

Design and Implementation of a Web-Based E-CRM System for Customer Management in Muslim Fashion MSMEs

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ABSTRACT

Micro, small and medium enterprises (MSMEs) in the Muslim fashion sector compete through digital channels, yet many still record customer data manually and promote products generically. Toko Alya, a Muslim fashion retailer in Kisaran, North Sumatra, keeps paper-based transaction records, handles customer interaction across scattered messaging channels and manages an uneven stock of sixteen product items without an integrated view of its customers. This study designs and implements a web-based Electronic Customer Relationship Management (E-CRM) system that integrates customer management and marketing on a single e-commerce platform. Following a qualitative descriptive approach, data were collected through interviews with the owner, observation, a closed-ended questionnaire and a literature study. The system was modelled with the Unified Modeling Language and an Entity Relationship Diagram, built with PHP and MySQL, and verified through functional testing. It provides 28 interfaces organised around the acquire, enhance and retain phases of E-CRM, including a product catalogue, voucher module, order tracking, rating and review, member database and sales reporting. The system consolidates fragmented customer records, delivers targeted promotions to identified customers and supports on-demand reporting for managerial decisions. Its effect on customer loyalty, satisfaction and sales was not measured and is left for further research.

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1. Introduction

The diffusion of digital technology has shifted the basis of competition among micro, small and medium enterprises (MSMEs) from product availability towards the quality of the relationship an enterprise maintains with its customers. Enterprises are no longer evaluated solely on what they sell, but on how consistently they understand customer needs, preferences and purchasing behaviour, and how quickly they respond to them. Recent evidence from Indonesian MSMEs indicates that Customer Relationship Management (CRM) exerts a positive and significant influence on both digital marketing strategy and enterprise performance, while also showing that most MSMEs remain at an elementary level of customer-data utilisation, relying on social media promotion without any structured customer database [1]. This gap between the strategic value of CRM and its actual level of adoption is the practical problem that motivates the present study.

CRM is a business philosophy that places the customer at the centre of every process, activity and organisational routine. As information technology matured, CRM evolved into Electronic Customer Relationship Management (E-CRM), a technology-mediated approach in which customer interaction, service delivery and marketing communication are conducted through digital channels [2], [3]. E-CRM is commonly decomposed into three components. Operational E-CRM automates marketing and service processes, typically in the form of a web application; analytical E-CRM supports market and customer-behaviour analysis; and collaborative E-CRM propagates loyalty from existing customers towards prospects who have not yet reached a comparable level of commitment [4]. Its implementation is further evaluated along three dimensions, namely information quality, ease of navigation and service quality [5], and is realised through three sequential phases: acquiring new customers, enhancing the value of existing relationships, and retaining loyal customers [6].

Prior studies confirm the effectiveness of E-CRM across a range of sectors. E-CRM has been shown to influence electronic loyalty significantly through digital experience and customer engagement, to deliver faster and more responsive service in healthcare settings [7], to support customer-data management and marketing effectiveness in food and beverage outlets [5], and to help enterprises monitor satisfaction and improve service quality on a continuous basis [8]. Design-oriented studies have produced web-based E-CRM artefacts for household retail [2], automotive workshops [6], manufacturing firms [6] and bakeries [4], while related work on business-to-customer e-commerce for Indonesian MSMEs shows that a web

platform alone widens market reach but does not by itself structure the customer relationship [9]. Systematic reviews likewise report that E-CRM improves customer retention through more integrated data management and more effective interaction [10].

Two limitations, however, are visible across this body of work. First, the sectors examined are dominated by food, beverage, services and general retail; the Muslim fashion segment has received little attention despite its distinctive characteristics, namely a large number of stock-keeping units differentiated by fabric, pattern and size, strongly seasonal demand around religious observances, and a customer base whose preferences are highly specific. Second, most design-oriented studies report the artefact and its interfaces without articulating the correspondence between the E-CRM constructs adopted in the literature review and the modules actually built, which makes the theoretical contribution of the artefact difficult to assess. This study addresses both limitations by developing a web-based E-CRM system for a Muslim fashion MSME and by mapping each implemented module explicitly onto the E-CRM phases, components and dimensions.

Toko Alya is a Muslim fashion retailer located at Jalan Diponegoro No. 30, Kisaran Kota, Asahan Regency, North Sumatra. Its assortment covers hijab, mukena, koko shirts and gamis. Preliminary observation and an interview with the owner identified four interrelated problems. Customer data are recorded manually and are not integrated with any digital system, which prevents systematic processing and reuse. Marketing remains generic because promotion is broadcast through social media without segmentation by customer need or preference. Customer interaction is handled through direct conversation and short messages without structured record-keeping, so behavioural analysis, market segmentation and personalised marketing are not feasible. Finally, offline and online selling are not integrated, so orders arriving through different channels are poorly coordinated, raising the risk of order-handling errors and delivery delays.

The consequence of these problems is visible in the enterprise's inventory profile. Table 1 presents the product and stock condition of Toko Alya before the E-CRM system was introduced. The distribution is markedly uneven: the hijab category dominates, with the Square Paris Classic Hijab holding 4,480 units, followed by the Square Paris Japan Hijab at 250 units, the Square Plain Thick Hijab at 156 units and the Square Patterned Hijab at 154 units. Several items, by contrast, are held in very small quantities, including the children's koko shirt at 6 units, the adult koko shirt at 8 units, the children's cotton mukena at 17 units and the adult cotton mukena at 22 units. Such a wide dispersion indicates that restocking priorities are not derived from any systematic analysis of demand, exposing the enterprise simultaneously to overstocking in some items and stockouts in others.

Accordingly, this study pursues four objectives: to analyse customer management practice at Toko Alya prior to the adoption of an E-CRM system; to design and implement a web-based E-CRM system for the enterprise; to examine how the system supports marketing effectiveness and service quality; and to identify the functional mechanisms through which the system is expected to influence customer loyalty and sales performance. The contribution of the study is twofold. It provides an E-CRM artefact tailored to the assortment complexity of Muslim fashion retail, and it demonstrates a transparent mapping between E-CRM theory and system modules that subsequent design studies can reuse and evaluate.

2. Research Methodology

This study adopts a qualitative descriptive approach combined with a structured system-development procedure. The qualitative approach was selected because the phenomenon under investigation, namely how an MSME manages its customer relationships, is expressed primarily in descriptive information about work practices, actor roles and information flows rather than in numerical measurements. The research was conducted at Toko Alya, Jalan Diponegoro No. 30, Kisaran Kota, Asahan Regency, North Sumatra, over five months from February to June 2026.

2.1 Research Framework

The study proceeded through seven stages. Problem identification established that the enterprise lacked an integrated system for consolidating customer data across channels, and that customer service was fragmented across WhatsApp, social media and the physical store, producing an inconsistent customer experience. Data collection gathered information on the running service process. System analysis examined the existing procedure and derived functional and non-functional requirements. System design produced the process, data and interface models. System construction implemented the design in a web environment. System testing verified that the implemented functions behaved as specified. System implementation prepared the artefact for operational use by the enterprise.

2.2 Data Collection Techniques

Data were collected through field research and literature study. Field research comprised three instruments. Interviews were conducted directly with the owner of Toko Alya using questions concerning current customer-relationship practice and the enterprise's expectations of an E-CRM system. Observation was carried out on site to examine the running sales and service process at first hand. A closed-ended questionnaire was distributed to obtain structured responses that could be analysed consistently. Literature study reviewed books and peer-reviewed articles relevant to E-CRM, customer management and web-based information systems, providing the theoretical basis against which the design decisions were compared.

2.3 Modelling and Development Tools

The system was modelled using the Unified Modeling Language, which provides a standardised visual notation for documenting the structure and behaviour of software systems [11], [12]. Use case, class, activity and sequence diagrams were prepared to specify actor interaction, static structure and process flow, and flowcharts were used to describe procedural logic. The database was modelled with an Entity Relationship Diagram, whose principal constructs are entity sets, relationship sets and integrity constraints [13]. Implementation used PHP as the programming language and MySQL as the database

management system, with XAMPP as the local server package, Sublime Text 3 as the code editor, Microsoft Visio 2013 for diagramming, and Windows 10 as the operating system. The development hardware consisted of a laptop with an Intel Core i3-4030U processor, 4 GB of RAM, a 500 GB hard disk and a 14.0-inch HD LCD display, together with a Canon iP2770 printer for report output.

3. Results and Discussion

3.1 Analysis of the Running System

The information flow in place before the intervention was entirely conventional. Customers visited the store in person to select products; price, size, colour and availability were communicated orally; stock was verified against a notebook or by physical inspection; transactions were recorded by hand in a ledger or on a handwritten receipt; payment was made in cash at the counter; and sales data were recapitulated manually for daily or monthly reporting. Records were stored as paper archives, exposing them to loss and damage and making retrieval difficult. Because the process depended on paper and non-digital communication, it was vulnerable to data inconsistency, processing delay and recording error, and it generated no reusable customer data.

Table 1. Product and stock profile of Toko Alya prior to E-CRM implementation

No	Product	Category	Price (IDR)	Stock (pcs)
1	Pashmina Ceruty Hijab	Hijab	30,000	30
2	Pashmina Jersey Knit Hijab	Hijab	35,000	25
3	Pashmina Viscose Hijab	Hijab	35,000	35
4	Pashmina Jersey Hijab	Hijab	30,000	30
5	Square Paris Classic Hijab	Hijab	18,000	4,480
6	Square Paris Japan Hijab	Hijab	60,000	250
7	Square Patterned Hijab	Hijab	40,000	154
8	Square Patterned Jumbo Hijab	Hijab	55,000	50
9	Square Plain Thick Hijab	Hijab	32,000	156
10	Bergo Hijab (Children)	Hijab	20,000	20
11	Bergo Hijab (Adult)	Hijab	30,000	45
12	Cotton Mukena (Children)	Mukena	70,000	17
13	Premium Rayon Mukena (Adult)	Mukena	140,000	24
14	Cotton Mukena (Adult)	Mukena	175,000	22
15	Koko Shirt (Adult)	Koko Shirt	160,000	8
16	Koko Shirt (Children)	Koko Shirt	120,000	6

Table 1 quantifies the consequence of the manual procedure. Because restocking decisions were made without reference to recorded demand, inventory accumulated in the lowest-priced, highest-turnover hijab lines while the higher-value mukena and koko shirt categories were held at levels that could not absorb a demand peak. The 4,480 units of the Square Paris Classic Hijab, priced at IDR 18,000, represent capital immobilised in a single item, whereas the adult cotton mukena at IDR 175,000 and the adult koko shirt at IDR 160,000 were held at 22 and 8 units respectively. This asymmetry is precisely the class of problem that analytical E-CRM is intended to address, since it originates in the absence of recorded customer demand rather than in any deficiency of the products themselves.

3.2 System Requirements

Seven groups of functional requirements were derived. The system must manage product data and hold stock information in real time; record sales transactions, decrement stock automatically and print transaction reports; record purchase orders to suppliers and increment stock on receipt; store supplier data with each supplier's purchase history; generate inventory, sales and purchasing reports for a specified period in printable PDF format; issue a notification when an item reaches its minimum stock threshold; and support multiple users with role-based access rights. Four non-functional requirements were specified: usability, requiring an interface that non-technical staff can operate without training; availability throughout the store's operating hours; efficiency in input, recording and reporting operations; and scalability to accommodate growth in users and functionality without structural redesign.

3.3 Proposed System Design

The proposed system replaces the manual procedure with a web-based e-commerce platform in which E-CRM functions are embedded rather than appended. Customers browse a catalogue carrying price, stock and description for each product, add items to a shopping cart, and register and log in before checkout. The system presents the order detail and payment total, offers the available payment methods, accepts proof of payment where required, and writes the transaction to the database automatically. The administrator is notified of the incoming order, verifies payment, processes the order and arranges delivery.

The customer receives the goods and can inspect the transaction history through a personal account, while the system generates sales reports accessible to the administrator at any time. Figure 1 presents the proposed information flow.

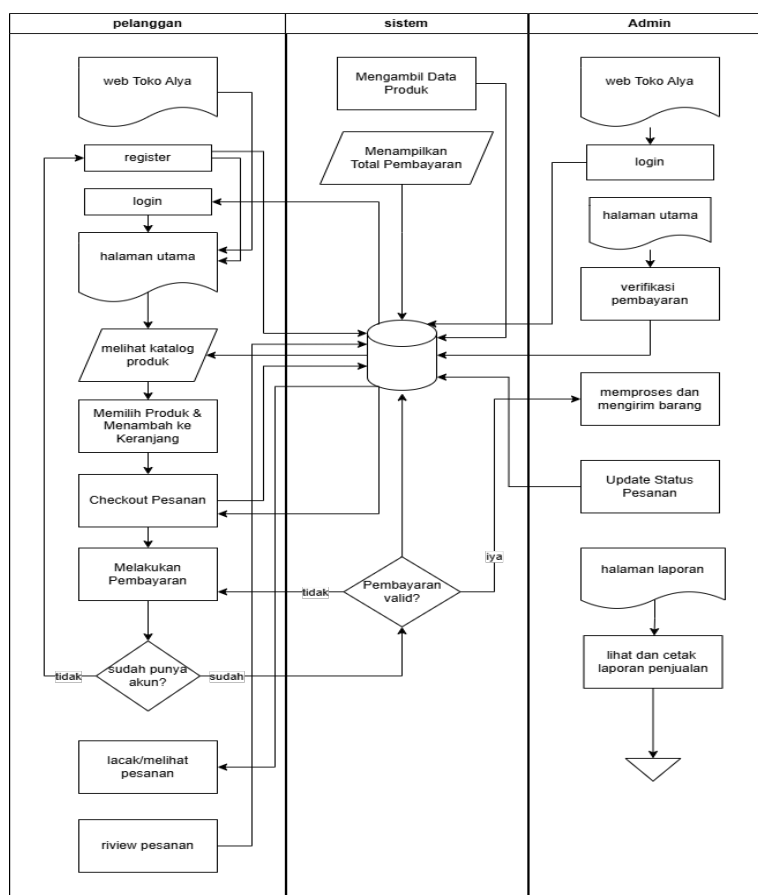


Figure 1. Proposed information system flow for the E-CRM platform

Three actors interact with the system. Their responsibilities are summarised in table 2.

Table 2. System actors and their responsibilities

No	Actor	Description
1	Administrator	Manages supplier data, stock, orders and incoming goods; reviews supplier offers and manages system accounts.
2	Owner	Holds full access to monitor all system processes, view sales and procurement data, and manage other users.
3	Customer	Registers, browses the catalogue, places orders, makes payments, and submits ratings and reviews.

The data model comprises five principal relations, summarised in table 3, whose associations are represented in the Entity Relationship Diagram in figure 2. Consistent with evidence that e-commerce, E-CRM and database design jointly determine the quality of a sales information system [14], the customer relation is the structural pivot of the design: it converts customer identity from an oral, transient attribute of the counter conversation into a persistent record that can be joined to sales history, and it is this join that makes segmentation, targeted promotion and loyalty analysis possible at all.

Table 3. Principal database relations of the proposed system

No	Relation	Attributes	Function
1	pengguna (user)	kode_pengguna (PK), username, password, nama_pengguna, level	System accounts and access levels.
2	pelanggan (customer)	kode_pelanggan (PK), nama_pelanggan, alamat, no_telp	Customer master record underpinning all E-CRM functions.
3	barang (product)	kode_barang (PK), nama_barang, harga_beli, harga_jual, satuan, min_stok, max_stok, stok, status_pesan	Product attributes, price and stock thresholds.

No	Relation	Attributes	Function
4	pemesanan (order)	kode_pemesanan (PK), tgl_pemesanan, barang (FK), jumlah_pemesanan, jumlah_disetujui	Purchase orders issued to suppliers.
5	penjualan (sales)	kode_penjualan (PK), tgl_penjualan, barang (FK), jumlah_penjualan, supplier (FK)	Sales transactions used for reporting.

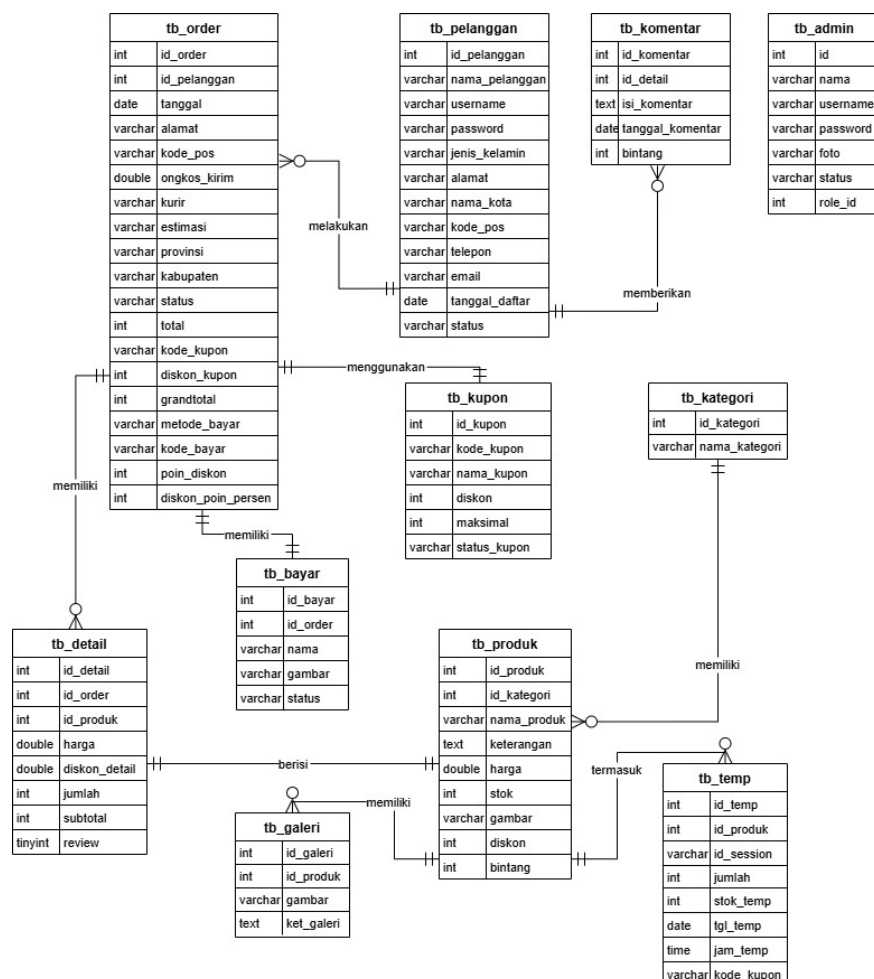


Figure 2. Entity Relationship Diagram of the proposed E-CRM system

3.4 System Implementation

The implemented system provides twenty-eight interfaces, divided between a customer-facing storefront and an administrative back office. Rather than enumerate every screen, this section presents the interfaces that carry the E-CRM functions and discusses their role in each phase of the customer relationship.

The acquire phase is carried out by the home page, the category page and the product-detail page. Together they present the catalogue with prices, images and stock status, allowing a prospective customer to obtain complete product information without contacting a staff member, and thereby operationalise the information-quality and ease-of-navigation dimensions of E-CRM: information that was previously available only through conversation is now self-service, complete and consistent.

The voucher page in figure 3 supports the enhance phase. Vouchers and discounts are stored as system objects rather than as verbal concessions granted at the counter, so a promotion can be issued to a defined group of registered customers and its take-up can be traced against the sales relation. This is the mechanism by which generic broadcast promotion is converted into targeted communication, addressing the second problem identified in the introduction. The shopping cart, checkout, payment, payment-confirmation and order-status pages complete this phase by making the transaction process transparent to the customer at every step, while the chat facility preserves the direct-communication channel the enterprise previously relied upon, now with a persistent record.

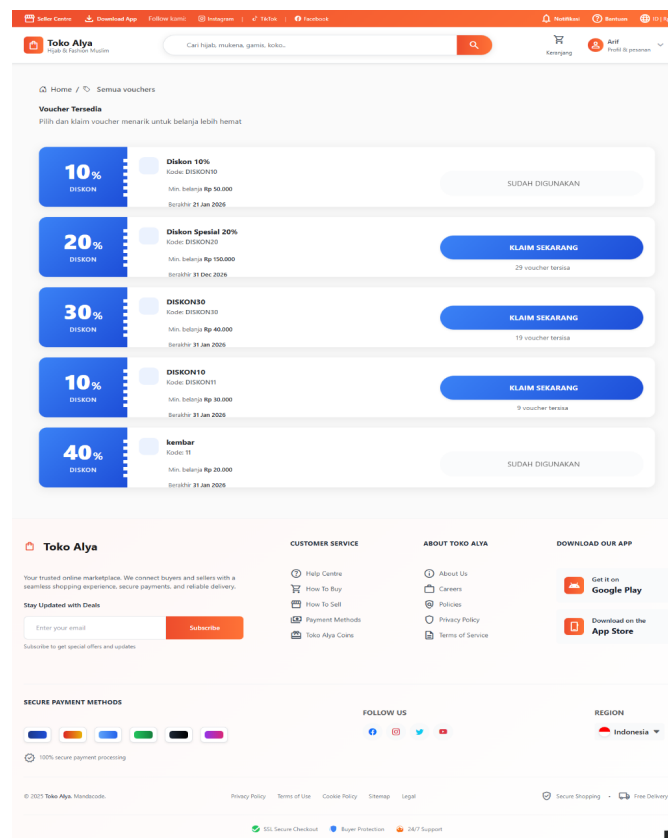


Figure 3. Voucher page supporting targeted promotion

The rating and review page in figure 4 belongs to the retain phase. It admits post-purchase feedback from verified buyers and thereby serves two functions simultaneously: it supplies the enterprise with analytical input on product and service performance, and it exercises the collaborative component of E-CRM by exposing the assessments of committed customers to prospective ones. In the terminology of the E-CRM phase model, it is the point at which retention activity feeds back into acquisition.

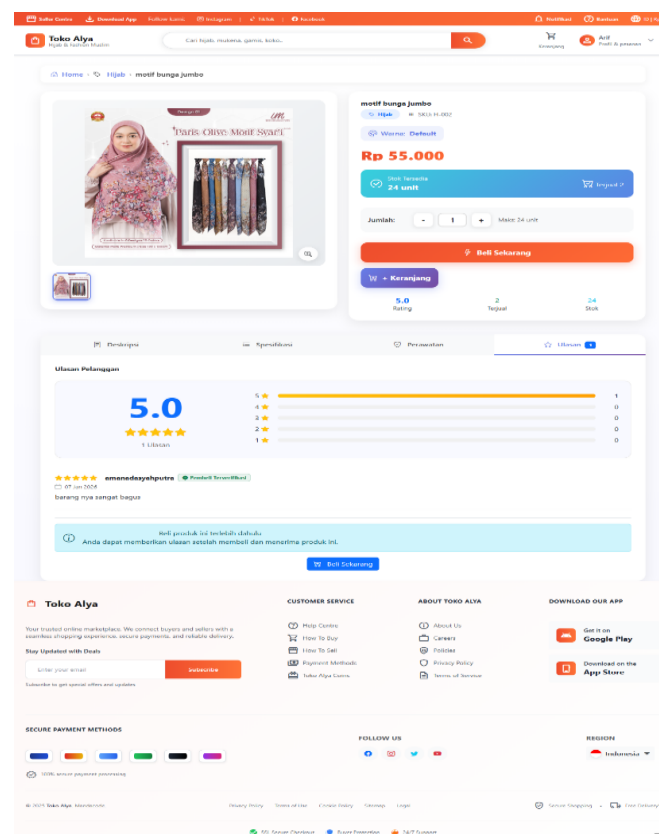


Figure 4. Rating and review page

On the administrative side, the dashboard shown in figure 5 consolidates product, transaction and member data into a single view, supported by interfaces for cashier transactions, transaction history and detail, product management, incoming and outgoing stock, sales reporting, member data and user administration. Two deserve emphasis. The member data page constitutes the customer database whose absence was the root of the enterprise's inability to segment its market. The sales report page converts transaction records into a periodic summary the owner can consult directly, replacing the manual recapitulation that previously delayed decision-making. Because stock is adjusted automatically on each sale and goods receipt, and a minimum-stock notification is raised when a threshold is crossed, the inventory asymmetry documented in table 1 becomes visible as it develops rather than only after it has accumulated.

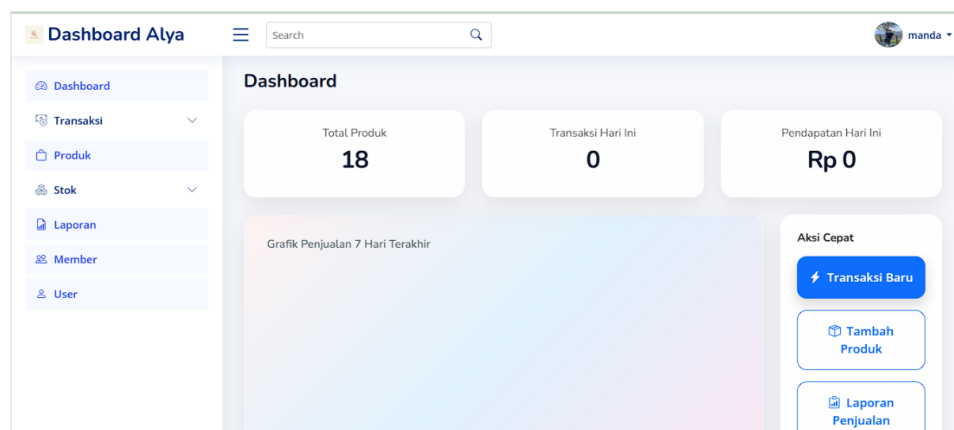


Figure 5. Administrator dashboard

3.5 Discussion

Table 4 maps the implemented modules onto the theoretical constructs of E-CRM. The mapping shows that all three phases, all three components and all three dimensions are represented in the artefact, which is the principal design contribution claimed here.

Table 4. Mapping of E-CRM phases, components and dimensions to implemented modules

Phase	Component	Dimension	Implemented modules
Acquire	Operational	Information quality; ease of navigation	Home page and product catalogue, product category page, product detail page, customer registration page
Enhance	Operational and collaborative	Service quality; ease of navigation	Voucher and coupon page, shopping cart, checkout, payment and payment confirmation, order status tracking, customer-admin chat
Retain	Analytical and collaborative	Service quality; information quality	Rating and review page, member (customer) database, targeted promotion and voucher distribution, sales report page

The findings are consistent with prior design-oriented work. As in the household-retail [2], automotive [6] and bakery [4] cases, integrating E-CRM into a web platform centralises customer information and shortens the service cycle. The present study extends that literature in two respects. First, the Muslim fashion assortment imposes a stock structure that ordinary sales-information systems handle poorly: sixteen items spanning a price range from IDR 18,000 to IDR 175,000 and a stock range from 6 to 4,480 units cannot be managed by a single reorder rule, and the combination of a real-time stock relation with minimum-stock notification is a direct response to this condition. Second, by publishing the phase-component-dimension mapping in table 4, the study makes the artefact's theoretical coverage auditable, which the reviewed design studies generally do not.

The limits of what can be claimed should be stated plainly. The evaluation reported here is functional: it establishes that the system performs the specified operations and that each E-CRM construct is instantiated in at least one module. It does not establish that customer loyalty, satisfaction or sales performance improved, because no pre- and post-implementation measurements of those constructs were collected. Quantitative studies reporting that E-CRM significantly influences electronic loyalty through digital experience and engagement, and that CRM affects customer loyalty with satisfaction as an intervening variable [15], provide grounds for expecting an effect, but that expectation is inherited from the literature rather than demonstrated at Toko Alya. Three further limitations apply: the study covers a single enterprise and is therefore not statistically generalisable; the post-deployment observation window did not span a seasonal demand cycle, which matters for

a category whose demand peaks around religious observances; and usability was assessed against the non-functional requirement rather than through a validated instrument.

4. Conclusion

This study designed and implemented a web-based Electronic Customer Relationship Management system for Toko Alya, a Muslim fashion MSME in Kisaran, North Sumatra. Three conclusions follow. First, the system manages customer data, transaction history and marketing activity in an integrated manner, replacing paper records and fragmented messaging channels with a single structured repository and thereby supplying the data foundation that structured customer management requires. Second, the system enables product information, promotions and offers to be delivered to identified customers rather than broadcast generically, since vouchers, orders and reviews are all associated with a persistent customer record. Third, the system shortens the reporting cycle and supports managerial decision-making, because sales, stock and customer data are consolidated and reportable on demand rather than recapitulated manually from dispersed documents.

The study is limited to a functional evaluation of a single enterprise and does not measure the effect of the system on customer loyalty, satisfaction or sales. Four directions for further work follow from this. A pre- and post-implementation study using validated instruments should measure loyalty, satisfaction and sales performance so that the effects anticipated from the literature can be tested at the enterprise. Usability should be assessed with a standard instrument. The platform should be integrated with social media, WhatsApp Business and marketplace channels so that promotion and communication operate across the channels customers actually use. Finally, a mobile application would allow the owner and customers to access product information, promotions, transaction history and customer service more flexibly than the current web interface permits.

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