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Design and Development of a Web-Based CRM Information System to Support Product Sales Strategies for Coffee MSMEs

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Abstract

The rapid growth of the coffee shop industry requires Micro, Small, and Medium Enterprises (MSMEs) to adopt digital technologies that strengthen customer loyalty, retention, and operational efficiency. Kopi Banget MSME continues to rely on manual transaction recording and lacks an integrated customer database, limiting its ability to implement systematic retention strategies and manage customer relationships effectively. This study aims to design and develop a web-based Customer Relationship Management (CRM) system based on the CRM Lite-Loyalty concept to support customer loyalty and retention strategies. The system was developed using the Rapid Application Development (RAD) methodology, which facilitates iterative development and flexible adaptation to user requirements. The application was implemented using the Laravel framework and a MySQL database and integrated with a WhatsApp Gateway API and automated scheduling mechanisms. System evaluation employed Black-Box Testing to validate functionality and PageSpeed Insights to assess application performance. The findings show that the developed system supports rapid customer onboarding, automated loyalty point calculation, reward redemption validation, and proactive customer retention through personalized WhatsApp messaging. Functional testing achieved 100% successful validation across 26 test scenarios, while performance testing indicated responsive interface performance. These results demonstrate that the CRM Lite-Loyalty system can integrate loyalty management and retention mechanisms into a unified web-based platform. The study contributes a practical digital CRM solution for MSMEs and provides an implementable approach for improving customer

relationship management, loyalty program administration, and retention activities through integrated digital processes.

Keywords: Customer Relationship Management; Customer Retention; Loyalty Program; Micro, Small, and Medium Enterprises; Web-Based CRM

INTRODUCTION

The increasing competition among Micro, Small, and Medium Enterprises (MSMEs) in the food and beverage sector has shifted business priorities from merely acquiring customers toward developing sustainable customer relationships. In the coffee shop industry, business continuity is no longer determined only by product quality and pricing strategies but also by the ability of enterprises to understand customer behavior and maintain repeated interactions. Recent studies highlight that digital capability and Customer Relationship Management (CRM) competence have become important factors influencing MSME competitiveness in the digital era (Efendi, 2023; Vidyanata et al., 2023). However, many MSMEs still encounter difficulties in transforming customer interactions into structured information that can support strategic decision-making.

Customer retention has become a critical issue because maintaining existing customers requires different strategies from acquiring new customers. Customer loyalty provides businesses with sustainable competitive advantages through repeated purchasing behavior and stronger customer attachment (Arslan, 2020) . However, achieving customer loyalty requires organizations to systematically manage customer data, purchasing history, and communication processes. Previous research indicates that customer retention contributes significantly to organizational growth because continuous engagement with existing customers can improve business stability and reduce dependence on new customer acquisition (Ejibenam et al., 2021) . Therefore, MSMEs require digital solutions that not only record transactions but also facilitate long-term relationship management.

Despite the importance of CRM implementation, many MSMEs still apply customer management practices through manual approaches or fragmented digital channels. In the case of Kopi Banget MSME, customer information was previously managed through informal interactions between employees and customers, resulting in limited knowledge regarding customer profiles, purchase frequency, and customer loyalty levels. This condition

creates difficulties for management in identifying loyal customers and recognizing inactive customers who potentially contribute to declining sales. Consequently, the absence of an integrated customer management mechanism limits the ability of MSMEs to conduct personalized marketing and proactive retention strategies.

Several studies have investigated the implementation of CRM systems to improve business processes and customer management. (Anggara et al., 2022) developed a web-based CRM system for cosmetic sales management, demonstrating that CRM implementation can improve customer data management and sales activities. Similarly, (Siallagan et al., 2020) implemented CRM in a web-based bakery information system to support customer relationship management. More recent studies have also explored CRM applications in MSMEs, including CRM implementation for flower businesses (Idrus et al., 2025) , customer loyalty improvement in MSMEs (Rimbasari & Afandi, 2025) , and digital marketing strategies based on CRM approaches (Fitriany & Yurisman Star, 2025) . These studies demonstrate the relevance of CRM adoption; however, most existing implementations primarily emphasize customer databases, sales management, or promotional activities rather than developing automated mechanisms for re-engaging inactive customers.

The limitation of previous approaches indicates a research gap in developing CRM solutions that integrate customer loyalty mechanisms with proactive retention strategies, particularly for MSMEs with limited technological resources. (Purnama & Manalu, 2024) identified that CRM implementation in the digital economy continues to face challenges related to adaptation, integration, and practical implementation. In addition, (Fitria et al., 2024) demonstrated that web-based CRM systems can support business management, but the focus remains primarily on information management rather than behavioral-based customer engagement. Therefore, there is a need for a simplified CRM model that enables MSMEs to manage customer loyalty while simultaneously initiating personalized communication based on customer activity patterns.

This study introduces the concept of CRM Lite-Loyalty, a simplified CRM approach designed specifically for MSME operational characteristics. Unlike conventional CRM systems that often require complex infrastructures and extensive customer management processes, CRM Lite-Loyalty focuses on three integrated components: customer identification through WhatsApp numbers, transaction-based loyalty point management, and automated customer retention through scheduled messaging. The novelty of this research

lies in combining loyalty management and customer re-engagement mechanisms within a lightweight web-based CRM framework. By integrating WhatsApp Gateway technology with automated retention processes, the proposed system extends CRM functionality from passive customer data storage into an active customer relationship strategy.

From a methodological perspective, this research applies the Rapid Application Development (RAD) approach to develop a CRM system that aligns with MSME requirements. RAD enables iterative system development through continuous interaction between developers and users, making it suitable for applications requiring rapid adaptation to business needs (Cahyadi & Sutisna, 2023). Previous CRM-based system developments have demonstrated the effectiveness of web technologies in improving operational efficiency, but further exploration is needed regarding lightweight CRM models that combine loyalty programs and automated retention features. Thus, this study contributes both practically and conceptually by proposing a CRM implementation model that addresses the specific challenges faced by MSMEs in maintaining customer relationships.

Based on the identified problems and research gap, this study aims to design and develop a web-based Customer Relationship Management system for Kopi Banget MSME using the CRM Lite-Loyalty concept. Specifically, this research focuses on developing customer data management, implementing a loyalty point mechanism, integrating automated retention through WhatsApp Gateway, and evaluating system functionality and performance. The findings are expected to contribute to the development of practical CRM solutions for MSMEs by demonstrating how digital customer relationship strategies can be implemented through accessible technologies while supporting sustainable customer engagement.

METHODS

1. Type of Research

This research was conducted at Kopi Banget MSME, a coffee shop business located in Tangerang Regency, Indonesia. The research focused on developing a web-based Customer Relationship Management (CRM) system to support customer loyalty management and retention activities. Data collection was performed through interviews, direct observation, and documentation analysis to identify existing business processes, operational challenges, and system requirements.

Interviews were conducted with business stakeholders to understand current customer management practices, loyalty mechanisms, promotional activities, and customer retention problems. Observation was carried out on cashier activities, customer ordering processes, member registration procedures, and transaction recording workflows. The collected information was analyzed to determine the functional requirements of the proposed CRM Lite-Loyalty system, which structures operational roles across five primary system actors.

Table 1. Core Functional Requirements

Actor	Required Capability
Employee/Cashier	Authenticate into the system, register new members, input customer information, update customer loyalty points, process customer redemption requests, and access customer information
Manager	Authenticate into the system, monitor customer information, manage retention features, configure master promotion settings, and manage loyalty-related configurations
Customer	Provide WhatsApp number during transaction activities, receive loyalty information, and receive automated notifications through WhatsApp Gateway
CRM System	Store customer data, validate customer records, calculate loyalty points, update visit history, evaluate loyalty rules, and trigger automated retention notifications
WhatsApp Gateway	Deliver automated messages related to loyalty information, transaction confirmation, and customer retention communication

Table 1. Core Functional Requirements shows that the system defines distinct functional capabilities across five primary entities: Employee/Cashier, Manager, Customer, CRM System, and WhatsApp Gateway. The Employee/Cashier handles daily member registration, transaction input, point updates, and redemption processing. The Manager maintains strategic oversight, configuring promotion settings, retention parameters, and system rules. The Customer interacts passively by providing contact details and receiving automated updates, while the CRM System executes background logic including data validation, point calculation, and event triggers. Finally, the WhatsApp Gateway handles outbound communication to deliver real-time notifications and retention messages.

2. RAD Development Procedure

The system development process adopted the Rapid Application Development (RAD) methodology, which emphasizes iterative development, rapid prototyping, and continuous improvement through user involvement. RAD was selected because the

development of an MSME-based CRM system requires flexibility in adjusting system requirements according to operational needs and stakeholder feedback.

The RAD implementation consisted of four stages: requirements planning, user design, construction, and cutover. The requirements planning stage focused on identifying business problems, defining system objectives, and analyzing user requirements based on existing operational processes. The user design stage transformed the identified requirements into system models, including use case diagrams, business process models, and interface designs. The construction stage involved implementing the CRM Lite-Loyalty features, including customer management, loyalty point processing, promotion management, and automated retention mechanisms. The cutover stage involved system verification, functional evaluation, and preparation of the developed system for operational use.

3. Use Case Diagram

The functional structure of the proposed system is modeled to illustrate how different user roles interact with system services. By mapping user interactions, the architecture clarifies how operational tasks and managerial controls are distributed within the CRM application. The system involves three main actors: employee/cashier, manager, and customer.

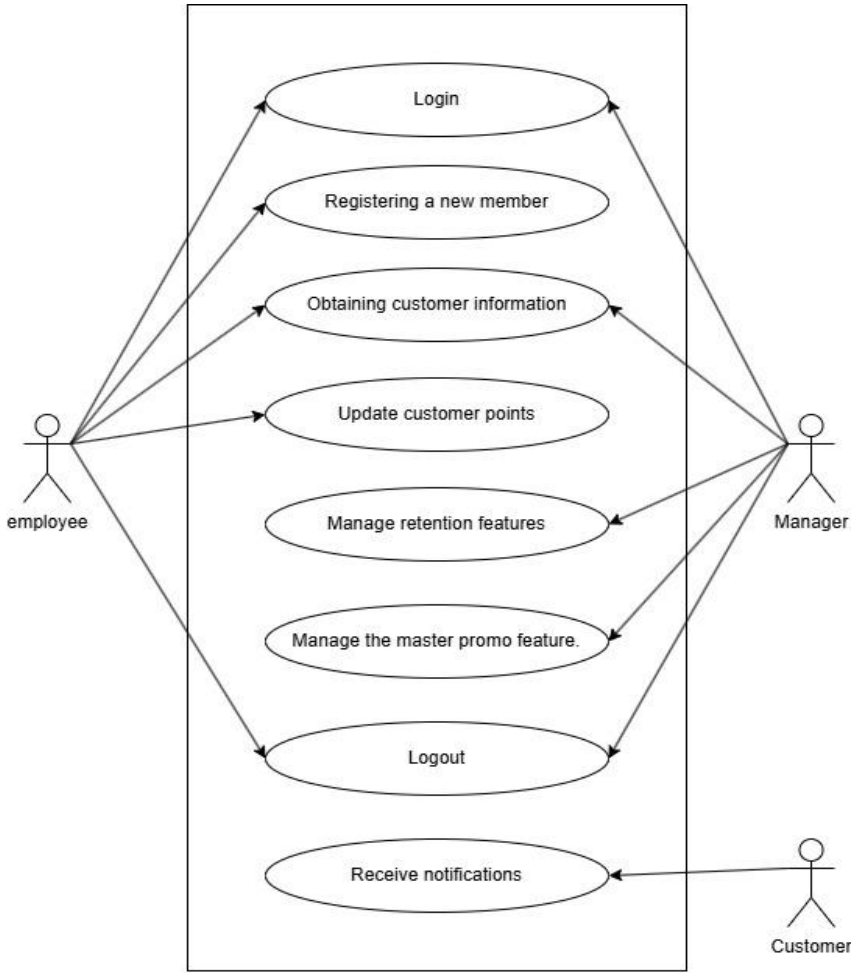

Figure 1. Use Case Diagram of CRM Lite-Loyalty System

Figure 1. Use Case Diagram of CRM Lite-Loyalty System shows that the system defines specific operational boundaries for three primary actors: employee, manager, and customer. The employee actor executes core operational use cases such as system login, new member registration, customer information retrieval, point updates, and logout. The manager actor holds high-level authorization to access customer data, manage retention settings, and configure master promotions. The customer acts as an external recipient who interacts with the system passively by receiving automated notifications, establishing a clear division between front-end operations, administrative configuration, and customer-facing communications.

4. Proposed Business Process Workflow

The proposed business process describes the end-to-end operational workflow integrating customers, employees, the web-based CRM system, and the WhatsApp Gateway to support seamless transaction processing and automated engagement.

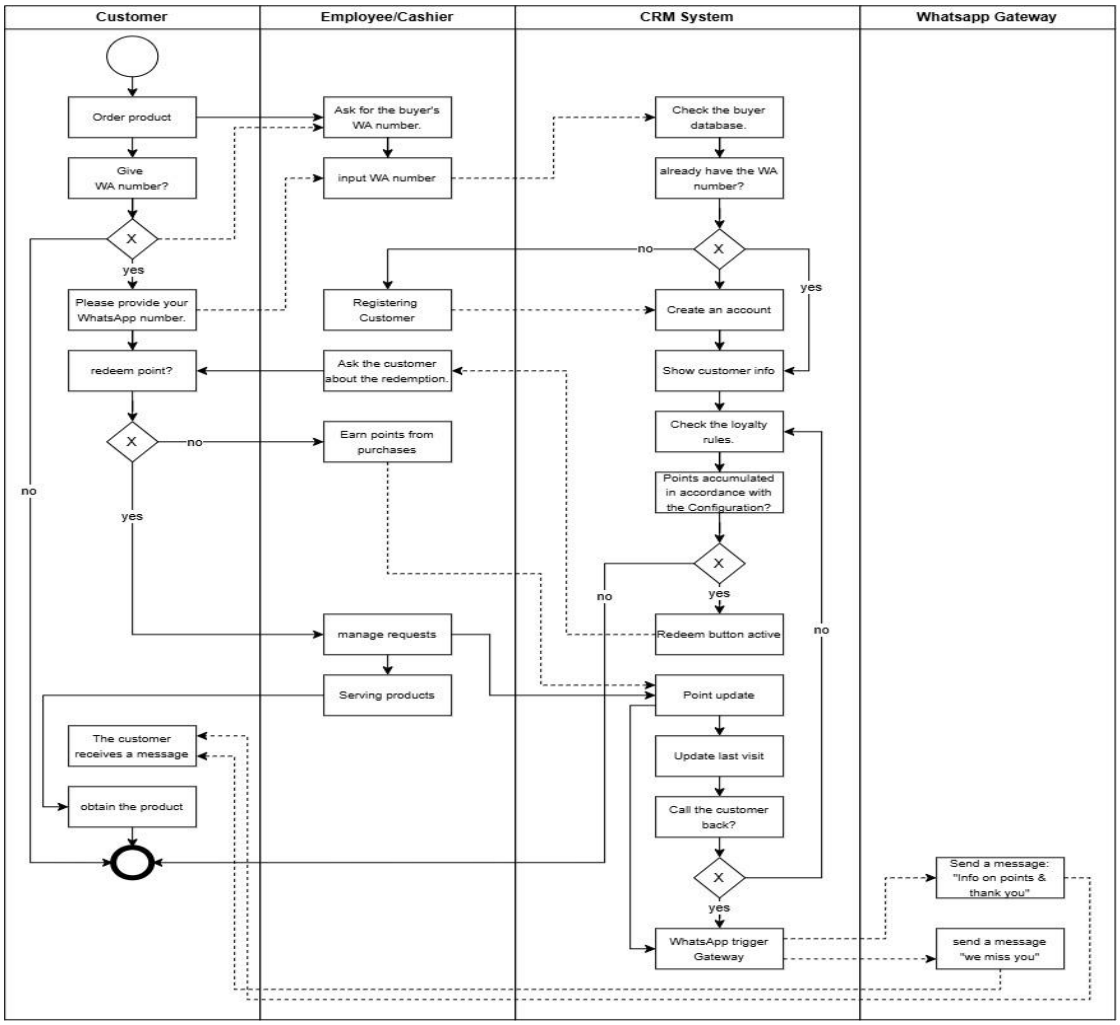

Figure 2. Proposed Business Process of CRM Lite-Loyalty System

Figure 2. Proposed Business Process of CRM Lite-Loyalty System, shows that the system workflow seamlessly integrates four key actors Customer, Employee, CRM System, and WhatsApp Gateway to automate customer identification, loyalty calculation, and proactive retention messaging. The interaction begins when a customer places an order and provides their WhatsApp number as a unique identifier. The CRM system checks the database; if the phone number is not registered, a new account is automatically created, whereas existing profiles are retrieved immediately to display current loyalty status. Following customer identification, the transaction proceeds to loyalty point management,

where the CRM system evaluates active rules, updates accumulated points based on purchase activities, and checks reward redemption eligibility. If point thresholds are met, the redemption button is activated, allowing the cashier to process the reward request and update both the point balance and the latest visit timestamp. Finally, the CRM system evaluates whether customer re-engagement is required; for inactive members, it automatically triggers the WhatsApp Gateway to deliver personalized retention messages (such as point balance summaries or "We Miss You" prompts).

5. Implementation of CRM Lite-Loyalty

The CRM Lite-Loyalty system was implemented as a web-based application that integrates customer management, loyalty point processing, promotion management, and automated retention features. The system uses customer WhatsApp numbers as unique identifiers to simplify member registration and customer recognition during transactions. Employees can manage customer data, record loyalty activities, and process reward redemption, while managers can configure master promotion rules and retention parameters. The system also integrates automated processes through WhatsApp Gateway, enabling customer communication based on transaction activities and customer inactivity conditions. This implementation transforms conventional transaction recording into a structured customer relationship management mechanism that supports loyalty development and customer retention strategies.

6. Testing

The developed CRM Lite-Loyalty system was evaluated using a dual-testing approach comprising functional Black-Box Testing and performance testing via Google PageSpeed Insights (PSI). Black-Box Testing was conducted to verify the functional suitability of the implemented features by evaluating system behavior based on inputs and expected outputs without analyzing the internal source code structure. This functional evaluation covered critical system workflows of the system, while the client-side efficiency and visual responsiveness were rigorously assessed through PageSpeed Insights (PSI) performance testing. The PSI evaluation measured key web performance and user experience metrics specifically First Contentful Paint (FCP), Largest Contentful Paint (LCP), Total Blocking Time (TBT), Cumulative Layout Shift (CLS), and Speed Index across six core operational pages (Login, Dashboard, Add Member, Cashier History, Settings, and Management History).

RESULTS

1. Management Interface

The developed CRM Lite-Loyalty system provides a management interface that functions as a centralized control center for configuring customer relationship strategies and operational parameters.

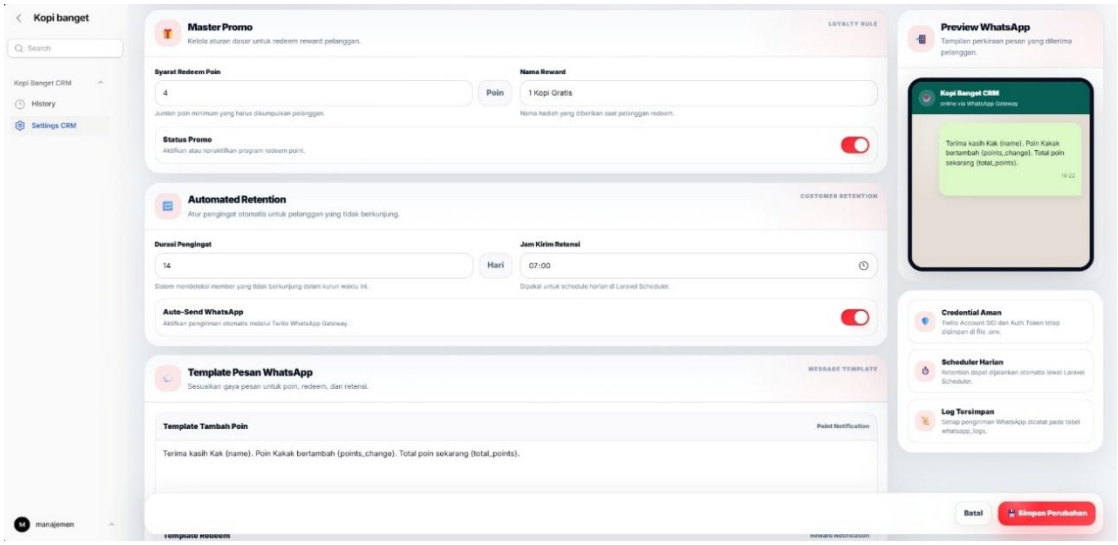

Figure 3. Management Interface of CRM Lite-Loyalty System

Figure 3. Management Interface of CRM Lite-Loyalty System, shows that the management control panel is structured into modular configuration sections including Master Promo, Automated Retention, WhatsApp Message Template management, and a real-time message preview panel. In the Master Promo section, managers can dynamically define redemption rules, such as setting the minimum required points (e.g., 4 points for 1 Free Coffee) and toggling promotion availability without altering the application codebase. The Automated Retention section allows customization of trigger conditions, including the inactivity threshold duration (e.g., 14 days), daily execution time (e.g., 07:00 AM managed by Laravel Scheduler), and automated WhatsApp dispatch toggles. Furthermore, the interface provides customizable message templates for point updates, reward redemptions, and customer re-engagement campaigns, supported by a live WhatsApp preview widget, secure API credential storage indicators, and transaction logging features to ensure operational flexibility and stability.

2. Cashier Interface and Loyalty Transaction

The cashier interface was implemented to support daily customer service activities, enabling fast customer identification and streamlined loyalty transaction processing during checkout operations.

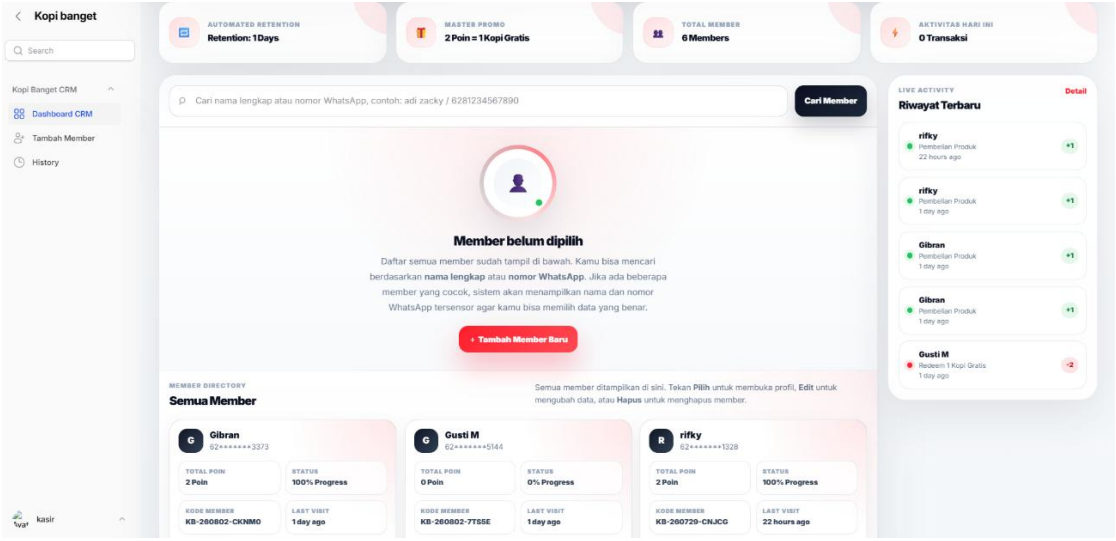

Figure 4. Cashier Dashboard and Member Directory Interface

Figure 4. Cashier Dashboard and Member Directory Interface, shows that the dashboard layout is organized into four main operational areas: top metric summary cards, a search and onboarding section, a member directory grid, and a real-time activity feed. The top metric cards present key operational indicators, including current retention parameters, active promotional rules (such as 2 Poin = 1 Kopi Gratis), total registered members, and daily transaction counts. Below the metric summary, the central search bar allows cashiers to retrieve customer profiles quickly using names or WhatsApp numbers, complemented by a prominent "+ Tambah Member Baru" button for rapid member onboarding. The Member Directory grid displays individual customer cards featuring privacy-masked phone numbers (e.g., 62*******5144), accumulated loyalty points, redemption progress percentages, unique member codes, and last visit timestamps. Additionally, the Live Activity sidebar on the right provides an auditable log of recent transactions, capturing point accruals from product purchases as well as point deductions from reward redemptions.

3. Loyalty Point Validation: Insufficient and Sufficient Point Conditions

The CRM Lite-Loyalty system implements an automated validation UI to control reward redemption eligibility dynamically based on real-time point balances.

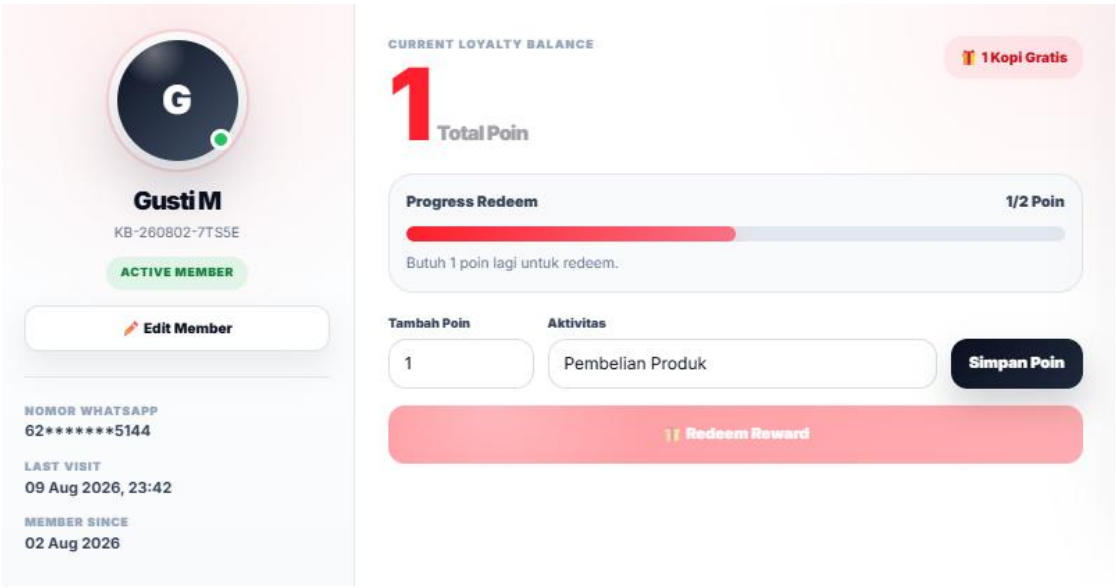

Figure 5. Insufficient Points Condition With Locked Redemption Button

Figure 5. Insufficient Points Condition with Locked Redemption Button, shows that when a customer's balance (e.g., 1 Total Poin for member Gusti M) falls short of the configured threshold (2 Poin for 1 Kopi Gratis). Under this condition, the "Redeem Reward" button remains visually faded and functionally disabled, preventing employees from processing unauthorized or invalid reward redemptions while still allowing cashiers to add new points from purchase transactions.

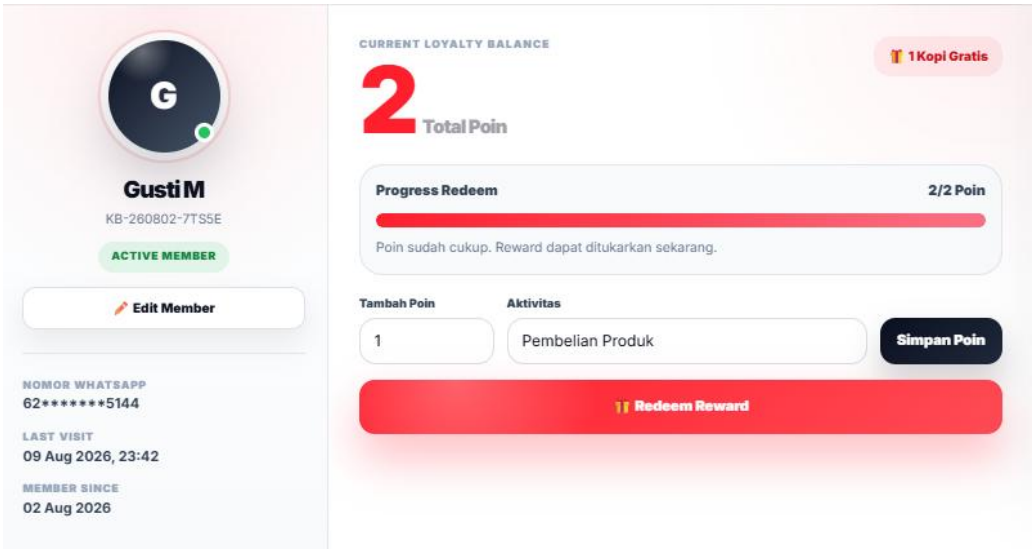

Figure 6. Sufficient Points Condition With Active Redemption Button

Figure 6. Sufficient Points Condition with Active Redemption Button, illustrates that once a customer has accumulated enough points to meet the promotion requirements (reaching the 2/2 point threshold), the progress bar hits 100% and the system automatically triggers a notification; the "Redeem Reward" button then automatically becomes fully active and turns a solid red, allowing the cashier to complete the transaction and deduct the corresponding points.

4. WhatsApp Notification Delivery for Loyalty Activities and Customer Retention

The CRM Lite-Loyalty system integrates the WhatsApp Gateway to support automated, event-triggered customer communication directly linked to transactional and retention activities.

Figure 7. WhatsApp Notification Implementation: (a) loyalty point addition notification, (b) successful redemption confirmation, and (c) customer retention message.

Figure 7. WhatsApp Notification Implementation: (a) loyalty point addition notification, (b) successful redemption confirmation, and (c) customer retention message, shows that the automated messaging pipeline delivers distinct dynamic notifications tailored to specific customer interactions via the WhatsApp Gateway (dispatched through the Fonnte API integration). As shown in Figure 7(a), upon completing a transaction, the customer receives an immediate confirmation detailing the newly earned point and updated total balance ("Terima kasih Kak Gusti M. Poin Kakak bertambah 1. Total poin sekarang 1."). Figure 7(b) demonstrates the redemption confirmation sent automatically after a reward exchange, summarizing the redeemed reward item and the remaining point balance ("Selamat

Kak Gusti M, redeem 1 Kopi Gratis berhasil. Sisa poin Kakak 0."). Lastly, Figure 7(c) illustrates the automated customer retention mechanism, where inactive members reaching the configured inactivity threshold automatically receive a personalized re-engagement message reminding them of their unused points ("Halo Kak Gusti M, sudah lama tidak mampir ke Kopi Banget. Poin Kakak masih ada 2. Yuk mampir lagi!"), effectively transforming static transaction data into proactive, direct customer engagement channels.

5. Black-Box Testing Results

The functional validation of the CRM Lite-Loyalty system was conducted using Black-Box Testing to evaluate feature compliance against predefined operational and system specifications across its primary user interfaces.

Table 2. Black-Box Testing Results of CRM Lite-Loyalty System.

Testing Group	Number of Scenarios	Valid	Invalid	Percentage
CRM System for Cashier/Employee	14	14	0	100%
Management Dashboard	12	12	0	100%
Total	26	26	0	100%

Table 2. Black-Box Testing Results of CRM Lite-Loyalty System, shows that all 26 evaluated test scenarios across both major system modules achieved a 100% functional validation success rate, with zero invalid test outcomes recorded. Specifically, the Cashier/Employee CRM System successfully verified 14 operational scenarios including member lookup, new account registration, purchase point additions, eligibility status checking, and reward redemption processing. Concurrently, the Management Dashboard successfully verified 12 administrative scenarios, validating Master Promo adjustments, automated retention duration parameters, customizable WhatsApp message templates, and automated dispatch triggers. These empirical results demonstrate that the proposed CRM Lite-Loyalty platform operates reliably and completely fulfills all specified functional requirements.

6. Performance Testing Results

The performance evaluation of the CRM Lite-Loyalty system was conducted using Google PageSpeed Insights to measure web client efficiency, rendering speed, and UI stability across six core operational pages.

The evaluation focused on six main system pages: Login, Dashboard, Add Member, Cashier History, Settings, and Management History. The measured parameters included

Performance Score, First Contentful Paint (FCP), Largest Contentful Paint (LCP), Total Blocking Time (TBT), Cumulative Layout Shift (CLS), and Speed Index (SI).

Table 3. Website Performance Testing Results of CRM Lite-Loyalty System

Login Page Performance Test Results		
Testing Metrics	**Actual Value**	**Category**
Performance Score	97 / 100	Excellent
First Contentful Paint (FCP)	0,5 Seconds	Good
Largest Contentful Paint (LCP)	1,1 Seconds	Good
Total Blocking Time (TBT)	0 Milliseconds	Good
Cumulative Layout Shift (CLS)	0	Good
Speed Index (SI)	1,2 Seconds	Good
Dashboard Page Performance Test Results		
Testing Metrics	**Actual Value**	**Category**
Performance Score	97 / 100	Excellent
First Contentful Paint (FCP)	0,5 Seconds	Good
Largest Contentful Paint (LCP)	1,1 Seconds	Good
Total Blocking Time (TBT)	0 Milliseconds	Good
Cumulative Layout Shift (CLS)	0	Good
Speed Index (SI)	1,2 Seconds	Good
Add Member Page Performance Test Results		
Testing Metrics	**Actual Value**	**Category**
Performance Score	98 / 100	Excellent
First Contentful Paint (FCP)	0,5 Seconds	Good
Largest Contentful Paint (LCP)	1,1 Seconds	Good
Total Blocking Time (TBT)	0 Milliseconds	Good
Cumulative Layout Shift (CLS)	0	Good
Speed Index (SI)	0,9 Seconds	Good
Cashier's History Page Performance Test Results		
Testing Metrics	**Actual Value**	**Category**
Performance Score	98 / 100	Excellent
First Contentful Paint (FCP)	0,6 Seconds	Good
Largest Contentful Paint (LCP)	1,1 Seconds	Good
Total Blocking Time (TBT)	0 Milliseconds	Good
Cumulative Layout Shift (CLS)	0	Good
Speed Index (SI)	0,9 Seconds	Good
Settings Page Performance Test Results		

Testing Metrics	**Actual Value**	**Category**
Performance Score	98 / 100	Excellent
First Contentful Paint (FCP)	0,5 Seconds	Good
Largest Contentful Paint (LCP)	1,1 Seconds	Good
Total Blocking Time (TBT)	30 Milliseconds	Good
Cumulative Layout Shift (CLS)	0	Good
Speed Index (SI)	0,9 Seconds	Good
Management's History Page Performance Test Results		
Testing Metrics	**Actual Value**	**Category**
Performance Score	98 / 100	Excellent
First Contentful Paint (FCP)	0,5 Seconds	Good
Largest Contentful Paint (LCP)	1,1 Seconds	Good
Total Blocking Time (TBT)	0 Milliseconds	Good
Cumulative Layout Shift (CLS)	0	Good
Speed Index (SI)	0,9 Seconds	Good

Table 3. Website Performance Testing Results of CRM Lite-Loyalty System, shows that all evaluated pages achieved very good performance levels, with performance scores ranging from 97 to 98 out of 100. The Login and Dashboard pages obtained a score of 97/100, while the Add Member, Cashier History, Settings, and Management History pages achieved 98/100.

The detailed measurement results indicate that the system maintained efficient rendering and stable interface performance. The First Contentful Paint (FCP) values ranged between 0.5 and 0.6 seconds, while the Largest Contentful Paint (LCP) consistently remained at 1.1 seconds across all evaluated pages. The Total Blocking Time (TBT) values were mostly 0 milliseconds, with the Settings page recording 30 milliseconds, while all pages achieved a Cumulative Layout Shift (CLS) value of 0, indicating stable visual rendering. The Speed Index values ranged between 0.9 and 1.2 seconds, demonstrating that the CRM Lite-Loyalty interface provided responsive access for operational activities.

DISCUSSION

1. Analysis and Interpretation of Findings

The findings demonstrate that the CRM Lite-Loyalty system successfully transformed conventional customer management activities into a structured digital customer relationship process. Before implementation, customer information management at Kopi Banget MSME relied primarily on direct interaction and informal recognition, which limited the ability to monitor customer behavior and maintain continuous engagement. The developed system addresses this limitation by integrating customer identification, loyalty point management, reward redemption, and automated retention communication within a single platform.

The implementation results indicate that the CRM Lite-Loyalty approach provides three important capabilities: customer data centralization, loyalty-based engagement, and proactive customer communication. The customer identification mechanism using WhatsApp numbers enables employees to recognize customers during transactions, while the loyalty point mechanism provides measurable incentives for repeat purchases. Furthermore, the automated retention feature extends CRM functionality beyond data storage by enabling the system to initiate communication with customers based on inactivity conditions. This approach supports the transition of CRM from a passive information management tool into an active customer engagement mechanism.

The successful integration between transaction activities and customer communication represents the main contribution of this research. Unlike conventional loyalty programs that depend on manual monitoring, the proposed system automatically connects transaction records with customer relationship activities. This enables MSMEs with limited resources to implement customer retention strategies through a lightweight CRM architecture.

2. Research Limitations and Directions for Future Research

The findings of this research support previous studies regarding the role of digital Customer Relationship Management (CRM) in improving customer relationship processes within small businesses. (Sabrina et al., 2024) demonstrated that the implementation of web-based E-CRM can support customer loyalty improvement through structured customer data

management and digital interaction mechanisms. Similar to these findings, the CRM Lite-Loyalty system developed in this research integrates customer information management with loyalty-based engagement. However, this study extends previous approaches by incorporating automated retention mechanisms through WhatsApp Gateway, enabling the system to actively initiate customer communication based on customer activity conditions.

The implementation of loyalty point management in this research is also consistent with the findings of (Sudarsono & Vebriandi, 2025) , who demonstrated that CRM systems integrated with loyalty point programs can optimize customer data management and reward mechanisms. However, the CRM Lite-Loyalty approach differs by emphasizing a simplified architecture suitable for MSME operational conditions. The system does not only manage reward accumulation and redemption but also connects loyalty activities with customer retention processes, creating a more integrated customer engagement workflow.

In the context of coffee shop and food-related MSMEs, the results are comparable with the study conducted by (Dewantoro & Dermawan, 2025) which highlighted the importance of website-based CRM implementation in supporting customer relationships within coffee businesses. Furthermore, (Wijaya et al., 2023) showed that CRM adoption in MSMEs can improve customer information management and business interaction processes. The findings of this research reinforce these studies by demonstrating that CRM implementation can be adapted for MSMEs through lightweight digital solutions that combine transaction management, loyalty programs, and automated customer communication.

The functional validation results obtained through Black-Box Testing are aligned with software evaluation practices described by (Uminingsih et al., 2022), where Black-Box Testing is used to verify whether software functions operate according to predefined requirements. The 100% validation result obtained from 26 testing scenarios confirms that the implemented CRM Lite-Loyalty features, including customer management, loyalty point processing, redemption validation, and WhatsApp notification delivery, function according to the designed specifications. These findings indicate that the proposed system provides both functional reliability and practical applicability for MSME-level CRM implementation.

3. Research Implications

This research provides both theoretical and practical implications. From a theoretical perspective, this study contributes to the discussion of CRM implementation in MSMEs by

proposing the CRM Lite-Loyalty concept, which integrates loyalty management and automated retention within a simplified digital framework. The research demonstrates that CRM adoption in small businesses does not necessarily require complex enterprise-level systems but can be adapted through lightweight architectures that focus on essential customer relationship functions (Fauziah et al., 2024) .

From a practical perspective, the developed system provides MSME owners with a mechanism to manage customer relationships based on structured data rather than relying solely on manual interaction. The system enables managers to configure loyalty rules, monitor customer activity, identify inactive customers, and maintain communication through automated WhatsApp messages. These capabilities can support more consistent customer engagement strategies and assist business owners in making decisions based on customer activity information.

The integration of WhatsApp Gateway also provides practical value because WhatsApp represents a communication channel that is familiar to many customers and businesses (Amman & I., 2025; Bariyah & Imania, 2022) . Therefore, the proposed approach reduces adoption barriers compared with CRM systems requiring customers to install additional applications.

4. Research Limitations and Directions for Future Research

Although the CRM Lite-Loyalty system successfully implements customer management and retention mechanisms, several limitations remain. First, the system evaluation was conducted within a single MSME context, namely Kopi Banget, which limits the generalization of findings to other business sectors or larger organizations. Second, the current system focuses on rule-based retention mechanisms using predefined inactivity periods and does not yet implement predictive analysis to identify customer behavior patterns automatically.

Third, this research evaluates system functionality and performance aspects but does not measure long-term changes in customer loyalty behavior, such as changes in purchase frequency, retention rate, or customer lifetime value after system implementation. Future research may extend this study by implementing customer segmentation, machine learning-based churn prediction, recommendation mechanisms, and analytical dashboards to provide deeper customer insights.

Future studies may also investigate the scalability of CRM Lite-Loyalty implementation across different MSME sectors and evaluate its effectiveness through longitudinal studies involving larger customer populations and longer observation periods.

CONCLUSION

Although the CRM Lite-Loyalty system successfully implements customer management and retention mechanisms, several limitations remain. First, the system evaluation was conducted within a single MSME context, namely Kopi Banget, which limits the generalization of findings to other business sectors or larger organizations. Second, the current system focuses on rule-based retention mechanisms using predefined inactivity periods and does not yet implement predictive analysis to identify customer behavior patterns automatically. Third, this research evaluates system functionality and performance aspects but does not measure long-term changes in customer loyalty behavior, such as changes in purchase frequency, retention rate, or customer lifetime value after system implementation. Future research may extend this study by implementing customer segmentation, machine learning-based churn prediction, recommendation mechanisms, and analytical dashboards to provide deeper customer insights. Future studies may also investigate the scalability of CRM Lite-Loyalty implementation across different MSME sectors and evaluate its effectiveness through

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