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Web-Based Sales System Development for Adi Jaya Electrical Store with Midtrans Payment Gateway Integration

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Abstract: MSMEs/UMKM remain a major driver of local economic activity, yet many still depend on offline, cash-based transactions that constrain operational efficiency. Digital sales platforms are therefore increasingly necessary to support faster, more reliable, and cashless purchasing processes. **Objective:** This study aims to develop and deploy a web-based sales system for Adi Jaya Electrical Store an MSME located at Ruko Taman Aster, Telaga Asih, Bekasi to improve transaction efficiency through online ordering and cashless payment. **Methodology:** The study adopts an applied information systems development approach using the Waterfall model. The system was implemented using PHP and a MySQL database, with requirements derived from field observation and interviews with the store owner. Functional verification was conducted using scenario-based black-box testing to assess whether key features operated according to the specified design. **Findings:** The website supports online product browsing and purchasing for electrical supplies (e.g., sockets, LED lamps, and cables) and integrates Midtrans as a payment gateway to facilitate non-cash transactions. Black-box testing indicates that the implemented functions and features operated as expected and were consistent with the design specifications. The system has been deployed and is accessible at https://adijaya.wuaze.com/. **Implications:** The platform provides a practical model for MSMEs to digitize sales operations, potentially improving transaction speed, reducing manual processing, and strengthening sales administration through structured order and payment management. **Originality:** This research delivers an operational MSME e-commerce implementation that combines end-to-end sales functionality with payment gateway integration and documented functional verification, extending prior work that often reports prototype development without demonstrable deployment readiness.

Keywords: *MSME/UMKM; e-commerce website; web-based sales information system; payment gateway; Midtrans; Waterfall model; black-box testing*

INTRODUCTION

Indonesia's e-commerce ecosystem continues to grow, increasing pressure on MSMEs/UMKM to provide digital sales channels beyond walk-in, cash-only transactions. Bank Indonesia reported that e-commerce transaction value reached IDR 44.4 trillion in

July 2025, accompanied by positive growth in both volume and value, indicating a sustained shift of household consumption toward online purchasing (kompas.com, 2025). APJII's 2025 survey also shows that marketplace access is highly concentrated, with Shopee as the most frequently accessed platform (53.22%) followed by TikTok Shop/Shop Tokopedia (27.37%), reflecting consumer expectations for rapid product discovery, promotions, and seamless payment and logistics as baseline service standards (kompas.com, 2025). This competitive context is increasingly relevant for niche retail segments, including electrical and household-related products, where digital catalogs, ordering, and payment functionality are needed to remain competitive.

APJII data further indicates that Indonesian internet users are concentrated in Java and Bali (~55%), with the largest provincial shares in West Java (16.6%), Central Java (14.3%), and East Java (13.5%), positioning Java-based MSMEs to benefit from dense, digitally connected demand clusters (Tempo.co, 2019). Jakpat's 2021 special report similarly characterizes Shopee users as slightly dominated by women (54%) and concentrated in productive age groups (especially 20–34 years), suggesting a digitally active customer segment that prioritizes speed and convenience in purchase completion (Dianka, 2021). Evidence from prior research also shows that perceived convenience/ease of use significantly influences online purchasing decisions on Shopee, reinforcing the relevance of designing MSME websites with simple ordering flows and integrated non-cash payments (Nasution et al., 2020).

Research on SME e-commerce development consistently positions e-commerce websites as strategic instruments to improve competitiveness and business performance through streamlined operations and reduced transaction and coordination costs (Hao & Yue, 2010; Jiao et al., 2011; Lin et al., 2010; Ma & Liu, 2021). Studies on web-based sales information systems emphasize operational benefits such as real-time inventory visibility, order processing, stock control, and sales reporting/analytics that strengthen decision-making and planning (Handoyo & Sensuse, 2018; Juanatas & Juanatas, 2024; Yulianto & Fauzi, 2020). Case-oriented implementations also indicate improvements in customer self-service and service quality, contributing to more structured sales administration (Hartono et al., 2023; Soegoto & Cica, 2018). Development practices in this stream commonly adopt SDLC approaches, including Waterfall, progressing from requirements analysis and UML-based design to implementation and testing (Soegoto & Cica, 2018; Yulianto & Fauzi, 2020). Despite these contributions, prior work frequently provides limited evidence of

operational readiness for end-to-end transactions, and evaluation reporting is often insufficiently traceable to requirements, particularly for transaction-critical workflows (Alobaydi et al., 2025; de Sá, 2008; Méndez et al., 2023).

Payment gateway integration studies emphasize security and privacy as core requirements because payment workflows process sensitive user and transaction data. Model-based and empirical research discusses encryption-oriented modeling and security posture assessment to reduce exposure to common threats (Bozveliev et al., 2020; Nagre & Sen, 2022), while other work addresses privacy-preserving payments and formal security analysis of browser-level payment integration, highlighting the need for systematic verification (Do et al., 2022; Zhang et al., 2009). Integration approaches frequently focus on API-based patterns that support flexible payment options and complex scenarios such as split payments (Hisyam & Manuaba, 2022), and software engineering contributions propose SPLE-based adapters to manage gateway variability and reduce development time via reuse (Febrian et al., 2021). Reliability and scalability are also treated as critical qualities through component selection and fault-tolerant distributed

architectures (Abalde et al., 2004; Sekar et al., 2014), with emerging work exploring decentralized models using distributed ledger mechanisms (Luque et al., 2023; Rajkumar et al., 2025; Zilnieks & Erins, 2023). A recurring limitation across these streams is that security, architecture, and integration patterns are not always translated into deployable, end-to-end operational implementations that explicitly synchronize payment status into the order lifecycle and administrative reporting.

Waterfall-focused software engineering literature characterizes the method as linear and documentation-driven, supporting predictable scheduling, clear milestones, and traceable artifacts when requirements are stable (Gupta et al., 2024; Wang et al., 2012). Comparative studies also highlight limitations relevant to transaction systems, particularly low adaptability to requirement change and late defect discovery when testing follows implementation, potentially increasing rework in complex systems (Chart et al., 2021; Rao et al., 2025). Agile approaches are often positioned as more adaptive through iterative delivery and continuous user feedback, while hybrid proposals attempt to combine structured planning with iterative validation (Aken, 2008; Dharmapal & Thirunadana Sikamani, 2015; Shao et al., 2018; Suganya & Sahaya Arul Mary, 2010). This study addresses the above gaps by designing and implementing an operationally deployable web-based sales system for Adi Jaya Electrical Store that delivers an end-to-end transaction

workflow (catalog-to-checkout), integrates cashless payments via Midtrans with automated payment-status synchronization into order management and reporting, and provides traceable SDLC deliverables (requirements, UML, database design, and implementation artifacts). The system is verified through documented black-box test cases covering critical scenarios (login, ordering, payment success/pending/failed/expired, and order-status updates), supporting readiness for practical use. The study advances the working hypothesis that a deployable e-commerce website with integrated payment and verifiable transaction handling will improve transaction efficiency, reduce administrative errors, and enhance perceived service quality compared with offline cash-based operations, primarily through improved convenience and payment flexibility that increase purchase completion and support more reliable order administration (Handoyo & Sensuse, 2018; Juanatas & Juanatas, 2024; Nasution et al., 2020; Yulianto & Fauzi, 2020).

METHOD

The unit of analysis in this study is a web-based sales system artifact developed for the MSME (UMKM) Toko Listrik Adi Jaya, including the end-to-end business workflow supported by the system on both customer and administrator sides. The investigated object covers core e-commerce functions such as product presentation, shopping cart and checkout flow, transaction handling, and administrative operations (e.g., master data management and sales reporting). The study therefore examines the design and implementation of the website as a digital sales channel intended to improve the effectiveness of transactions that were previously conducted through offline, cash-based procedures.

This research employs a software engineering research and development design within the System Development Life Cycle (SDLC) framework using the Waterfall model. The Waterfall approach is selected because it provides a structured, sequential, and documentation-oriented process that supports traceability between requirements, design artifacts, implementation, and verification outcomes. The development is conducted through five consecutive phases requirements, design, implementation, verification/testing, and maintenance in which each phase is completed before the next is initiated, enabling systematic planning and controlled execution. Figure 1 illustrates the Waterfall development flow adopted in this study.

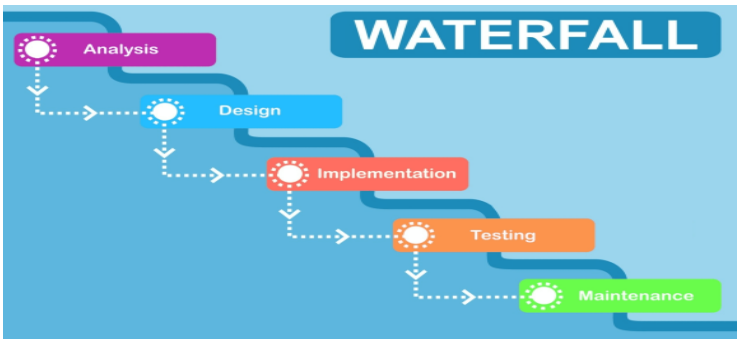

Figure 1. Waterfall method

The study primarily relies on primary data obtained from the store owner as the key informant to capture operational needs, business rules, required features, and user-interface expectations. Supporting information includes technical and operational specifications for system realization, such as the required hardware and software environment used in development and deployment, including the programming stack and database platform. These sources collectively inform the functional and non-functional requirement specifications that guide system development.

Data are collected through non-participant observation and semi-structured interviews. Observation is conducted to document the existing sales process and identify operational constraints and inefficiencies in the current transaction workflow. Semi-structured interviews are used to elicit detailed system requirements, including data entities to be managed (e.g., products, orders, and transaction records), interface preferences, and constraints that may affect implementation. The data collection instruments consist of an interview guide and structured observation notes, which are consolidated into a formal requirements specification that becomes the baseline for design decisions.

Data analysis is performed by translating the elicited requirements into formal specifications and technical designs that can be implemented and verified. Requirement analysis yields a consolidated list of functional and non-functional requirements, which are subsequently modeled using Unified Modeling Language (UML) to represent system behavior and structure, followed by the design of the user interface and the database schema. The implementation phase converts the design into program code to produce the operational website. Verification is carried out through functional testing to ensure that each feature operates correctly and conforms to the defined requirements and design specifications. Maintenance is positioned as the post-deployment activity for applying

corrective updates and refinements when issues or change requests arise during operational use.

RESULT AND DISCUSSION

Requirements Elicitation and System Scope

Requirements elicitation established a two-role architecture customer and administrator and translated the operational needs of Toko Listrik Adi Jaya into functional and non-functional requirements. Customer-facing functions were defined to support a complete online purchasing flow through six modules: Home, Product, Belanja, Transaksi, Keranjang, and Profile. Administrator functions were defined to ensure operational governance through Home, Master Data, Laporan, Pesanan, Kontak, and Logout, enabling structured management of users, products, categories, shipping parameters (city and shipping cost), order handling, and sales reporting. Non-functional requirements were specified to ensure development and deployment feasibility, including the hardware and software environment (e.g., PHP-based development stack, XAMPP, MySQL, and browser compatibility).

Table 1. Functional and non-functional requirement summary of the Adi Jaya sales website.

Requirement Type	Customer (User)	Administrator (Admin)	Non-functional/Platform
Access control	Registration, login, logout	Admin login, logout	Role separation, session control
Product handling	View products, view details, select items	CRUD products, manage categories	Data consistency in database
Transaction flow	Cart → checkout → payment → history	View orders, edit/delete orders	Reliability for transaction updates
Reporting	View transaction history	Sales report & period report	Export/print readiness (if applicable)
Deployment environment			Windows 10 Pro, PHP, XAMPP, MySQL, Chrome (as stated)

Table 1 confirms a clear division of responsibilities between the customer purchasing workflow and administrator governance functions. The customer modules form a coherent purchase funnel (browse–cart–checkout–payment–history), while the admin modules emphasize control over master data, transaction monitoring, and reporting. The explicit non-functional specification indicates that the system is implementable using a common PHP–MySQL stack, supporting portability and reproducibility for similar MSME contexts.

System Design Artifacts (Navigation Structure and UML)

System design translated the elicited requirements into implementable structures through navigation modeling and UML representations. Navigation structures were produced for both roles to ensure that users can complete their tasks with minimal ambiguity and predictable paths. UML artifacts were then used to formalize system behavior (use case and activity diagrams) and system structure (class diagram), providing traceable design evidence prior to coding.

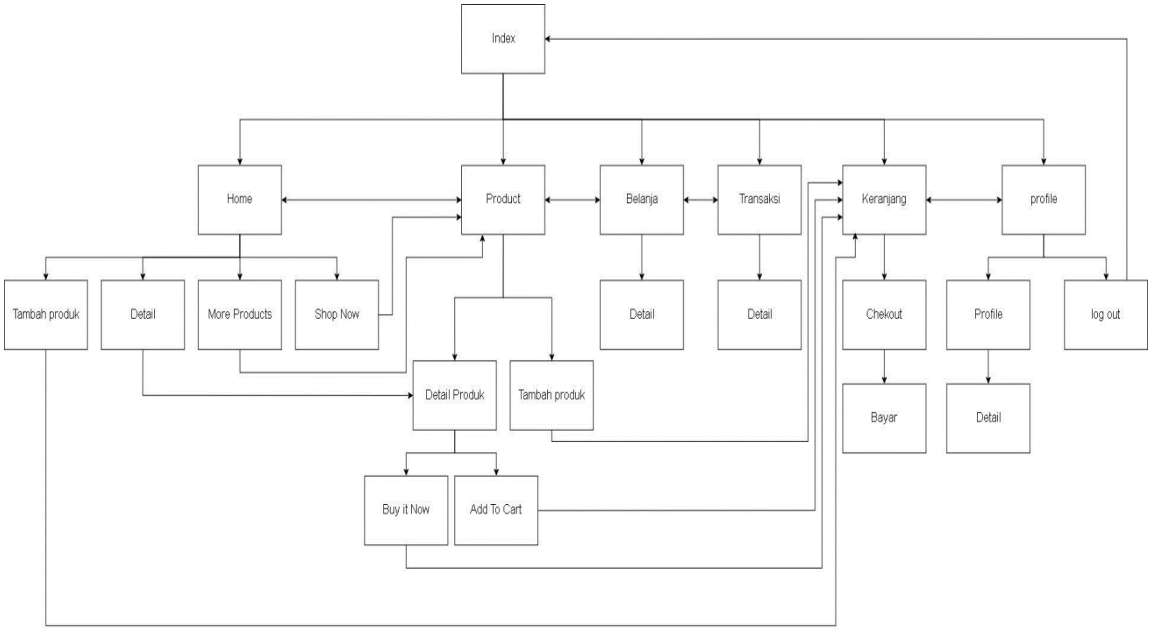

Figure 2. User navigation structure.

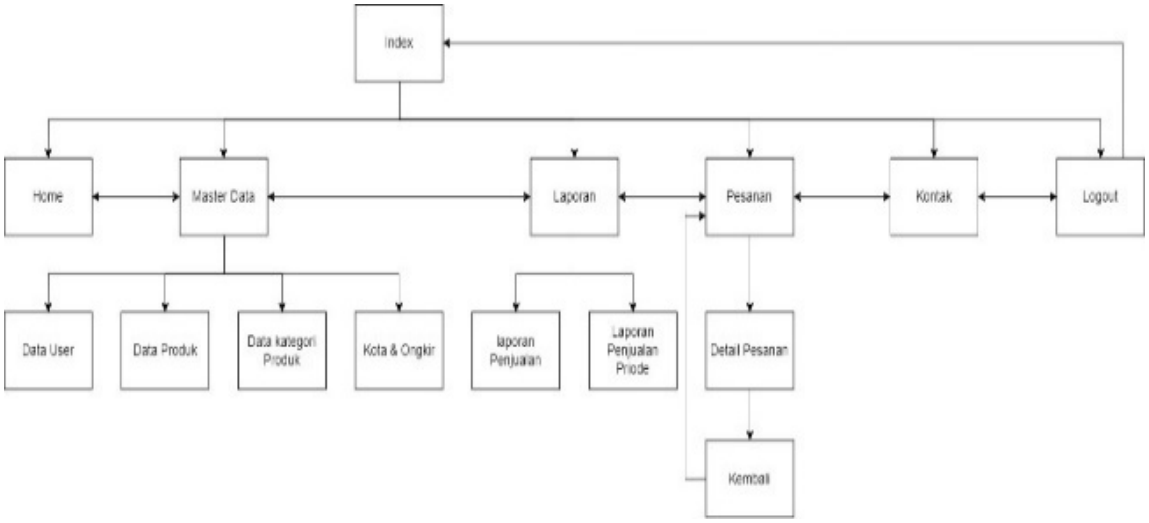

Figure 3. Admin navigation structure

Figures 2 and 3 show that user navigation prioritizes product discovery and transaction completion, while admin navigation centralizes master data control, reporting, and order supervision. This separation reduces functional overlap and supports role-based access boundaries, which is essential to maintain operational integrity in web-based retail systems.

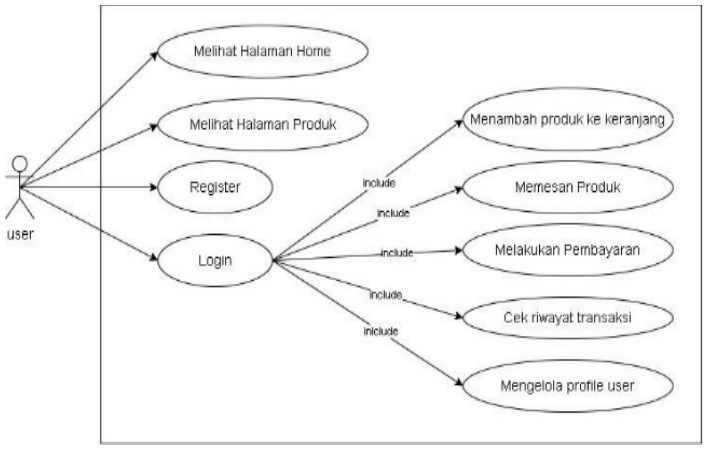

Figure 4. Use case diagram (User).

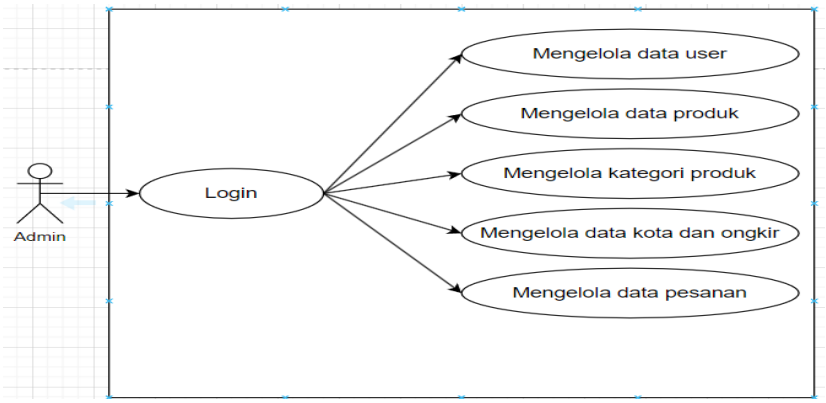

Figure 5. Use case diagram (Admin).

The use case diagrams clarify authorization and responsibilities for each actor. The user role is associated with transaction-critical activities such as adding items to cart, ordering, executing payments, and accessing transaction history, whereas the admin role is associated with operational management tasks such as maintaining user/product data, managing shipping parameters, and supervising orders.

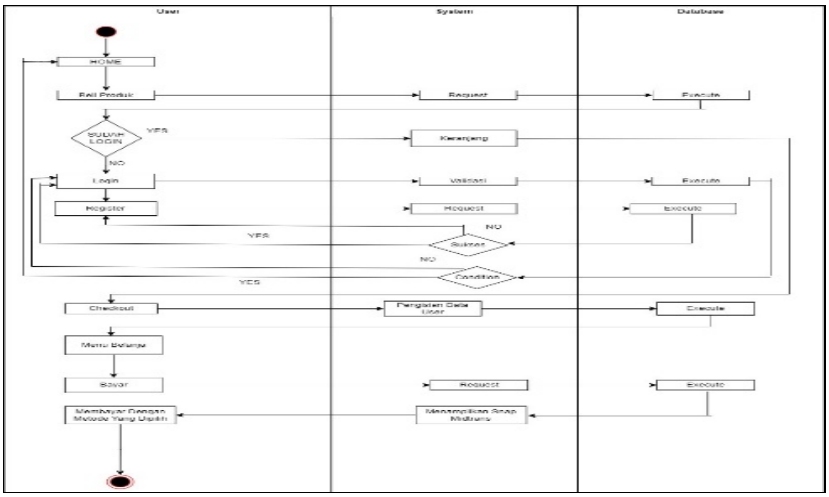

Figure 6. Activity Diagram User

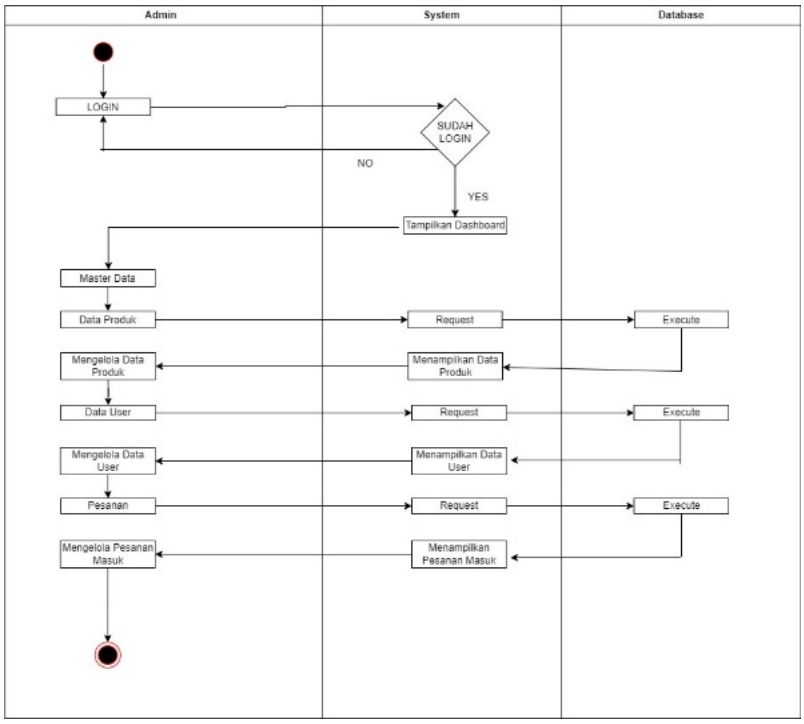

Figure 7. Activity Diagram Admin

The activity diagrams operationalize the step-by-step flow of user purchasing (registration/login–cart–checkout–payment) and administrative operations (master data handling and order management). This sequential representation enables direct mapping between process steps and test scenarios during functional verification.

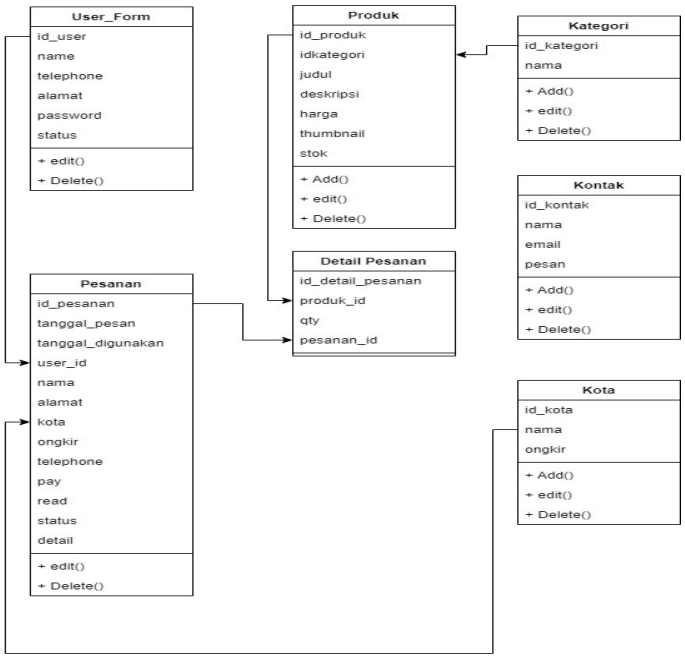

Figure 8. Class Diagram

The class diagram provides structural evidence that the system is data-driven and supports transactional consistency. Core entities and relationships derived from this model serve as the basis for implementing the database schema required for managing users, products, orders, and transaction records, which are necessary for reporting and order traceability.

System Implementation, Midtrans Integration, and Functional Verification

Implementation results demonstrate that the designed workflows were realized in an operational website for both user and admin roles. The user interface evidences a complete purchase journey from initial access and product browsing to cart confirmation, checkout, payment via Midtrans, and order history. The admin interface evidences governance functions including master data management, reporting (including period-based reporting), and order monitoring with transaction/payment status visibility.

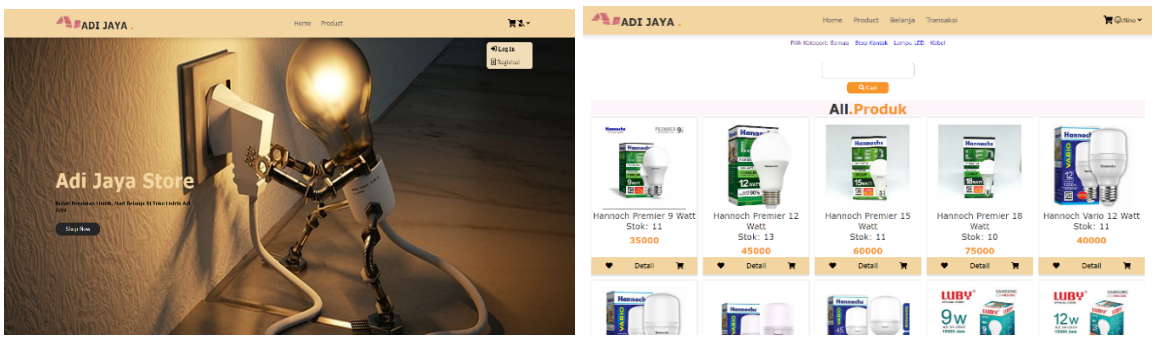

Figure 9. Index User (Left), Product Menu (Right)

Figures 9–10 indicate that the user-side entry points are designed to support product discovery and controlled access through authentication. The presence of registration and login functions ensures that transaction-critical actions can be associated with a verified user identity

Figure 11. Shopping cart page (left), Checkout page (right).

Figure 12. Order list (Belanja) page.

Figures 11-112 demonstrate that the system supports cart management and structured checkout procedures prior to payment. This sequence is consistent with typical e-commerce ordering workflows and provides a clear transition from selection to purchase execution.

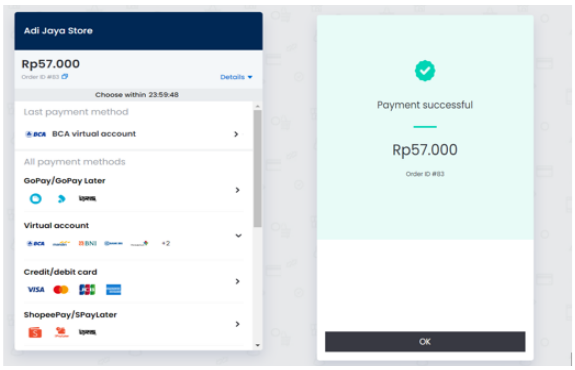

Figure 13. Midtrans payment interface.

Figure 13 provides evidence of payment gateway integration, enabling non-cash transactions through Midtrans. The system allows users to initiate payment from the order stage, supporting practical execution of cashless transactions required by the study objective.

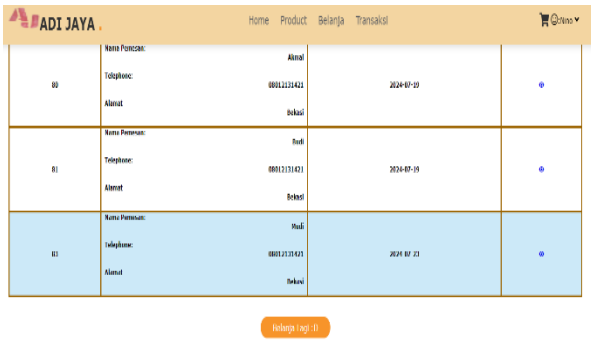

Figure 14. Order history

Figure 14 shows that post-transaction transparency is supported through an order history module. This feature strengthens user trust and enables traceability for customers to review completed and ongoing orders.

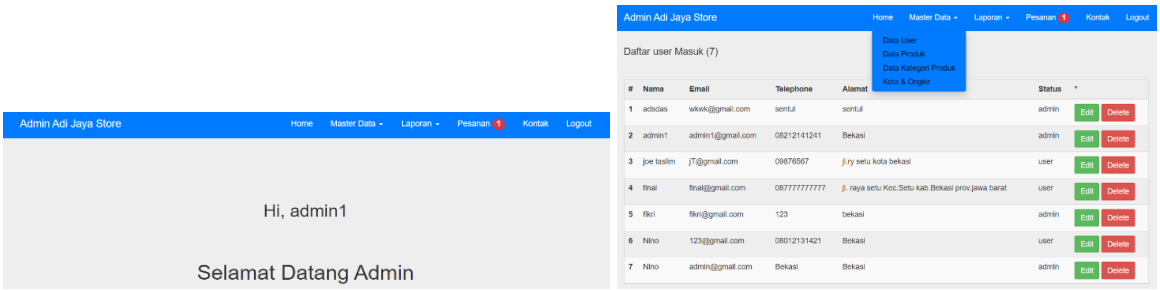

Figure 15. Admin dashboard/index page (left), Admin master data (right)

Figures 15 demonstrate that administrative access is controlled and that core governance functions (e.g., CRUD operations for products and master data) are available to support day-to-day operations, data maintenance, and catalog accuracy.

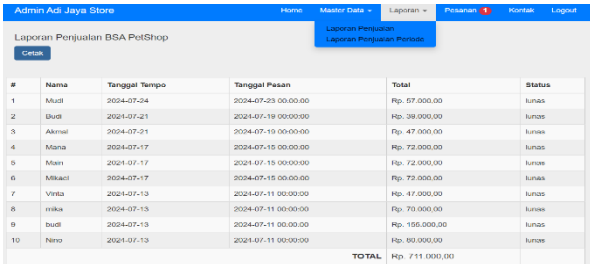

Figure 16. Admin sales reporting and period-based reporting.

Figure 16 evidences that reporting functionality is implemented to support managerial oversight. Period-based reporting enables administrators to retrieve sales information according to specified time ranges, supporting monitoring and decision-making.

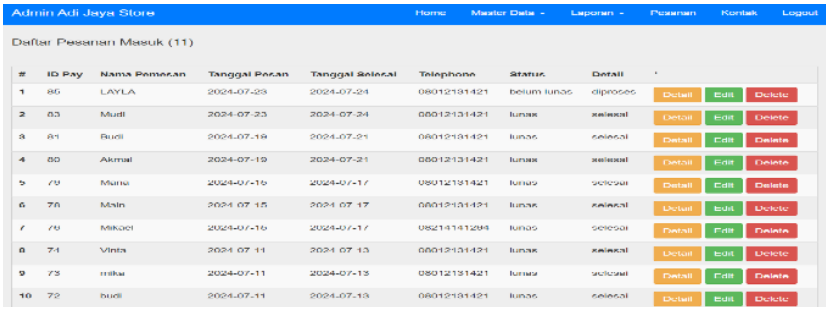

Figure 17. Admin order list page**.**

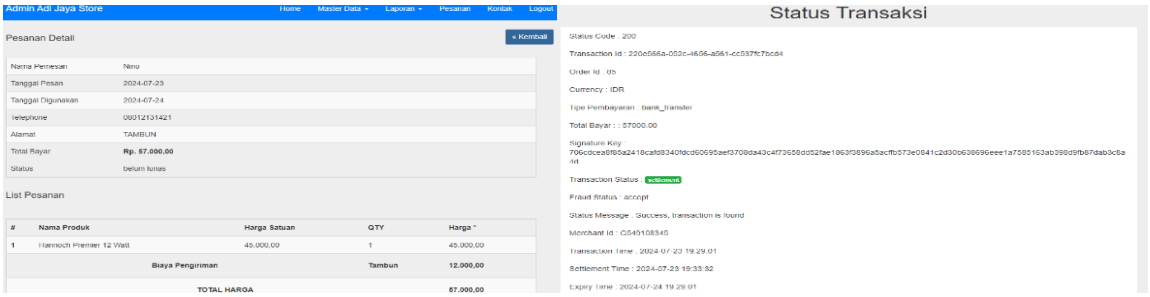

Figure 18. Admin order detail page (left), Admin transaction/payment status page (right)

Figures 17-18 show operational order supervision capabilities, including access to order lists, order details, and transaction/payment status updates. This visibility is critical for reconciliation and for ensuring that payment events are reflected in administrative records, reducing reliance on manual checks.

Functional verification was conducted using black-box testing to assess whether each module performs according to expected behavior at the user-interface and functional level. Testing covered authentication, product browsing, cart operations, checkout submission, payment initiation, status handling, reporting, and administrative data operations

Table 2. Black-box functional testing results for the Adi Jaya web-based sales system (reformatted).

Test Case ID	Feature/ Module	Scenario / Input	Expected Output	Observed Output
BB-01	Registration	Submit valid registration data	Account created; user can login	Matches expected
BB-02	Login (User)	Valid username/password	User authenticated; dashboard accessible	Matches expected
BB-03	Login validation	Invalid credentials	Error shown; access denied	Matches expected
BB-04	Product listing	Open product page	Product list displayed	Matches expected
BB-05	Product detail	Select a product	Detail displayed	Matches expected
BB-06	Add to cart	Add selected product	Cart updated	Matches expected
BB-07	Cart update	Update/remove item	Total recalculated / item removed	Matches expected
BB-08	Checkout validation	Missing required fields	Validation message; order not created	Matches expected
BB-09	Checkout submit	Valid checkout data	Order created; ready for payment	Matches expected
BB-10	Payment initiation	Click “Pay”	Midtrans interface opened	Matches expected
BB-11	Payment status sync	Payment completed	Status updated in system/admin view	Matches expected
BB-12	Order history	Open history page	Past orders displayed	Matches expected
BB-13	Admin login	Valid admin credentials	Admin authenticated	Matches expected
BB-14	Product CRUD	Add/edit/delete product	Data persisted and updated	Matches expected
BB-15	Shipping parameters	Update city/ongkir	Values stored; used in checkout	Matches expected
BB-16	Reporting	Generate report	Report displayed/printable	Matches expected
BB-17	Period report	Filter by date	Filtered results displayed	Matches expected
BB-18	Order management	View/edit/delete order	Order updated/deleted correctly	Matches expected

Table 2 indicates that core transaction pathways and governance functions executed as expected across tested scenarios. The successful completion of test cases that span authentication, ordering, payment initiation, and payment-status visibility supports the

system's readiness for operational use, particularly because transaction-critical functions were verified in a complete workflow rather than as isolated pages.

Discussion

The study demonstrates that a web-based sales system for an MSME electrical retail store can be implemented as a deployable, transaction-complete platform when requirement traceability, role separation, and payment orchestration are treated as central design constraints. The delivered system operationalizes two distinct interfaces (customer and admin), implements the full purchase cycle from discovery to post-transaction history, and integrates Midtrans for cashless payment initiation and transaction status visibility. Design evidence (navigation structures and UML) supports a traceable pathway from requirements to process logic and database-relevant entities, while black-box verification provides functional evidence that critical scenarios authentication, cart and checkout operations, payment initiation, and administrative monitoring/reporting behave as expected.

A plausible explanation for the achieved functional readiness lies in the coupling of a low-friction interaction model with formalized payment processing. A sequential and predictable user journey reduces decision friction and supports task completion, particularly for MSME customers who value convenience and fast execution. Payment gateway integration reduces transactional ambiguity by enabling standardized cashless options and making payment outcomes observable within the order lifecycle, thereby strengthening transaction transparency and minimizing manual reconciliation. Administrative modules translate operational needs into structured governance capabilities (master data management, order control, reporting), which can improve internal accountability and data-based oversight for small merchants.

The findings are consistent with literature describing e-commerce websites as strategic levers for SME competitiveness and process efficiency (Hao & Yue, 2010; Jiao et al., 2011; Ma & Liu, 2021) and with studies showing that web-based sales information systems support order processing and decision support through reporting (Handoyo & Sensuse, 2018; Juanatas & Juanatas, 2024; Yulianto & Fauzi, 2020). The study extends this stream by foregrounding gateway integration and verification as implementation-critical components, reflecting research that frames payment workflows as security-sensitive, reliability-dependent, and best implemented through reusable API-oriented integration

patterns (Bozveliev et al., 2020; Febrian et al., 2021; Hisyam & Manuaba, 2022; Nagre & Sen, 2022). The Waterfall-based SDLC contributes methodological transparency through documentation and phase deliverables, aligning with contexts where requirements stability is assumed, while acknowledging broader concerns about limited adaptability in evolving environments (Chart et al., 2021; Gupta et al., 2024; Petersen et al., 2009; Rao et al., 2025). The broader meaning is social and institutional. Digital storefronts and standardized payments shift MSME retail from informal, cash-centric routines to more transparent and auditable transactions, reinforcing norms of efficiency and accountability in small-scale commerce. Benefits include improved traceability, reduced administrative error potential, and enhanced customer confidence; risks include increased dependence on connectivity and third-party services, coupled with heightened exposure to privacy and cybersecurity threats. Actionable steps include formal SOPs for catalog and order operations, security hardening (HTTPS, session control, validation, and regular vulnerability checks), resilience measures (backup and recovery), and MSME capacity-building policies focused on payment governance, cybersecurity hygiene, and operational analytics adoption.

CONCLUSION

This study demonstrates that an MSME-oriented web-based sales system for Adi Jaya Electrical Store can be engineered as an operationally deployable e-commerce platform that formalizes the full transaction lifecycle. The implemented solution supports role-based separation between customers and administrators, operationalizes the customer purchase funnel (product discovery, cart formation, checkout, cashless payment, and transaction history), and provides administrative capabilities for master-data governance, order monitoring, transaction-status visibility, and sales reporting. The Waterfall-based SDLC enabled methodological traceability by linking requirements elicitation to UML-driven design artifacts and implementation outputs, while black-box functional verification provided documented evidence that core transaction-critical scenarios executed in accordance with predefined expected behaviors. The principal contribution of this research lies in its practice-oriented integration of a payment gateway (Midtrans) within the order lifecycle, which strengthens transactional transparency and reduces reliance on manual reconciliation an aspect that is frequently under-specified in MSME e-commerce prototypes that emphasize interface deliverables without demonstrating verifiable operational readiness.

Several limitations delimit the generalizability and evaluative depth of the present findings. System validation in this study is primarily confined to functional correctness; therefore, the results do not yet quantify non-functional attributes such as performance under concurrent usage, reliability during peak transaction loads, or security robustness against common web vulnerabilities and payment-related threat vectors. In addition, the study has not conducted user-centered evaluation to measure usability, perceived convenience, or customer acceptance, nor has it reported longitudinal operational metrics (e.g., conversion rate, checkout abandonment, reconciliation error rate) derived from sustained real-world deployment. Future research should extend the evaluation framework by incorporating standardized usability assessment and task-based user testing, rigorous performance benchmarking and scalability testing, and security hardening accompanied by vulnerability scanning and penetration testing. Longitudinal field deployment should also be undertaken to empirically estimate the system's impact on transaction efficiency, administrative accuracy, and service quality, thereby strengthening the evidence base for MSME digital transformation initiatives and informing actionable implementation guidelines for similar retail contexts.

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