the product catalog. This system provides a straightforward way to maintain product records, update pricing and stock levels, and perform basic inventory management tasks through a clean, user-friendly interface.

Payments Monitoring System



This page provides a real-time payments monitoring system for tracking transaction activities. The interface displays a table that organizes payment information into five key columns: payment identification number, corresponding order number, transaction amount, payment method used, and current transaction status.

The system supports multiple payment methods and clearly indicates whether each transaction was completed successfully or failed. A live indicator at the top confirms that the monitoring system is actively tracking transactions in real-time.

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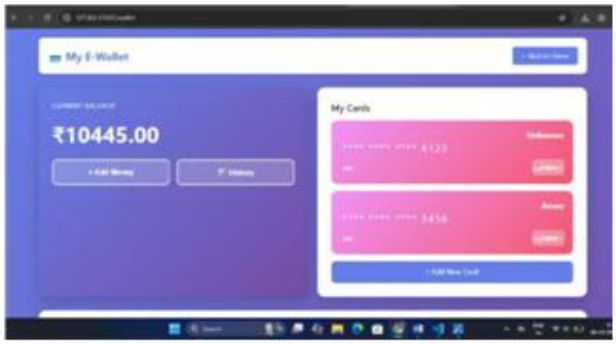
E-Wallet Payment System



This digital wallet interface displays the user's current balance and provides options to add funds or view transaction history. The page includes a card management section showing saved payment cards with masked numbers for security. Users can add new cards and navigate back to the home page. This system allows convenient management of multiple payment methods and financial transactions from one centralized platform.

Transaction History

This transaction history page displays a chronological list of wallet activities including deposits and payments. Each entry shows the transaction type, date, time, and amount, with color coding to differentiate deposits (blue, positive amounts) from purchases (red, negative amounts). The scrollable interface allows users to track their spending and monitor account activity efficiently.

XII. CONCLUSION

This project successfully demonstrates an e-wallet–based cashless shopping system that reduces customer waiting time and improves checkout efficiency. By enabling online product selection, automated billing, and secure digital payments, the system eliminates the need for traditional cashier-based transactions. The implementation results confirm accurate transaction processing and reliable system performance. Overall, the proposed solution provides a simple, efficient, and cost-effective approach for modernizing retail shopping, particularly for small and medium- sized shops.

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