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Design of an E-Commerce Information System for Textile Material Sales Applying Customer Relationship Management (CRM)

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ABSTRACT
The advancement of technology has transformed the way businesses interact with customers. An effective approach is to implement Customer Relationship Management (CRM) in e-commerce systems. Despite the growing body of literature on CRM and e-commerce integration, limited studies have addressed practical implementations for small-scale retail businesses in developing country contexts, particularly those operating textile material sales with fully manual legacy processes. This research aims to design and implement an e-commerce information system for Happy Abadi Store a textile material retailer by incorporating CRM methods grounded in the three core CRM objectives of customer identification, customer-centric program development, and coordinated service delivery as defined. The system is developed using PHP as the programming language and MySQL as the database management system. Using the Unified Modelling Language (UML) for system modeling, the design encompasses use case diagrams, class diagrams, activity diagrams, and sequence diagrams. The database consists of ten interrelated relational tables covering admin, customer, product, category, cart, transaction, bank account, proof of payment, courier, and voucher data. Functional testing results confirm that all twelve system modules operate as intended. The implementation of an e-commerce system with a CRM approach demonstrates potential to enhance customer interaction, optimize promotional activities, and improve overall business data management for small and medium-sized enterprises (SMEs).

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INTRODUCTION

The rapid advancement of information technology has fundamentally transformed modern business practices, particularly in the retail sector (Maulidina & Nafiati, 2024; Hasibuan et al., 2024). The transition from conventional commerce to digital platforms has become a strategic necessity for businesses seeking to remain competitive and expand their market reach (Tarigan et al., 2024). E-commerce, defined as commercial transactions conducted electronically through the internet, enables businesses to offer products and services without geographical and temporal limitations (Khair et al., 2021; Suradi, 2022). Through online platforms, companies can provide 24/7 access to product information and purchasing services, while simultaneously reducing operational costs related to physical infrastructure and manual administration (Firmansyah & Herman, 2023; Maulidina & Nafiati, 2024).

Abadi Store is a textile material retailer that previously operated entirely through manual business processes. Customers were required to visit the store directly to make purchases, transaction records were maintained in handwritten ledgers, and product availability inquiries relied on phone communication. These conventional practices resulted in several operational inefficiencies, including the risk of data loss, slow report generation, limited customer reach, and the absence of a structured digital engagement strategy (Afifah & Setyantoro, 2021; Sulastari et al., 2021). Such limitations reduced business agility and hindered opportunities for expansion in an increasingly digital marketplace (Tarigan et al., 2024).

Customer Relationship Management (CRM) is a strategic approach that emphasizes building, maintaining, and strengthening long-term customer relationships to enhance satisfaction, loyalty, and retention (Sartika & Murdana, 2023; Jam'an, 2021). Integrating CRM into an e-commerce platform enables businesses to manage customer data systematically, personalize shopping experiences, optimize promotional strategies, and analyze purchasing behavior for data-driven decision-making (Hikmatillah, 2022; Ramadhani et al., 2022). By leveraging CRM principles, businesses can shift from transactional selling to relationship-oriented marketing, thereby improving customer lifetime value (Firmansyah & H., 2021).

Although a growing body of literature addresses CRM integration in e-commerce systems (Khair et al., 2021; Br Purba & Harahap, 2024; Syahnita et al., 2022), several research gaps remain. First, most existing studies focus on medium or large enterprises, whereas the operational and resource constraints specific to small independent retailers such as the complete absence of digital infrastructure and customer data records have received less attention (Siahaan et al., 2023). Second, prior works largely report system design outcomes without explicitly mapping CRM features to established theoretical frameworks or evaluating the degree to which implemented features fulfill CRM objectives (Ramadhani et al., 2022). Third, studies in the textile retail context within developing country settings remain scarce (Maulidina & Nafiati, 2024). This research addresses these gaps by: (1) targeting a fully manual small-scale retailer as the implementation context; (2) explicitly linking each implemented system feature to the three CRM objectives established by Widyana et al. (2021); and (3) situating the contribution within the broader discourse on SME digital transformation.

This research aims to design and develop an e-commerce information system integrated with CRM methods using PHP as the programming language and MySQL as the database management system (Suradi, 2022). The proposed system is expected to overcome existing operational constraints, improve service efficiency, and provide a digital foundation for sustainable business growth (Tarigan et al., 2024).

An information system functions as an organized framework that processes input data into meaningful information outputs for managerial decision-making (Novitasari et al., 2021). It integrates people, procedures, data, hardware, and software components into coordinated subsystems consisting of input, processing, output, storage, and control mechanisms to ensure accurate and timely information flow within an organization (Suradi, 2022). E-commerce systems typically include essential functionalities such as product catalog management, shopping cart processing, secure payment confirmation, order tracking, and customer account

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administration (Khair et al., 2021; Firmansyah & Herman, 2023). For small and medium-sized enterprises, adopting e-commerce significantly expands market accessibility without requiring substantial capital investment in additional physical outlets (Maulidina & Nafiati, 2024). The ability to conduct continuous transactions and manage digital customer interactions enhances competitiveness and operational flexibility (Hasibuan et al., 2024).

CRM, as an integrated strategy combining information technology and marketing, encompasses processes of identifying customers, developing customer-oriented programs, and implementing coordinated service and promotional activities (Sartika & Murdana, 2023). Widyana et al. (2021) define three core CRM objectives: (1) customer identification collecting and structuring customer data to understand the customer base; (2) customer program development designing targeted promotions and personalized services; and (3) coordinated implementation delivering integrated sales, marketing, and after-sales service activities. Within an e-commerce environment, CRM features such as voucher-based promotions, order history tracking, customer databases, and transaction status updates operationalize these objectives and contribute to improved customer engagement and retention (Hikmatillah, 2022; Syahnita et al., 2022).

The system design in this research utilizes Unified Modeling Language (UML) to ensure structured development (Syarif & Nugraha, 2020). UML diagrams including Use Case Diagrams, Class Diagrams, Activity Diagrams, and Sequence Diagrams provide clarity, reduce development ambiguity, and support system scalability (Novitasari et al., 2021). PHP is a widely used server-side scripting language designed for dynamic web development and seamless database integration (Suradi, 2022). MySQL, as a relational database management system, supports structured data storage and efficient query processing (Suradi, 2022). The integration of PHP and MySQL offers a scalable, flexible, and cost-effective technology stack for developing e-commerce applications with CRM capabilities, ensuring reliable performance and long-term maintainability (Hasibuan et al., 2024).

METHODS

This research employed a descriptive-applied methodology integrating field study with structured system development procedures. The research was conducted from November 2023 to February 2024. The methodological stages were systematically organized to ensure comprehensive system analysis, design, implementation, and evaluation.The initial stage consisted of preliminary research through direct observation and in-depth interviews with the store owner. This phase examined existing operational workflows, identified key business problems, and defined system requirements based on actual operational conditions. The findings formed the foundation for designing a solution aligned with business needs.

Data collection involved both primary and secondary sources. Primary data were obtained from business process documentation, product catalog records, and transaction data. Secondary data were gathered through a literature review related to e-commerce systems and CRM implementation in retail businesses. This theoretical review provided conceptual support and design references for system development.

During the system analysis and design phase, the existing manual system was evaluated to determine inefficiencies and areas requiring improvement. A proposed system was then designed using UML to represent system functionality, actor interactions, and workflow processes. Database design was conducted using Entity-Relationship (ER) modeling principles, which were subsequently translated into relational database tables to ensure data integrity and structured storage.System development was implemented using PHP as the server-side scripting language and MySQL as the relational database management system. XAMPP functioned as the local server environment, while Visual Studio Code was used as the development editor. A web browser was utilized for system testing and debugging during development.

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Finally, system testing was performed using functional testing methods to verify that each module operated in accordance with predefined requirements. Testing covered both the customer-facing frontend interface and the administrative backend system. Future research directions may further extend evaluation to include usability testing (to assess user experience for non-technical customers), performance testing (to evaluate system behavior under concurrent user loads), and security assessment (to verify protection against common web vulnerabilities such as SQL injection and unauthorized access).

RESULTS

1. System Analysis

The analysis of the existing system revealed several critical inefficiencies. The business relied entirely on manual transaction recording, frequently leading to data inaccuracies and delays in report preparation. Sales reports were compiled manually, making the process time-consuming and prone to human error. Customers could only obtain product information during store operating hours, thereby limiting potential sales opportunities. Furthermore, there was no structured mechanism for managing customer data, maintaining long-term customer relationships, or implementing targeted promotional strategies.

The proposed system addresses these limitations by introducing a digital database for transaction recording, an online product catalog accessible at any time, integrated customer data management, automated report generation, digital promotional features (such as vouchers), and online payment confirmation capabilities. Table 1 summarizes the differences between the current manual system and the proposed digital system across seven key operational dimensions.

Table 1. Comparison of Current System vs. Proposed System

Aspect	Current System	Proposed System
Transaction Recording	Manual ledger/notebook	Digital database (MySQL)
Product Information	Available only in-store	Online catalog, accessible 24/7
Order Process	In-store or phone only	Online ordering via website
Customer Data Management	Not available	CRM-based customer database
Report Generation	Manual, time-consuming	Automated digital reports
Promotional Activities	Limited, word-of-mouth	Digital vouchers and promotions
Payment Confirmation	In-person only	Online payment confirmation upload

2. System Design UML Models

The proposed system was modeled using UML to provide a clear blueprint for development. Three primary actors interact with the system: Admin, Member (registered customer), and Visitor (unregistered user). Table 2 describes the roles and access levels of each actor. The separation of actor roles ensures proper access control: Visitors can only browse the public catalog; Members gain transactional privileges upon registration; and Admins have full system management authority.

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Table 2. System Actor Definitions (Use Case Diagram)

No.	Actor	Description
1	Member	Registered users who can browse products, add items to cart, place orders, make payments, and view order history.
2	Visitor	Unregistered users who can view the homepage and product catalog but cannot place orders.
3	Admin	System administrator who manages products, categories, transactions, customer accounts, vouchers, couriers, bank accounts, and generates reports.

The Use Case Diagram models the interactions between actors and the system. Member use cases include: register, login, browse products, add to cart, checkout, upload payment proof, and view order history. Admin use cases include: manage categories, manage products, manage transactions, manage customer accounts, manage vouchers, manage couriers, manage bank accounts, and generate transaction reports. The Activity Diagrams capture the step-by-step workflow for each actor, while the Sequence Diagrams detail the message exchanges between system components for each major operation.

3. Database Design

The system database named 'textile' consists of ten relational tables designed to support all CRM-integrated e-commerce functions. The tables are organized hierarchically and relationally as follows. The admin and customer tables serve as independent entity tables storing system user credentials. The kategori (category) and kurir (courier) tables are reference tables that provide structured classification data for products and shipping options, respectively. The product table references kategori via id_kategori, enabling catalog organization. The keranjang (cart) table functions as a temporary session table linking customer (id_customer) and product (id_product) records during the pre-checkout phase. The transaksi (transaction) table serves as the central transactional table, linking customer (id_customer) and product (id_product) records with shipping, payment, and status information. The bukti_transaksi (payment proof) table is dependent on transaksi, referencing id_transaksi to associate uploaded payment confirmation images with the corresponding order. The rekening (bank account) table is referenced by transaksi to direct customers to the correct payment destination. Finally, the voucher table operates independently at checkout, storing discount codes that are applied against the transaction total. Table 3 provides an overview of all database tables and their primary purposes.

Table 3. Database Table Summary

No.	Table Name	Primary Key	Purpose
1	admin	id_admin	Stores administrator account credentials and profile data.
2	customer	id_customer	Stores registered customer data including name, address, email, and phone.
3	product	id_product	Stores product details: name, price, stock, category, description, and image.

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4	kategori (category)	id_kategori	Stores product categories for catalog organization.
5	keranjang (cart)	id_keranjang	Stores temporary shopping cart items with quantity and subtotal.
6	transaksi (transaction)	id_transaksi	Stores order details: customer info, shipping address, total, courier, and status.
7	rekening (bank account)	id_rekening	Stores the store's bank account details for payment instructions.
8	bukti_transaksi (payment proof)	id_bukti	Stores uploaded payment confirmation images and verification status.
9	kurir (courier)	id_kurir	Stores courier options with shipping costs and estimated delivery time.
10	voucher	id_voucher	Stores promotional voucher codes and discount values for CRM promotions.

Table 4 presents the detailed structure of the Customer table, which serves as the core CRM data entity. It stores all relevant customer information that enables personalized service delivery and customer relationship management fulfilling the first CRM objective of customer identification.

Table 4. Detailed Structure of Customer Table

No.	Field Name	Data Type	Width	Description
1	id_customer	VARCHAR	30	Primary key unique customer identifier
2	nama_customer	VARCHAR	30	Customer full name
3	alamat	TEXT	-	Customer shipping address
4	email	VARCHAR	30	Customer email address for communications
5	password	VARCHAR	30	Encrypted customer login password
6	telp	VARCHAR	30	Customer phone number

Table 5 shows the Transaction table structure, which integrates CRM data by linking customer information to purchase records via the id_customer foreign key. This linkage enables behavioral analysis of purchasing patterns per customer, supports order status visibility, and directly fulfills the CRM objective of implementing coordinated sales and service activities.

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Table 5. Detailed Structure of Transaction Table

No.	Field Name	Data Type	Width	Description
1	id_transaksi	VARCHAR	30	Primary key unique transaction ID
2	id_customer	VARCHAR	30	Foreign key linked customer
3	nama_customer	VARCHAR	30	Customer name for order reference
4	catatan_pembelian	TEXT	-	Purchase notes from the customer
5	alamat	TEXT	-	Delivery address
6	total	INT	30	Total transaction amount (IDR)
7	no_rek	INT	30	Selected bank account number
8	kurir	VARCHAR	30	Selected courier service
9	no_resi	VARCHAR	30	Shipment tracking number
10	tgl_transaksi	VARCHAR	30	Transaction date
11	status	VARCHAR	30	Order/delivery status
12	id_product	VARCHAR	30	Foreign key linked product

4. System Implementation

The system was implemented using XAMPP v3.2.3 as the local web server (Apache + MySQL), PHP for backend logic, and Google Chrome as the client interface. Development was conducted on an Asus laptop with 4 GB RAM running Windows 10. The implemented system consists of two main interfaces: the customer-facing frontend and the administrator backend. Table 6 summarizes the key system modules and their functionalities, organized by interface.

Table 6. System Modules and Features

Interface	Module / Page	Description
Customer Frontend	Homepage (Home)	Displays featured products and navigation for visitors and members.
Customer Frontend	Registration Page	Allows visitors to register and create a member account.
Customer Frontend	Login Page	Allows registered members to log in to their account.
Customer Frontend	Product Search & Browse	Enables customers to search and view available textile products.
Customer Frontend	Shopping Cart	Allows members to add items to cart and manage quantities.

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Customer Frontend	Checkout Page	Confirms order details including shipping address, courier, and total.
Customer Frontend	Payment Page	Displays bank account details and allows upload of payment proof.
Customer Frontend	Transaction Detail	Shows full details of a specific order for the member.
Customer Frontend	Order History	Lists all past orders and their current status.
Customer Frontend	About Us Page	Displays store information and contact address.
Admin Backend	Admin Login	Secure login for the system administrator.
Admin Backend	Dashboard	Overview panel showing store activity and quick access to modules.
Admin Backend	Product Management	Add, edit, and delete textile products with stock tracking.
Admin Backend	Category Management	Manage product categories for catalog organization.
Admin Backend	Transaction Management	View and process customer orders; update shipment status and tracking.
Admin Backend	Customer Account Management	View and manage registered customer accounts (CRM data).
Admin Backend	Voucher Management	Create and manage promotional discount vouchers.
Admin Backend	Courier Management	Manage available courier services and shipping costs.
Admin Backend	Bank Account Management	Manage store bank account details for payment instructions.
Admin Backend	Transaction Report	Generate printable sales and transaction reports.

5. CRM Feature Integration

The CRM methodology underpinning this system is grounded in the framework established by Widyana et al. (2021), which defines three sequential CRM objectives: (1) identifying customer needs and characteristics; (2) developing customer-centric programs; and (3) implementing those programs through coordinated sales, marketing, and service activities. Each implemented CRM feature in the proposed system can be directly mapped to one or more of these objectives.The Customer Database module centered on the

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customer table (Table 4) fulfills Objective 1 (customer identification) by systematically capturing customer profiles including name, address, email, and phone number. Unlike generic e-commerce registration forms, this structured data store provides the foundational infrastructure for long-term relationship tracking. In practice, the admin can access aggregated customer profiles through the Customer Account Management module to understand the customer base and identify high-value segments.

The Voucher Promotion module fulfills Objective 2 (customer-centric program development) by enabling the creation of targeted discount campaigns. Rather than relying on generic word-of-mouth promotion the sole promotional channel in the prior manual system admins can now design and distribute voucher codes to incentivize specific customer behaviors such as first purchases or repeat orders. This aligns with the CRM principle of shifting from mass marketing to relationship-oriented, personalized promotional strategies (Firmansyah & Herman, 2021; Ramadhani et al., 2022).

The Order History feature and Transaction Status Tracking collectively fulfill Objective 3 (coordinated service implementation). Order History provides both the customer (via the member dashboard) and the admin (via Transaction Management) with a continuous record of purchase interactions, enabling after-sales service and facilitating purchasing pattern analysis. Transaction Status Tracking which progresses through pending, confirmed, shipped, and received states maintains real-time service transparency, enhancing customer trust and satisfaction. The Order Notes feature further reinforces personalized service by allowing customers to communicate specific requirements with each order, enabling the store to adapt its service delivery accordingly.

Collectively, these features demonstrate that the implemented system moves beyond a standard transactional e-commerce platform toward a relationship-oriented digital infrastructure consistent with the theoretical distinction between transactional CRM and analytical CRM identified in prior literature (Sartika & Murdana, 2023; Jam'an, 2021).

6. System Testing Results

Functional testing was conducted to verify the correctness of all system modules. Each module was tested against defined functional requirements. Table 7 presents the testing results for the twelve major system functions across both the customer frontend and the admin backend.

Table 7. System Functional Testing Results

No.	Test Case	Input	Expected Result	Actual Result	Status
1	Visitor Homepage Access	Open website URL	Homepage displays with product listings	Homepage displayed correctly	Pass
2	Member Registration	Fill registration form with valid data	Account created successfully	Registration successful	Pass
3	Member Login	Enter valid username and password	Redirect to member dashboard	Login successful	Pass
4	Product Search	Enter product keyword in search bar	Relevant products displayed	Search results displayed	Pass

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5	Add to Cart	Select product and click 'Add to Cart'	Item added to shopping cart	Item added successfully	Pass
6	Checkout Process	Submit order with shipping details	Order created with pending status	Order created correctly	Pass
7	Payment Upload	Upload payment proof image	Image uploaded and order awaiting confirmation	Upload successful	Pass
8	Admin Login	Enter admin credentials	Redirect to admin dashboard	Admin logged in	Pass
9	Add New Product	Fill product form and submit	Product appears in catalog	Product added to database	Pass
10	Update Order Status	Admin changes status to 'Shipped' + tracking number	Status updated and visible to customer	Status updated correctly	Pass
11	Voucher Application	Enter valid voucher code at checkout	Discount applied to total	Discount calculated correctly	Pass
12	Transaction Report	Admin clicks generate report	Printable report generated	Report generated successfully	Pass

All twelve tested functions passed successfully, confirming that the system meets its functional requirements under normal usage conditions. The test results validate the technical reliability of both the customer frontend and the admin backend interfaces. It is acknowledged that functional testing alone does not constitute comprehensive system validation; the limitations subsection below addresses this constraint and outlines directions for extended evaluation.

DISCUSSION

The development of the CRM-integrated e-commerce system at Abadi Store demonstrates a substantial transformation from a fully manual retail operation into a structured, digital business system. The initial system analysis revealed significant inefficiencies, particularly in manual transaction recording, time-consuming report generation, and the complete absence of structured customer data management. By implementing a MySQL-based database system, transaction records are now stored digitally, enabling automatic aggregation of sales data and faster report generation. This improvement reduces administrative workload, minimizes recording errors, and enhances managerial decision-making through accurate and real-time information access.

The transition from offline-only sales to a web-based ordering platform significantly improves accessibility and market reach. Customers can now browse products, place orders, and confirm payments at

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any time, removing limitations related to store operating hours. The availability of a 24/7 online product catalog increases potential sales opportunities and aligns the store with contemporary digital commerce practices. This shift not only addresses operational inefficiencies but also strengthens the store's competitive position in the increasingly digital retail environment.

The use of UML modeling in system design contributed to development clarity and structural consistency. By clearly defining three actors Admin, Member, and Visitor the system ensures proper role separation and access control. Use Case, Activity, and Sequence Diagrams provided a logical blueprint prior to coding, reducing ambiguity and ensuring that development aligned with identified business requirements. This structured design approach enhances system reliability and scalability for future improvements.

The database structure, particularly the Customer and Transaction tables and their relational linkage via id_customer, forms the core infrastructure of CRM integration. By linking customer identities with transaction histories, the system enables analysis of purchasing behavior and supports data-driven decision-making. Unlike the previous manual system where customer interactions were entirely undocumented the new system systematically records customer data, facilitating personalized service delivery and long-term relationship management. This relational database design shifts the business focus from isolated transactions to continuous customer engagement.

The CRM feature integration represents the most strategically significant contribution of the system. As mapped in Section 5, the customer database fulfills the identification objective; the voucher module fulfills the program development objective; and order history tracking, transaction status updates, and order notes collectively fulfill the coordinated implementation objective. This explicit alignment with the Widyana et al. (2021) framework distinguishes the present study from prior implementations that deploy CRM features without grounding them in theoretical CRM objectives.

The system testing results further validate the effectiveness of the developed platform. All twelve functional test cases passed successfully, confirming that both frontend and backend modules operate as specified. The successful testing outcomes confirm that the system is technically reliable under normal usage conditions. It is acknowledged, however, that functional testing represents only one dimension of system quality evaluation.

From a theoretical perspective, this study contributes to the CRM literature by demonstrating that the three-objective CRM framework (identification, program development, coordinated implementation) can be operationalized in a lightweight, resource-constrained e-commerce environment without requiring advanced analytics infrastructure. This is particularly relevant for extending CRM theory into the context of small and informal retail businesses, where prior theoretical application has been limited. The study also contributes to e-commerce systems research by providing a replicable implementation model for PHP/MySQL-based CRM integration in SME retail contexts.

From a managerial perspective, the findings carry direct implications for SME digital transformation. First, the results demonstrate that even businesses with no prior digital infrastructure can implement structured CRM capabilities through open-source technologies (PHP, MySQL, XAMPP) at minimal cost. Second, the voucher promotion module illustrates that targeted marketing is feasible without sophisticated analytics tools a critical insight for micro-entrepreneurs transitioning from manual operations. Third, the automated reporting and order status tracking features provide store owners with real-time operational visibility that was previously inaccessible, directly supporting managerial decision-making. These findings suggest that CRM-integrated e-commerce adoption should be actively encouraged and supported by SME development programs, particularly in developing economies where digital transformation of traditional retail remains an important policy objective.

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This study is subject to several limitations that should be acknowledged to guide the interpretation of findings and the direction of future research. First, system evaluation was limited to functional testing; usability, performance, and security assessments were not conducted. As a result, the system's behavior under concurrent user loads, its resistance to common web vulnerabilities, and the ease of use for non-technical customers remain unvalidated. Future research should incorporate these evaluation dimensions to provide more comprehensive evidence of system quality.

Second, the implementation was conducted using a local development environment (XAMPP), meaning the system has not yet been deployed in a live production environment. Real-world deployment may introduce additional technical challenges related to server configuration, network reliability, and scalability that were not observed during controlled testing.

Third, the study relies on functional testing as the sole evidence of CRM effectiveness, without collecting empirical data on customer satisfaction, retention rates, or purchasing frequency before and after system implementation. Longitudinal data collection following live deployment would be necessary to substantiate claims regarding CRM impact on customer loyalty and business performance.

Fourth, the implementation context is a single small-scale textile retailer, which limits the generalizability of findings. The degree to which this system design and its outcomes are transferable to other SME types, product categories, or regional contexts remains an area for future investigation.

CONCLUSIONS

This research has successfully designed and implemented an e-commerce information system for Happy Abadi Store's textile material sales, incorporating Customer Relationship Management (CRM) methodology. The system was developed using PHP and MySQL, with system modeling performed through UML diagrams. The main conclusions of this research are as follows:

First, the implemented e-commerce system effectively addresses the operational limitations of the previous manual system, enabling online product browsing, ordering, and payment confirmation accessible 24 hours a day, seven days a week. Second, the integration of CRM methodology through comprehensive customer data management, promotional voucher features, order history tracking, transaction status updates, and personalized order notes is explicitly grounded in the three-objective CRM framework (Widyana et al., 2021), providing a theoretical foundation for the implemented features and their contribution to customer satisfaction, loyalty, and data-driven decision-making. Third, the MySQL database with ten interrelated tables provides a robust and scalable data management infrastructure capable of handling customer data, product inventory, transactions, and business reporting requirements. Fourth, functional testing confirmed that all twelve system modules operate as intended.

Future research may further develop this system by incorporating additional CRM intelligence features such as automated product recommendations based on purchase history, customer segmentation analytics, and SMS or email notification systems for order updates. Integration with third-party payment gateways and real-time courier tracking APIs would also significantly enhance user experience and system utility. Extended evaluation including usability testing, performance testing, and security assessment is recommended to comprehensively validate system quality prior to live production deployment.

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