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Designing a Laundry Management Information System Using Rapid Application Development

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Abstract –

Many small and medium-sized laundry service enterprises still rely on traditional handwritten notes to record transactions and customer information. This manual practice frequently results in unstructured data management, delayed transaction-history retrieval, and inefficient handling of revenue reports and customer loyalty programs. This study aims to design and develop a web-based Laundry Management Information System to optimize operational processes and business efficiency for a local laundry service enterprise, employing the Rapid Application Development (RAD) method. Data were collected through direct observation, interviews with business stakeholders, and a comprehensive literature review. The system development followed three core RAD phases: requirements planning, user-centered design workshops, and implementation. The platform was built using PHP with the Laravel framework and a MySQL database. Active stakeholder participation during design iterations ensured the refinement of key features, including user interface design, transactional workflows, payment processing, loyalty point management, digital receipt generation, automated financial reporting, and role-based access control. The resulting system successfully delivers robust functionalities for managing customer and service data, monitoring real-time order statuses, calculating point-to-discount conversions, and generating comprehensive period-based revenue reports in PDF and Excel formats. Functional evaluation utilizing black-box testing demonstrated that all system components performed precisely according to specified operational scenarios and met user requirements. Ultimately, this digital solution streamlines administrative tasks, enhances business productivity, and supports technology-driven transformation in the service sector.

Keywords – *Management Information System; Rapid Application Development (RAD); Laundry Business Operations; Digital Transformation; SME Productivity*

I. INTRODUCTION

The rapid advancement of information technology drives business practitioners to manage data more systematically through digital transformation. For small and medium-sized enterprises (SMEs), information systems serve as a strategic tool to support operational record-keeping, secure data storage, and provide essential insights for business management. Rahayu and Veri (2025) emphasize that the implementation of digital-based information systems in SMEs plays a crucial role in enhancing business management amidst technological evolution. Such operational needs are prominently evident in laundry service businesses, which involve repetitive daily activities ranging from order intake, customer registration, service selection, and payment processing to workflow tracking and final delivery. Information generated across these operational touchpoints must be systematically stored, as it directly impacts service quality and managerial decision-making. Alam et al. (2021) demonstrate that the deployment of web-based information systems effectively optimizes information management within laundry service operations.

Despite these technological advancements, many local laundry businesses still rely on traditional handwritten notes for transaction recording. Customer records are frequently unstructured, despite a high volume of repeat clientele. When historical transaction data is required for operational review or customer service, retrieval relies on manual searches through physical archives. Observations indicate that such retrieval needs arise multiple times a week, leading to administrative bottlenecks and prolonged search times as archives accumulate. Manual record-keeping introduces several operational vulnerabilities, including human error in recording customer names, service weights, or transaction amounts. Physical archives are also prone to damage, misplacement, or loss. From a managerial perspective, revenue reports require manual consolidation from physical notes, while customer loyalty programs remain under-integrated. Managing loyalty points such as accumulation, redemption, and discount conversions traditionally demands manual tracking and calculation, which diminishes operational efficiency and customer retention effectiveness.

Previous studies have highlighted the adoption of web-based information systems to streamline laundry services, typically focusing on transaction processing, customer profiling, and status tracking. Somaida et al. (2025), for instance, developed a website-based laundry management system equipped with progress-tracking features. A review of existing literature reveals that while internal process digitalization is well-explored, the integration of loyalty point mechanisms directly tied to automated payment workflows offers room for further innovation. Therefore, this study integrates customer loyalty points directly into the payment process, allowing qualified points to be seamlessly converted into automated discounts.

To achieve this, the Rapid Application Development (RAD) method was chosen due to its short development cycles, prototyping capabilities, and iterative refinement based on user feedback. This approach aligns with organizational needs that require active stakeholder involvement in evaluating prototypes prior to final deployment. The system was engineered using PHP with the Laravel framework and a MySQL database. Grounded in these operational challenges, this study addresses three core problem formulations: how transactional and customer data management processes are conventionally handled, how a web-based Laundry Information System can be designed to support transactions, revenue reporting, and integrated point-to-discount mechanisms, and how the RAD method is applied throughout the development lifecycle. Consequently, this study aims to evaluate existing operational workflows, design and build a web-based Laundry Management Information System tailored to business requirements, and implement the RAD framework systematically. The findings are expected to provide a structured operational management framework while laying the groundwork for future digital innovations in the service sector.

II. METHOD

This study was conducted at a representative local laundry service enterprise, focusing on the analysis of operational workflows, as well as the design, development, evaluation, and testing of a web-based Laundry Management Information System. The development process was driven by practical requirements identified within daily business operations. Data collection was carried out through direct observation, semi-structured interviews, and a comprehensive literature review. Observation was utilized to examine conventional transaction recording, customer data storage, paper-based receipt usage, payment processing, order status tracking, and report generation workflows. Interviews were conducted with the business owner to identify existing operational bottlenecks and define functional requirements for the proposed system. Furthermore, literature reviews provided theoretical frameworks and benchmarks regarding management information systems, laundry automation, the Rapid Application Development (RAD) method, web-based technologies, and software testing methodologies.

Key stakeholders involved in requirements elicitation included the business owner, while prototype evaluations actively engaged both the owner and administrative staff as primary system users. Their direct involvement ensured that the user interface design, operational workflows, information presentation, and role-based access control were precisely aligned with business needs.

The system was developed using the Rapid Application Development (RAD) methodology, structured into three core phases. The first phase, requirements planning, involved data gathering, analysis of existing workflows, and the identification of functional, non-functional, data, user, and hardware requirements. The outcomes of this phase served as the foundational basis for defining the core functionalities of the system. The overall RAD development stages implemented in this study are illustrated in Figure 1.



Fig 1. Rapid Application Development (RAD) Method Development Cycle

The second phase is the RAD design workshop. The gathered requirements were translated into process models, database architectures, and system interfaces. System modeling was performed using Unified Modeling Language (UML), and the designs were subsequently transformed into interactive prototypes. These prototypes were evaluated by key stakeholders, and their feedback drove iterative refinements and design improvements. The third phase is implementation. The finalized designs were developed into a fully functional web-based platform using PHP with the Laravel 8 framework and a MySQL database, deployed locally via XAMPP servers. Following system implementation, functional testing was executed using the black-box testing method.

Data analysis was conducted descriptively by comparing pre-development operational workflows with the functionalities delivered by the developed system. System success was evaluated based on black-box testing scenarios by injecting specific inputs and verifying whether the resulting outputs matched expected outcomes. This evaluation focused strictly on assessing the fulfillment of functional requirements rather than quantifying improvements in operational efficiency, user satisfaction, or customer loyalty.

III. RESULTS AND DISCUSSION

The analysis revealed that transaction recording in conventional laundry operations was previously performed using handwritten notes. Customer information from repeat clients was not systematically stored in a database, requiring customer details to be re-entered or verbally requested during subsequent visits. Transaction histories also heavily relied on physical paper archives. When historical data was required, manual inspections of physical notes were necessary. Observations and interviews indicated that retrieval of past transactions occurred two to three times a week, with the search duration increasing proportionally as physical archives accumulated.

Additional challenges were identified in revenue reporting and customer loyalty programs. Revenue reports were not automatically generated from transaction records, while point accumulation and redemption for discounts were managed manually. These operational limitations served as the foundational basis for designing a system that integrates customer data management, transaction processing, payment handling, loyalty point conversion, order status tracking, history logs, digital receipts, and automated revenue reporting.

The resulting system accommodates two user roles: owner and admin, categorized to align system functions with operational authority. Owners possess access to both operational functions and managerial information, including administrator management and revenue reports. Conversely, admins are restricted to service and transactional activities, excluding access to administrative management and financial reports. During the transaction workflow, stored customer profiles can be retrieved seamlessly, eliminating the need to re-enter customer credentials for repeat visits. Users then specify the service types and packages requested. The recorded transaction details subsequently drive payment processing and order status monitoring.

Payment processing is decoupled from order registration. This separation allows the total cost to be determined from finalized transaction data before payment execution. On the payment interface, the system displays the total amount due, the customer's loyalty point balance, point utilization, applied discounts, payment received, and change

due. Through this architecture, transactions and loyalty points remain interconnected without conflating order entry with payment settlement.

The implementation of the transaction and payment workflows is illustrated in Figure 3. Order recording is executed through the transaction interface, while payment settlement is handled on a dedicated page displaying total costs, customer point balances, point-to-discount conversions, cash tendered, and change calculations.

The top screenshot shows the 'Form Ubah Transaksi' interface. It includes a sidebar with navigation links like 'Dashboard', 'Batu Monitor', 'Data User', and 'Form Transaksi'. The main area has fields for 'Customer' (10/07/2026) and 'Alamat/Location' (mansang). Below these is a table of transaction items:

NO.	ITEM/LAYANAN	SATUAN	HARGA	JUMLAH	TOTAL
1	Dry Clean Jas	KG	Rp. 25.000	10	Rp. 250.000
2	Setrika Pakaian	satuan	Rp. 3.000	5	Rp. 15.000
3	Cuci + Setrika bi	KG	Rp. 8.000	7	Rp. 56.000

The bottom screenshot shows the 'Pembayaran' (Payment) page. It displays a customer's point balance of 3 points. Below this, it shows the total amount due (Rp. 3700) and a section for entering payment details, including a field for 'Masukkan uang pembayaran pelanggan' and a 'TOTAL YANG HARUS DIBAYAR' section.

Fig 2. Implementation of Transactions and Payments in the System

The system also provides order status indicators to track the progress of laundry processing. Transaction history logs preserve historical data, enabling users to retrieve past information seamlessly through the system. Upon payment completion, transaction receipts can be printed as official proof of service for customers. Period-based revenue reports are generated automatically, allowing owners to access financial summaries without manually consolidating physical receipts. These reports can be exported in both PDF and Excel formats. Access to financial data is strictly restricted to the owner role, reflecting proper managerial governance over sensitive enterprise financials. Prototype evaluations were conducted collaboratively with the business owner and administrative staff. Assessment focused on user interfaces, workflow navigation, information completeness, and role-based access control. User feedback served as the basis for system refinement during the iterative phases.

One notable iteration resulting from user evaluation involved the transaction receipt format. The initial draft was refined into a more concise receipt structure that clearly incorporates transaction details, payment summaries, discounts, and customer point statuses. These iterative evaluations highlight the core characteristics of the RAD methodology. Initial designs were not deployed as final products; instead, they were reviewed by users and optimized based on practical requirements identified during evaluations. Adjustments spanned across user interfaces, operational workflows particularly the decoupling of transactions and payment processing and the restriction of revenue reports. The findings indicate that the primary operational challenges in small-scale laundry businesses extend beyond the use of handwritten notes to include limitations in information storage and retrieval. When transactions, customer data, and payment information are stored within an interrelated database, data can be queried efficiently without heavy reliance on physical archives.

These findings align with previous discussions on web-based laundry information systems by Alam et al. (2021). Similarly, the inclusion of order status tracking corresponds with the research by Somaida et al. (2025), which highlights progress-tracking features within laundry management systems. This confirms that structured data management and status tracking are critical components in service process digitalization.

A key distinction emphasized in this study is the integration of customer loyalty points directly into the payment workflow. Rather than treating loyalty points as isolated records, they are linked to transactions, allowing users to view point balances and convert eligible points into automated discounts. This mechanism structures customer loyalty

management technically. However, this study did not measure shifts in customer retention rates, meaning the findings cannot conclusively claim that the point feature directly increases customer loyalty.

Role-based access control between owners and admins constitutes another vital aspect of system design. Financial information is restricted to the owner's authority, while admins retain access to operational functions. This access limitation demonstrates that enterprise system integration does not necessitate universal data access for all system users. The application of RAD is evident in the evolution from initial prototypes to user-centric final designs. Feedback regarding customer address structures, transaction-payment separation, receipt formats, revenue reports, and access privileges was successfully integrated via iterative cycles. This aligns with the characteristics of RAD defined by Pressman (2010) and Ramadhan et al. (2024), emphasizing development cycles that accommodate continuous system adaptation based on user requirements.

From a practical perspective, the system provides local laundry businesses with a structured platform to manage customer records, transaction histories, payments, loyalty points, and period-based revenue reports. The system also generates comprehensive digital receipts detailing financial settlements and point updates. Nevertheless, black-box testing solely verified that system functions operated according to expected scenarios. This study did not quantitatively measure reductions in service time, decreases in recording errors, user satisfaction, or customer loyalty. Consequently, the quantitative impact of the system on these operational metrics warrants future investigation through pre- and post-implementation analyses.

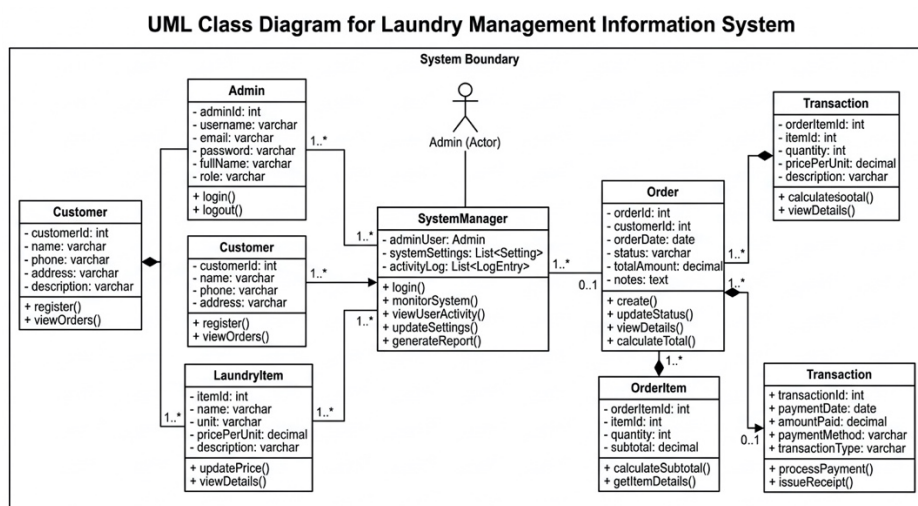


Fig 3. Proposed System UML

Based on the research findings, conventional transaction and customer data management in local laundry businesses previously relied on handwritten notes, resulting in unstructured data storage and prolonged physical archive inspections for retrieving past transactions. These operational limitations served as the foundational basis for developing a web-based Laundry Management Information System.

The system was successfully designed and engineered to support comprehensive data management, including customer profiles, service packages, transactions, payments, order statuses, transaction histories, loyalty points, receipt generation, and revenue reports. The platform incorporates two distinct user roles: owner and admin. Owners possess broader administrative privileges, including administrator management and financial report access, whereas admins are strictly focused on operational service functions.

The Rapid Application Development (RAD) methodology was systematically implemented through the requirements planning, RAD design workshop, and implementation phases. Active stakeholder involvement during prototype evaluations drove critical refinements in customer data handling, transactional workflows, payment processes, receipt formatting, revenue reporting, and access control. Based on black-box testing, all tested core functions produced outputs matching expected scenarios, confirming that the developed system fully fulfills the functional requirements established for daily laundry operational activities.

Before implementing the database into the system, a logical structure mapping is conducted using a Logical Record Structure (LRS) to depict the relationships between tables in detail. In this LRS diagram for the Rapid Application Development-based laundry management information system, primary entities such as Admin, Customer, LaundryItem, Order, OrderItem, Transaction, and LogEntry are interconnected through Primary Keys (PK) and Foreign Keys (FK). This mapping clarifies the database relationships—ranging from the management of customer data

and service catalogs by the admin, to the recording of order items with cost calculations, as well as the structured logging of payment transaction histories and system activities.

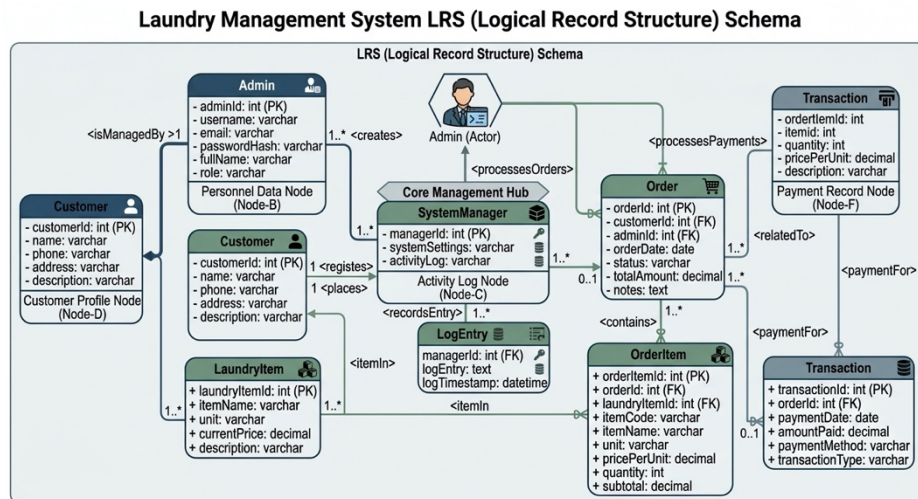


Fig 4. Logical Record Structure (LRS)

The development of the Laundry Management Information System follows the Rapid Application Development (RAD) methodology to ensure swift design iterations and continuous user involvement throughout the development lifecycle. As shown in the process diagram below, the system development is structured into four primary phases: Requirements Planning, User Design (Iterative Prototyping), Construction (Rapid Coding & Testing), and Cutover (Deployment & Transition). Through this iterative approach, system requirements are continuously refined and converted into functional modules with regular feedback from the single administrator actor.

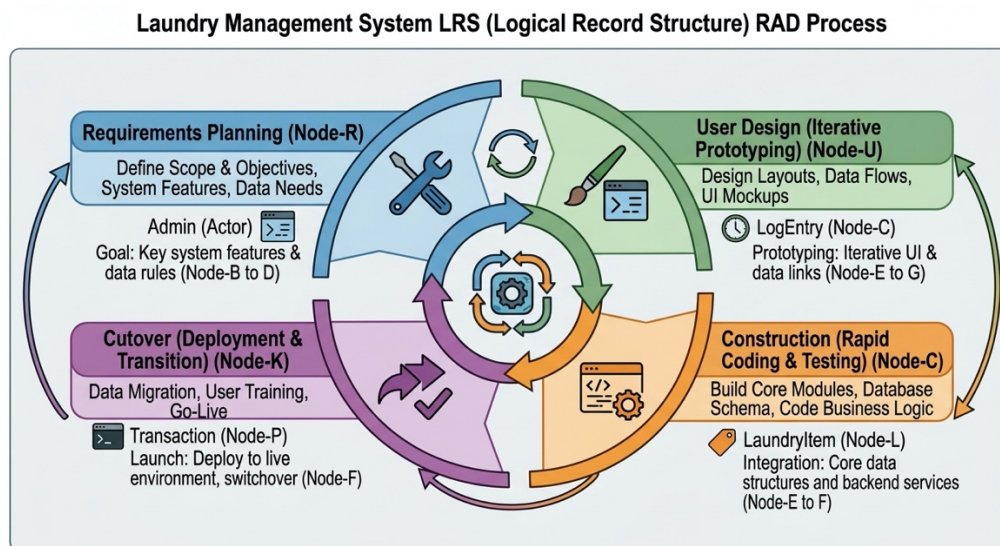


Fig 5. RAD Process

IV. CONCLUSIONS

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