

Design and Development of an Android-Based Laundry Application with a Drop-and-Go System

Abdillah Fa'iz¹, Muhamad Fikri²

Software Engineering Technology Study Program, Politeknik IDN Bogor

Manual administration in MSME laundry businesses is a primary source of operational inefficiency, generating service bottlenecks and a high risk of human error. High-mobility customers are hindered by slow manual record-keeping, the absence of order status transparency, and the lack of digital payment options. This study aims to design and develop an Android-based laundry application incorporating a Drop and Go system to fully automate and eliminate these administrative barriers. The system integrates a self-service booking feature, QR Code scanning for instant drop-off confirmation, and the Midtrans payment gateway for cashless transactions. The application was developed using the Flutter framework and Node.js, following the Waterfall methodology. Black-box testing on 10 Customer Application scenarios and 14 Outlet Application scenarios yielded a successful status for all functionalities. System Usability Scale (SUS) evaluation produced an average score of 75 (Good) for the Customer Application and 85 (Excellent) for the Outlet Application, demonstrating that the system is viable for implementation as a modernization solution for MSME laundry operations.

Keywords: Android, Drop and Go, Laundry, Cashless, System Usability Scale.

This is an open access article under the [CC BY-NC](#) license



Corresponding Author:

Abdillah Fa'iz

Software Engineering Technology Study Program, Politeknik IDN Bogor
abdillahdotfaizz@gmail.com

1. Introduction

The rapid development of information technology in the Industrial Revolution 4.0 era has encouraged businesses to adopt digital systems to improve operational effectiveness and service quality. Various business sectors have begun integrating mobile applications, cloud-based systems, and digital payment technologies to simplify business processes and provide faster services to customers. Digital transformation is no longer limited to large-scale companies but has also become increasingly relevant for micro, small, and medium enterprises (MSMEs) that need to remain competitive in a technology-driven market environment.

In the era of the Industrial Revolution 4.0, information technology has become a catalyst for fundamental business transformation. The integration of digital systems provides opportunities for businesses to improve operational efficiency while expanding market reach [1]. Business process automation has been proven to reduce operational costs and minimize the risk of human error [2]. However, real-world conditions show a significant gap: the majority of small and medium-sized laundry businesses (SMEs) still rely on manual processes for recording customer data, issuing receipts, and reporting transactions [3].

This reliance on manual mechanisms creates operational bottlenecks, especially during peak hours. The processes of weighing, writing physical receipts, and calculating costs individually have the potential to cause human error and loss of transaction data. The direct impact is a decrease in service speed and customer satisfaction. On the other hand, the demand for cashless payments continues to increase, particularly among Generation Z and Generation Y. Data shows that 81% of Indonesians use digital wallets for transactions, with the highest adoption among Generation Z (76%) and Generation Y (69%) [4][5].

A review of previous studies reveals that existing solutions are still partial. Systems developed for Laundry Rumah Hana [6] and LC Jaya Clean [7] focus on cashier digitalization and internal data management but do not yet provide flexibility for customers to perform self-service booking and integrated digital payments. The TRILA application [8] offers tracking features but has not optimized the efficiency of item drop-off processes at outlets. Another study integrating the Midtrans payment gateway into an Android platform [9] has not incorporated a QR Code-based confirmation mechanism as an anti-queue solution.

In the context of laundry services, one critical issue occurs during the item drop-off process at outlets. Customers are generally required to wait while staff perform administrative tasks such as recording customer information, weighing clothes, calculating service costs, and issuing receipts. These activities can create queues during busy periods and reduce overall service efficiency. Therefore, a digital solution that minimizes administrative interactions while maintaining transaction accuracy is needed to support faster and more convenient service delivery.

This study focuses on the design and development of an Android-based laundry application that implements a Drop and Go system. The system integrates self-service booking, QR Code-based item handover confirmation, cashless payment facilities, and real-time order tracking within a single platform. The research is limited to the development and evaluation of the application from both customer and outlet perspectives in supporting laundry service operations.

The objective of this study is to design, develop, and evaluate an Android-based laundry application using a Drop and Go approach that facilitates digital booking, cashless transactions, QR Code-based item handover verification, and real-time order monitoring to improve the efficiency and convenience of laundry service operations.

2. Literature Review

Digital transformation has become an important strategy for improving operational efficiency and service quality through the adoption of information systems and process automation [1], [2]. In the laundry service sector, digital systems are increasingly utilized to support customer data management, transaction recording, and business administration, while the growth of cashless payment adoption reflects changing consumer preferences toward faster and more convenient services [3]–[5]. These developments indicate that integrating digital technologies into service operations can enhance transaction efficiency, reduce manual workloads, and improve customer satisfaction.

Several studies have explored the implementation of digital systems in laundry businesses, including cashier digitalization, transaction management, order tracking, and payment gateway integration [6]–[9]. However, existing solutions generally focus on specific functions and have not fully integrated self-service booking, cashless payments, and QR Code-based item handover verification within a single ecosystem. Consequently, operational inefficiencies during the customer drop-off process remain a challenge. Based on this gap, this study addresses the problem of how to develop an Android-based laundry application using a Drop and Go system that integrates booking, payment, and verification features to reduce administrative bottlenecks and improve service efficiency. Therefore, this research seeks to answer the following questions: (1) How can an Android-based laundry application with a Drop and Go system be designed and developed? (2) How effective is the system in reducing administrative bottlenecks during the laundry drop-off process? and (3) How do customers and outlet operators perceive the usability of the developed application?

3. Methods

Type and Research Approach

This study employs the Research and Development (R&D) method, which is appropriate for effectively producing and validating a product [16]. The approach used is mixed methods: qualitative methods are applied to identify system requirements through comparative literature studies, while quantitative methods are used to measure usability using the System Usability Scale (SUS) questionnaire and functional testing through black-box testing.

Object and Research Subjects

The research object is a digital laundry service system using a Drop and Go approach, which includes self-service booking, cashless payment, and item handover via QR Code scanning. The research subjects consist of two groups: (1) laundry business operators (Tanjung Laundry, Pameungpeuk, Bandung Regency) as validators of system design suitability; and (2) 6 respondents aged 18–35 selected using purposive sampling for usability testing. This number of respondents refers to Nielsen's opinion stating that 5 respondents are sufficient for exploratory usability testing.

System Development Model: Waterfall

The system is developed using the Waterfall model, which consists of sequential phases where each phase must be completed before proceeding to the next [16]. The stages include:

- Requirement Analysis:** Identification of functional and non-functional requirements synthesized from literature studies. Customer functional requirements include outlet location search, self-service booking, cashless payment, and order status tracking. Employee functional requirements include login, statistical dashboard, QR Code scanner, transaction management, Bluetooth printer settings, and service management.
- System Design:** Development of system blueprints including process flowcharts, database design (PostgreSQL), and user interface (UI/UX) design for both Customer and Outlet applications.
- Implementation:** System development using Flutter 3.41.4 for the mobile side and Node.js + Express.js for the backend server, with PostgreSQL as the database and Midtrans integration as the payment gateway.
- Testing:** Black-box testing is conducted to verify system functionality, and the SUS questionnaire (10 items, Likert scale) is used to measure application usability.

Implementation Environment Specifications

Table 1. System Implementation Environment

Component	Specification / Description
Development Operating System	Windows 11
IDE / Code Editor	Visual Studio Code & Antigravity
Mobile Framework	Flutter 3.41.4
Backend Framework	Node.js + Express.js
Database	PostgreSQL
Payment Gateway	Midtrans
Target Platform	Android
Testing Devices	Tecno Camon 40 & Oppo A5 2020

4. Result And Discussion

Drop and Go System Architecture and Workflow

The developed system consists of three integrated main components: (1) an Android-based Customer Application for users; (2) an Android-based Outlet Application for laundry staff; and (3) a Node.js-based backend server that facilitates communication between the two applications through REST APIs. The Drop and Go mechanism is implemented through two key features: self-service booking, which allows customers to place orders independently before arriving at the outlet, and QR Code scanning as a medium for instant confirmation of clothing drop-off without manual input from staff. This transformation fundamentally eliminates administrative bottlenecks found in conventional systems.

Customer Application Implementation

The Customer Application is designed to enable users to perform the entire transaction process independently. The main features include: (a) user authentication through Login and Register pages; (b) interactive search for the nearest laundry outlets; (c) self-service booking with automatic price estimation; (d) QR Code Order as a digital ticket for clothing submission; (e) cashless payment integrated with Midtrans; and (f) real-time order status tracking accompanied by push notifications.

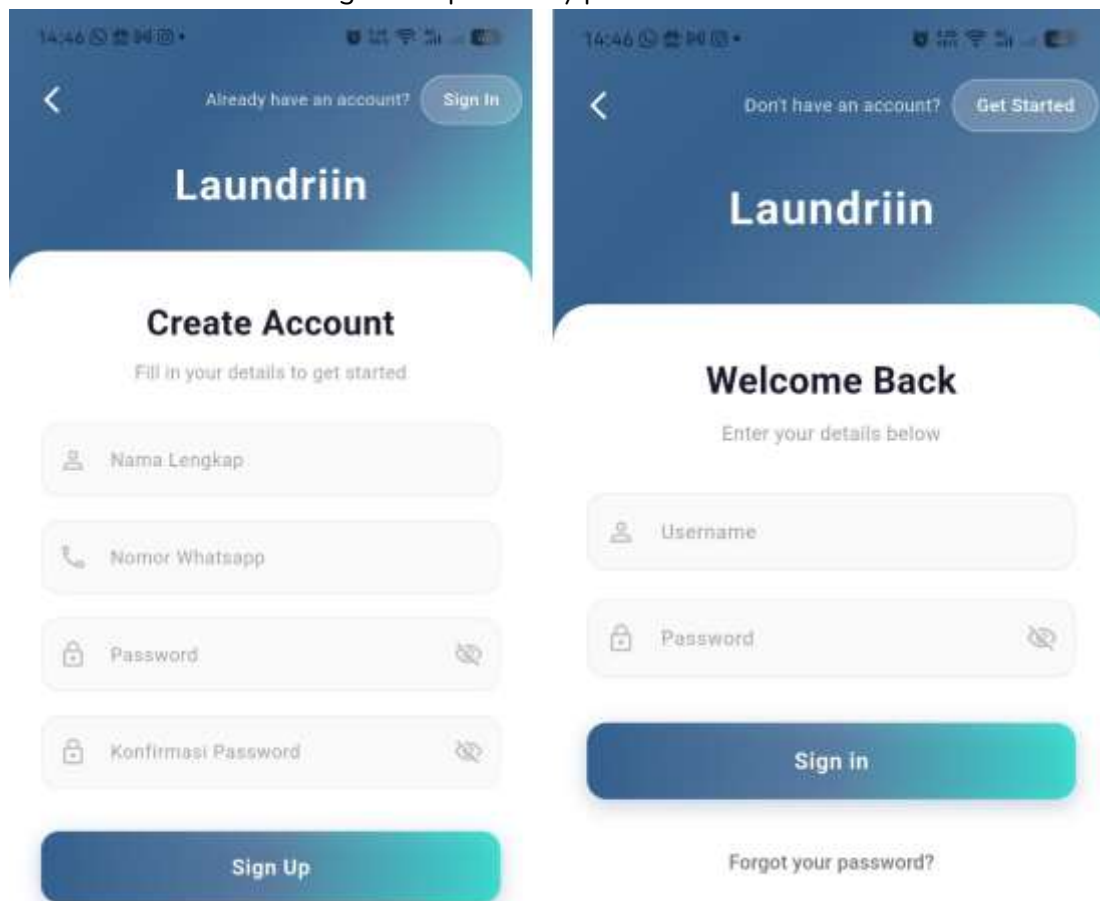


Figure 1. Customer Application Register and Login Interface

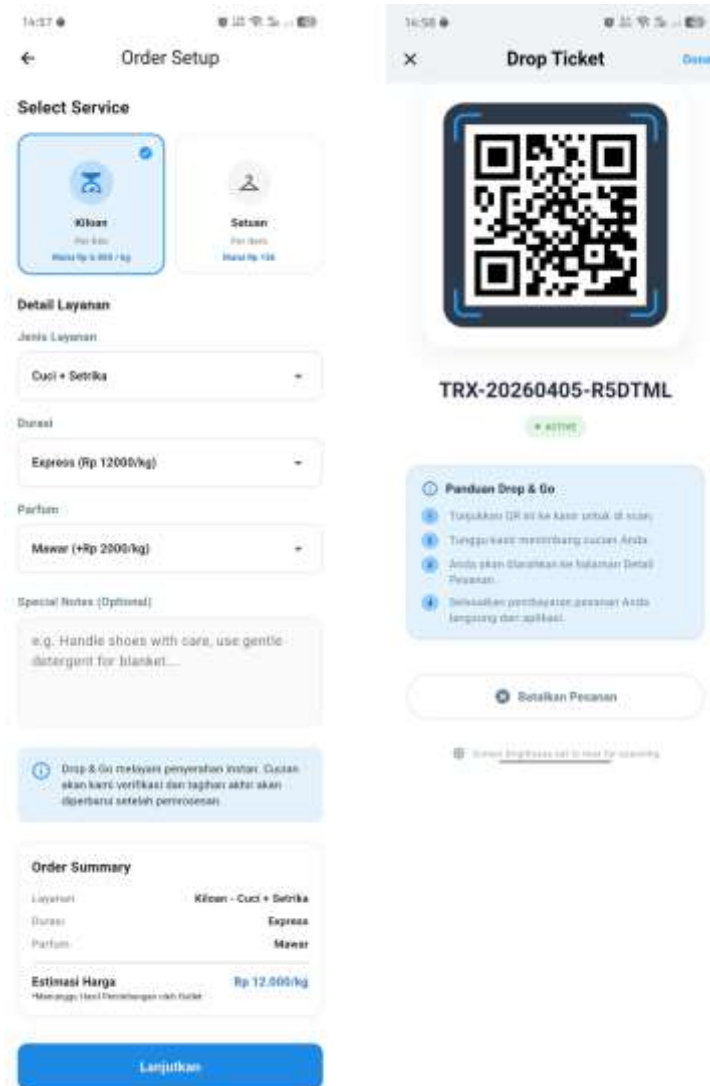


Figure 2. Self-Booking Interface (Order Setup) and QR Code Drop Ticket Customer Application

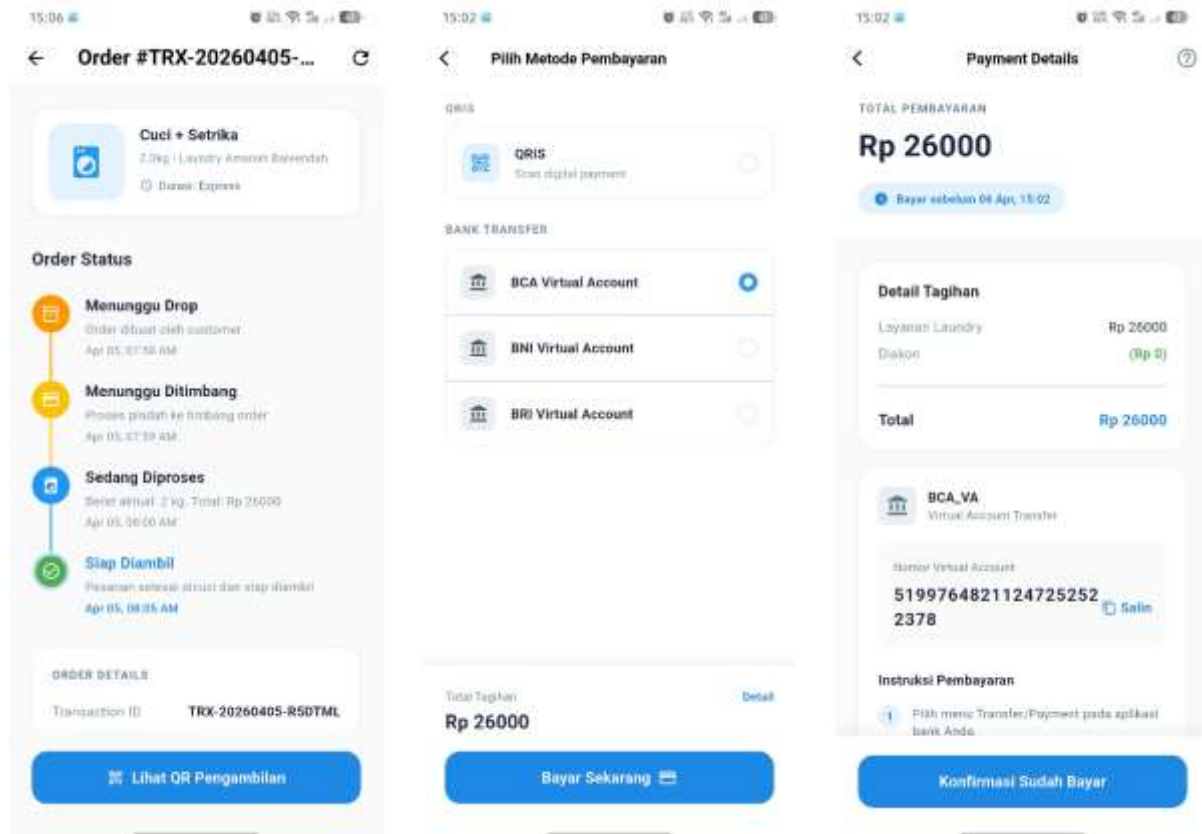


Figure 3. Customer Application Order Status Tracking and Cashless Payment Interface

Outlet Application Implementation

The Outlet Application is designed for laundry employees or administrators with the following key features: (a) A dashboard displaying a summary of daily order statistics; (b) A QR Code Scanner as the core of the Drop and Go mechanism, which automatically validates and displays transaction details when a customer's QR Code is scanned; (c) An Order Weighing form for inputting actual weight, which automatically calculates the total bill; (d) Transaction Details and Status Updates synchronized in real time with the Customer Application; (e) Bluetooth Thermal Printer integration for printing physical receipts; and (f) laundry service management (per item, per kilogram, and per added perfume).

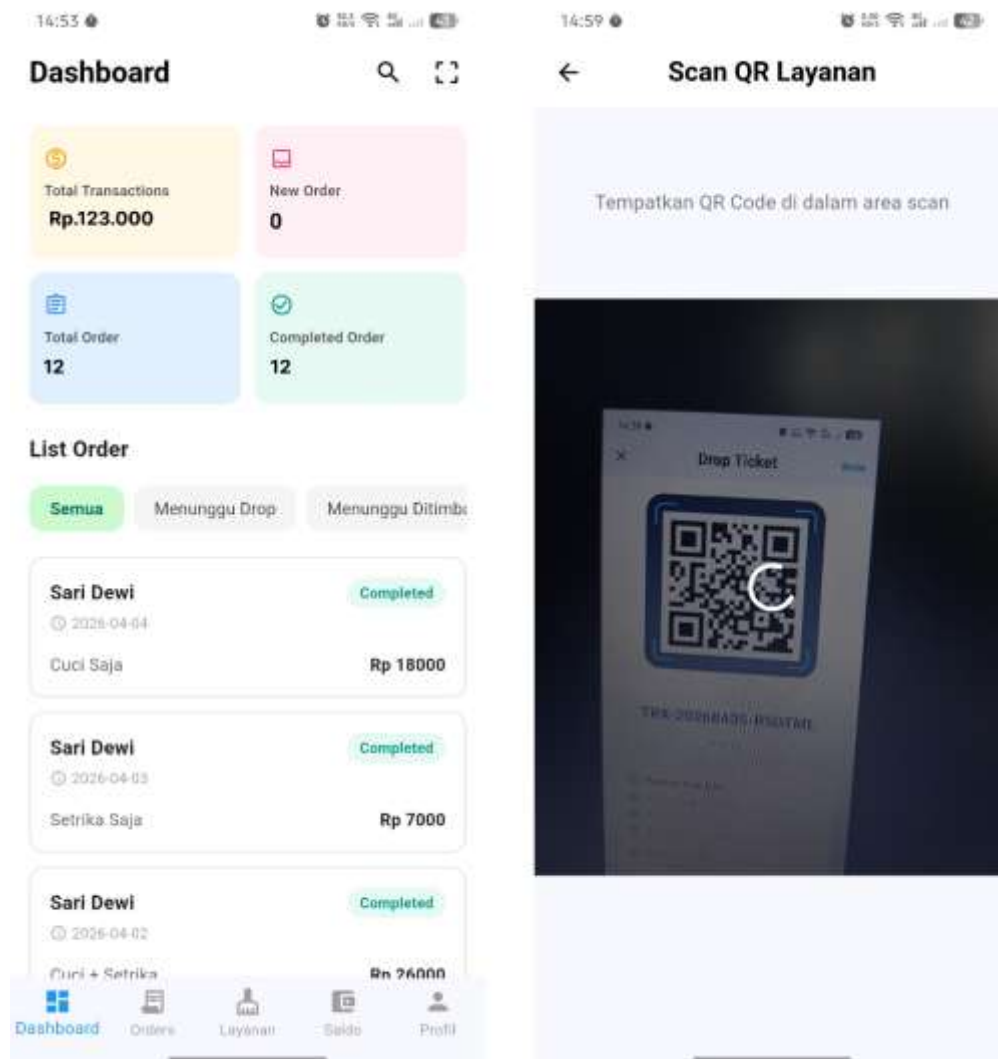


Figure 4. Outlet Application Dashboard and QR Code Scanner Interface

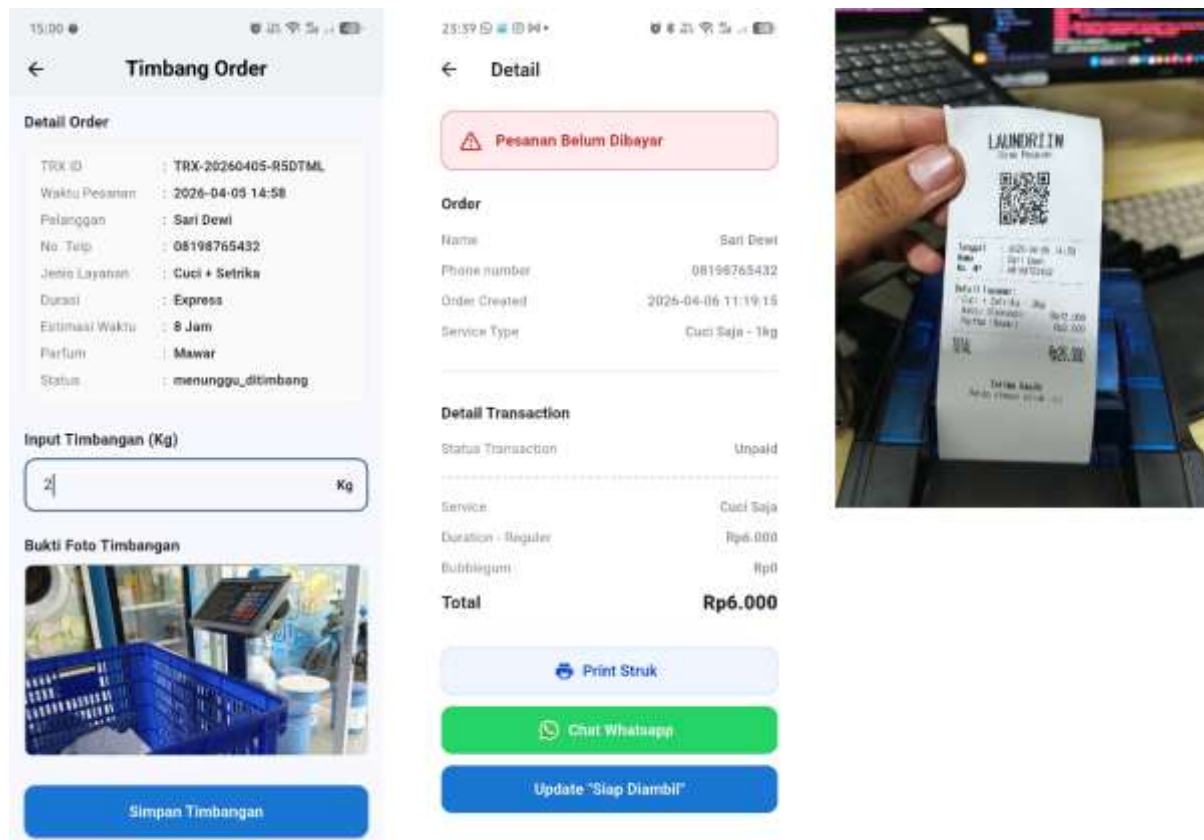


Figure 5. Weigh Order, Transaction Details, and Thermal Receipt Interfaces for the Outlet Application

Black-Box Testing Results

Black-box testing was conducted to verify that each system functionality produces output as expected based on the test scenario, regardless of the system's internal processes [16].

Table 2. Summary of Black-Box Testing Results for the Customer Application

No	Feature	Test Scenario	Status
1	Login	Valid credentials → navigate to main page	Success
2	Login	Invalid credentials → error message displayed	Success
3	Register	Complete data → account created, redirected to login	Success
4	Register	Empty fields → validation notification displayed	Success
5	Location Search	Location permission granted → outlet list and map displayed	Success
6	Booking	Complete data → price estimation and summary displayed	Success
7	Booking	Incomplete data → validation notification displayed	Success
8	QR Code Order	Successful booking → QR Code displayed	Success
9	Payment	Select payment method → payment code displayed, confirmation verified	Success
10	Tracking	Open active page → latest status displayed	Success

Table 3. Summary of Outlet Application Black-box Testing Results

No	Feature	Test Scenario	Status
1	Employee Login	Valid credentials → outlet dashboard displayed	Success
2	Outlet Registration	Complete outlet data → outlet successfully registered	Success

No	Feature	Test Scenario	Status
3	Dashboard	Successful login → order statistics displayed	Success
4	QR Scanner (Drop-off)	Scan customer QR → transaction details displayed automatically	Success
5	Order Weighing	Input actual weight → total bill calculated automatically	Success
6	Status Update (On Progress)	Confirm receipt → status updated & synced to customer	Success
7	Status Update (Done)	Mark as completed → status updated, notification sent	Success
8	QR Scanner (Pickup)	Scan pickup QR → order completion confirmed	Success
9	Service Management (Kg)	Add/edit/delete → changes saved	Success
10	Service Management (Item)	Add/edit/delete → changes saved	Success
11	Perfume Management	Add/edit/delete → changes saved	Success
12	Bluetooth Printer	Connect printer → receipt test print successful	Success
13	Print Receipt	Order completed → receipt printed via Bluetooth	Success
14	Outlet Profile	Edit outlet data → saved & displayed in Customer app	Success

Test results showed that all 10 scenarios in the Customer Application and 14 scenarios in the Outlet Application achieved a Success (100%) rating. This confirmed that all functional modules—from registration, self-service booking, cashless payments, QR Code scanning, service management, to order status updates—were running stably and according to system design.

System Usability Scale (SUS) Test Results

Usability testing was conducted using the System Usability Scale (SUS) method with 10 standardized Likert-scale statements. Scores were calculated using the standard SUS formula: odd-numbered statements were scored as (score - 1), even-numbered statements as (5 - score), and the total was then multiplied by 2.5 to produce a final score ranging from 0 to 100 [17].

Table 4. Summary of SUS Scores per Respondent

No	Respondent Name	Role	SUS Score	Application Tested
1	Tharisa Deswinia	Outlet Staff	90	Outlet Application
2	Masyail Khilmi	Customer	85	Customer Application
3	Zaid Al Maghfur	Customer	55	Customer Application
4	Miko	Customer	85	Customer Application
5	Ikrom	Customer	75	Customer Application
6	Danis	Outlet Staff	80	Outlet Application
Average – Customer Application: Average			75	Good (Grade B)
Average – Outlet Application:			85	Excellent (Grade A)

Table 5. SUS Score Interpretation Scale

SUS Score Range	Grade	Category
> 80.3	A	Excellent
68 – 80.3	B	Good
68	C	Okay (Acceptable)
51 – 68	D	Poor
< 51	F	Awful

Based on the SUS test results, the Customer Application received an average score of 75 (Good/B category), indicating that customers can operate the application well and comfortably. The Outlet Application received an average score of 85 (Excellent/A category), reflecting a very high level of acceptance by laundry staff. One Customer respondent (score 55) indicated the need to improve the application's initial learning curve as a future development direction.

Discussion: Effectiveness of the Drop and Go System

The implementation of the Drop and Go system fundamentally changes the paradigm of the laundry transaction flow. In conventional systems, there are at least four manual interaction stages when handing over clothes: registering identity, weighing, writing a physical receipt, and determining the payment method—a major bottleneck during peak hours. With the Drop and Go system, customers complete the first three stages independently through the application before arriving at the outlet. During physical handover, staff only need to scan a single QR Code, eliminating this repetitive administrative interaction, significantly shortening drop-off times.

These advantages complement the limitations of previous studies: the integration of the Midtrans payment gateway which is in line with Triase and Alda's research [9], the addition of a QR Code-based confirmation mechanism which was not found in previous studies, and a real-time tracking feature which strengthens information transparency for customers as recommended by Candraningtyas [10]. The combination of these three main features in one application ecosystem makes this system a more comprehensive solution compared to previous studies in the field of MSME laundry digitalization.

5. Conclusion

Based on the design, implementation, and testing results, the following conclusions can be drawn:

1. An Android-based laundry application with a Drop and Go system was successfully designed and built using the Flutter framework for mobile and Node.js as the backend, with integration with the Midtrans payment gateway for cashless transactions. All system components have been integrated into a single, integrated digital ecosystem.
2. The Drop and Go system has proven to significantly simplify the transaction flow. All administrative tasks previously performed upon customer arrival at the store are now completed independently through the app. Upon physical delivery, employees simply scan a QR Code, eliminating administrative bottlenecks and increasing transparency through real-time tracking.
3. Black-box testing of all test scenarios (10 Customer Application scenarios and 14 Outlet Application scenarios) resulted in a Success status for 100% of tested functionality, demonstrating the system's stability and reliability.
4. Usability testing using SUS resulted in an average score of 75 (Good/B) for the Customer App and 85 (Excellent/A) for the Outlet App, proving that both apps meet usability standards acceptable to end users as solutions for modernizing MSME laundry operations.

For further research, the following are recommended: (1) expanding the platform to iOS; (2) adding a geolocation-based pick-up and drop-off feature; (3) increasing the number of SUS test respondents; (4) developing a business analytics dashboard; and (5) adding more comprehensive push notifications.

6. References

- [1] R. Utami and A. Fauzi, "Strategi pemasaran usaha mikro, kecil dan menengah (UMKM) di era revolusi industri 4.0," *J. Akunt. dan Manaj. Bisnis*, vol. 3, no. 1, pp. 90–94, 2023.

- [2] A. Ayu, D. Lestari, A. Merthayasa, U. Cendekia, and M. Indonesia, "Peran teknologi dalam perubahan bisnis di era revolusi industri 4.0," vol. 7, no. 11, 2022.
- [3] S. Baco, "Perancangan sistem informasi laundry berbasis Android," *J. Teknol. dan Komput.*, vol. 1, no. 01, pp. 32–38, 2021.
- [4] A. D. Andriani et al., *Transformasi Indonesia Menuju Cashless Society*. Tohar Media, 2022.
- [5] D. Cahyani, A. Suherman, and I. Noor, "Pengaruh penggunaan cashless dan online shopping terhadap perilaku konsumtif Gen Z," *Econ. Rev. J.*, vol. 3, no. 4, pp. 1238–1248, 2024.
- [6] R. I. Salam, D. E. Putra, and S. Djasmayena, "Implementasi aplikasi kasir berbasis website pada usaha Laundry Rumah Hana," *J. Teknol. Komput. dan Inf.*, vol. 12, no. 1, pp. 45–55, 2024.
- [7] R. D. Supriatman and D. Mulyana, "Aplikasi laundry berbasis website menggunakan metode RAD pada LC Jaya Clean," *J. Mhs. Sist. Inf. Galuh*, vol. 1, no. 1, pp. 81–92, 2024.
- [8] E. M. Octhaviani, S. P. Haswanto, I. Kamelasari, and W. Haryono, "TRILA: Tracking dan rancang informasi laundry," *Mesada J. Innov. Res.*, vol. 2, no. 1, pp. 549–559, 2025.
- [9] T. Triase and M. Alda, "Aplikasi pemesanan layanan laundry pada Noda Laundry dengan integrasi Mid-trans payment gateway," *JTIK (J. Tek. Inform. Kaputama)*, vol. 8, no. 1, pp. 8–14, 2024.
- [10] R. V. Candraningtyas, "Rancang bangun aplikasi pencarian laundry berbasis arsitektur microservice menggunakan metode RAD," 2023, UNUSIA.
- [11] T. Pricillia, "Perbandingan metode pengembangan perangkat lunak (waterfall, prototype, RAD)," *J. Bangkit Indones.*, vol. 10, no. 1, pp. 6–12, 2021.
- [12] E. I. Setiawan, D. G. Saputra, and M. H. Purnomo, *Pemrograman Multiplatform dengan Flutter*. Deepublish.
- [13] I. Y. Supardi, *Semua Bisa Menjadi Programmer JavaScript & Node.js*. Elex Media Komputindo, 2021.
- [14] Yovita, "Apa itu payment gateway? Cara kerja dan manfaat bagi bisnis." [Online]. Tersedia: <https://mid-trans.com/id/blog/payment-gateway>
- [15] M. S. Rumetna, T. N. Lina, and A. B. Santoso, "Rancang bangun aplikasi koperasi simpan pinjam menggunakan metode research and development," *J. Simetris*, vol. 11, no. 1, pp. 119–128, 2020.
- [16] T. D. Capote, "A Comparative Study of Black Box and White Box Testing Techniques in Modern Software Development," *Front. Eng. Technol*, vol. 5, no. 1, pp. 1–7, 2024.
- [17] J. Brooke, "SUS-A quick and dirty usability scale," *Usability Eval. Ind.*, vol. 189, no. 194, pp. 4–7, 1996.