Jurnal Teknik Komputer AMIK BSI
Published: LPPM Universitas Bina Sarana Informatika
website: http://ejournal.bsi.ac.id/ejurnal/index.php/jtk
Vol. 12, No. 1, Januari 2026, P-ISSN 2442-2436, E-ISSN: 2550-0120, Page. 1-11.

Design and Development of Mobile-Based Laundry Business Application

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ARTICLE INFORMATION

Artikel History::
Received: 06/10/2025
Revised: 11/11/2025
Accepted: 10/02/2026

Keyword:
Laundry Business
Software Development
Application Prototype
Mobile-Based Application
Unified Modelling Languages (UML)

ABSTRACT

With the rapid advancement of technology comes solutions to maintain the welfare of businesses, including the laundry industry, which relies on customer retention and efficient service to sustain business. This research outlines the development cycle of a mobile-based application prototype for laundry businesses, providing an approach to support ongoing operations and drive customer engagement forward. The study follows the Software Development Life Cycle (SDLC) methodology, incorporating Unified Modeling Language (UML) and the Waterfall model for a structured process in information systems development. The application prototype provides key features such as online ordering, real-time order tracking, digital payments, automated notifications, and customer feedback platform. Additionally, the application includes an integrated database management system to aid business owners in data processing, improving productivity and service efficiency. The interface is designed to be intuitive, ensuring accessibility for a diverse range of users. Testing results indicate that the application meets functional requirements and enhances customer and worker experience by automating work activities therefore reducing manual workload. The findings suggest that implementing digital solutions in laundry businesses can improve customer satisfaction, increase customer retention, and optimize business resources. This research contributes to the digital transformation of businesses in the laundry sector, demonstrating the importance of technology in service-based industries.

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INTRODUCTION

The execution of business operations has been greatly aided with the rise of technological innovations. With each milestone the tech world achieves, from small to large, many businesses have reaped the benefits it sowed. The integration of technology in business processes has the ability to provide easier, faster, and more reliable completion of operational activities (Ahmad & Looy, 2020). Key activities in business operations, such as data processing, data management, and decision-making, can be significantly improved with the current technology of software development; assisting business owners to achieve desired results (Dylen et al., 2024).

According to Ryananda et al. (2022), laundry businesses fall into the "fast turnover" category, which means that its high demand causes the time span between orders to be relatively short. An example of this is when customers would repeatedly use the same laundry service in a short amount of time. From the previously mentioned activity, Ryananda et al. saw that laundry businesses rely quite heavily on customer retention, which have both short-term and long-term benefits for a business (Khair et al., 2023). One of the ways businesses can drive customer retention forward is with software development and database building to accommodate customer needs (Schleckser, 2023). A few benefits of implementing software into the business are that customers can access the product or service provided without the constraint of time and space, businesses can build a more recognizable brand, and business activities such as collecting, archiving, managing, and processing of data are easier to do (Lozić & Čiković, 2021). With database management technology, business processes are also able to be automated, reducing time needed in data processing, minimizing risks in human errors, as well as enhancing accuracy in data processing (Banurea & Nasution, 2023).

Constraints and limitations have been set on this study to ensure optimal focus and effectiveness towards building an intuitive, well-structured, and elegant mobile-based laundry application prototype. The application is designed exclusively for mobile devices, excluding other platforms such as desktop or web-based services. This research focuses on conceptual development and user interface design of the application. Additionally, testing is limited to simulated scenarios and user feedback on graphical user interface design as well as application flow.

The purpose of this study is to provide a practical solution for laundry businesses to be able to provide a convenient, customer-oriented, as well as an easy-to-use service for their customers. Another goal in developing the prototype is to expedite coordination between departments in order to accomplish various business activities efficiently, assisting staff in swiftly communicating with each other through built-in application features. This research aspires to aid businesses in increasing customer satisfaction and retention by providing an online platform to order services and a tool to boost operational efficiency through automated systems.

RESEARCH METHOD

1. Waterfall Method in Software Development Life Cycle (SDLC)

   Software Development Life Cycle (SDLC) methodology is a set of systematic steps that are implemented in the process of software development (Hakim et al., 2024). SDLC is used by system analysts and programmers as a sequence of workflow processes in developing an information system. According to Mangedong & Prayitno (2023), the main purpose of SDLC is to provide an effective and efficient information system as well as a means to fulfill customer needs.

   The waterfall model or waterfall methodology is one of the methods used in SDLC (Wahid, 2020). According to Wahid, this model follows a systematic and sequential approach, from analysing, planning, modeling, constructing, to system deployment. This model is named waterfall due to its sequential nature where each step has to be completed before moving on to the next, as well as a linear process without any way to go back to the previous step.

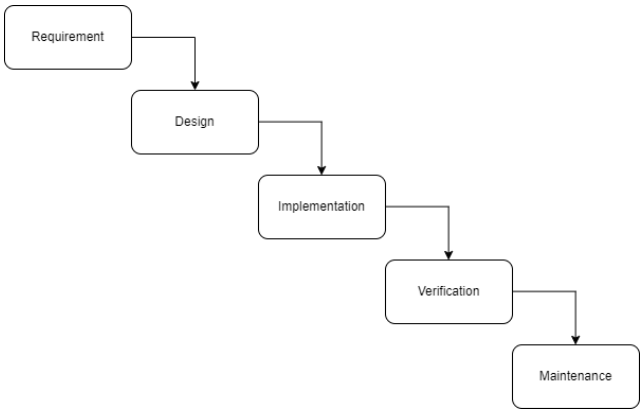

Figure 1. Phases of the Waterfall model in SDLC

Figure 1 represents the five phases in SDLC using the Waterfall method, which are (Wahid, 2020):

1. Requirement: Communication with users to understand desired software and its constraints, gathering information through interviews, discussions, or surveys.
2. Design: Developing system design to define hardware and system requirements and overall system architecture.

3. Implementation: Developing and testing units for functionality in the first phase, followed by integrating units and further testing.
4. Verification: Verifying and testing the system to ensure it meets user requirements. Includes unit testing, system testing, and acceptance testing.
5. Maintenance: Final stage involving running the software and maintaining it, including fixing previously undetected errors.

2. UML (Unified Modelling Language) Diagram

Unified Modeling Language (UML) is a widely used industry-standard language for defining requirements, creating analysis and design, and describing architecture in object-oriented programming. Analysis and design modeling in software development is crucial to ensure the quality of processes and products. UML helps in describing and designing software systems, especially those built using object-oriented programming (Ramdany et al., 2024).

a. Use Case

A use case describes the functions of a system from the user's perspective (Purnasari et al., 2022). It outlines the interaction between users and the system at a high level. The steps that explain the interaction between users and the system are known as scenarios. Each scenario depicts a sequence of events that can be initiated by individuals, other systems, hardware, or based on timing. A use case comprises a series of interrelated scenarios focusing on the user's overall goals. Typically, a use case involves actors, which are roles that users can play while interacting with the system (Herdiyanto & Normalisa, 2020). Elements of a use case diagram includes actors, use cases, and relations (Molla et al., 2024). According to Molla et al., in drawing a use case diagram, there are three aspects to note: Who, What, and Why. The aspect of “who” refers to the system’s actors, “what” refers to the actor’s desired activity, and “why” refers to the reason behind the activity.

b. Activity Diagram

An Activity Diagram provides a more detailed representation than a use case diagram, where each state depicts an action state, and transitions between states occur as a result of completing the previous state's action (Narulita et al., 2024). This diagram is generally used to clearly show the sequence of states. It explains the internal behavior of a method or state and shows the flow of actions influenced by previous actions (Hasanah & Untari, 2021). There are multiple components in illustrating an activity diagram. Those components include the initial/start node, activity, control flow, decision, merge, join, fork, swimlane, and lastly, an end point (Ramdany et al., 2024).

c. Entity Relationship Diagram (ERD)

ERD is a data model with a conceptual schema that views the real world as a collection of entities and relationships between entities (Saad & Muniandi, 2020). This diagram aims to assist in the design of database systems by illustrating the relationships between tables and how the database works (Afifah et al., 2022). Variations of ERD notation include Chen Notation proposed by Peter Chen, Barker Notation proposed by Richard Barker, Ian Palmer, and Harry Ellis, and Crow's Foot Notation proposed by Gordon Everest (Akion, 2024). According to Coronel & Morris (2022), there are four components in Crow’s Foot notation, which are Entities, Attributes, and Participation and Cardinality, and Relationship Strength. These components are the basis of the conceptual model database we build in this study..

RESULTS AND DISCUSSION

This section provides the essential components that shape the system's functionality and design. It covers the Entity-Relationship Diagram (ERD) to define data relationships, the use case diagram to illustrate system interactions, and the activity diagram to represent workflow processes. Lastly, the Figma prototype showcases the application's user interface, providing a visual representation of the final design. These elements collectively demonstrate the system’s structure and usability.

1. Use Case Diagram

Below is the use case diagram of the laundry business application. This diagram illustrates the interactions between the actors as well as the system in use. All of the use cases describe a function in the application, providing information on which actors contribute to the function and use it.

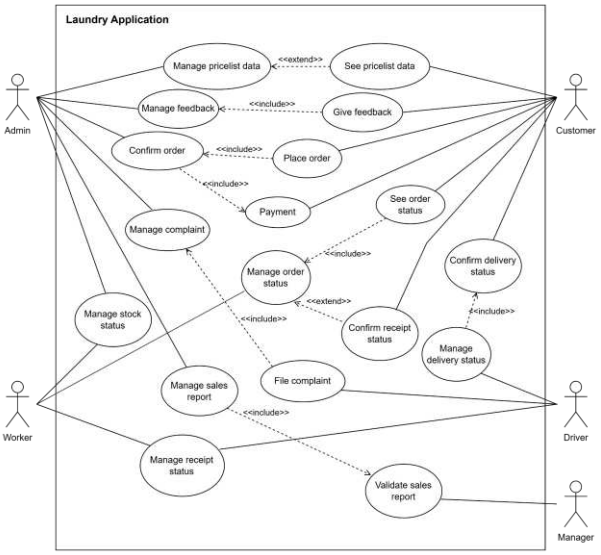

Figure 2. Use Case Diagram of Laundry Business Application

2. Activity Diagram

The following are three activity diagrams illustrating actions that are supported by the application. The activity diagram illustrates the workflow or steps that the actor takes, decisions that are made, as well as actions done by the system to support the action.

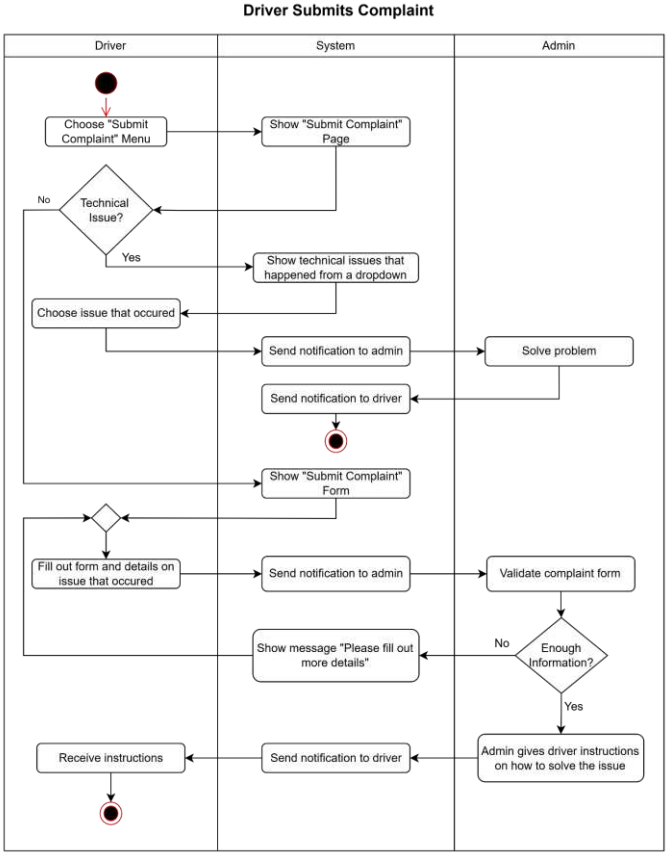

Figure 3. Activity Diagram of "Driver Submits Complaint"

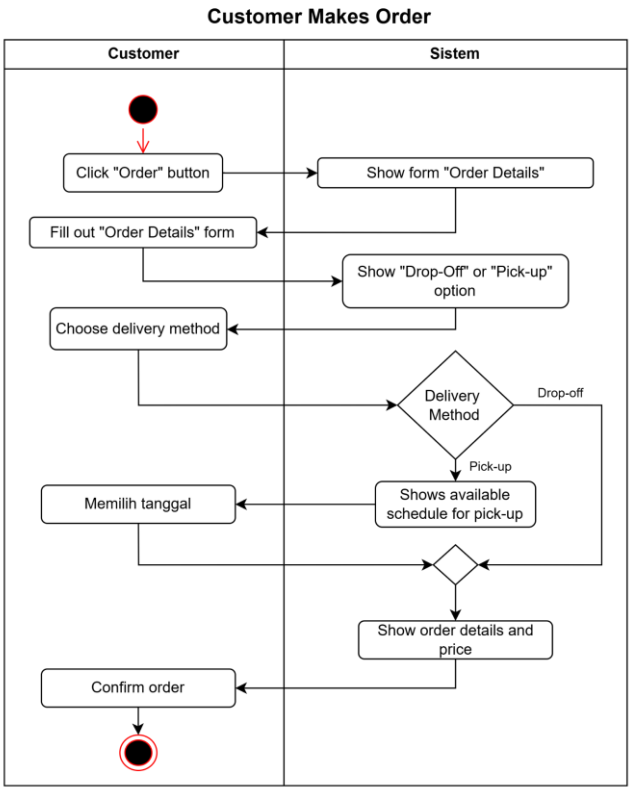

Figure 4. Activity Diagram of "Customer Makes Order"

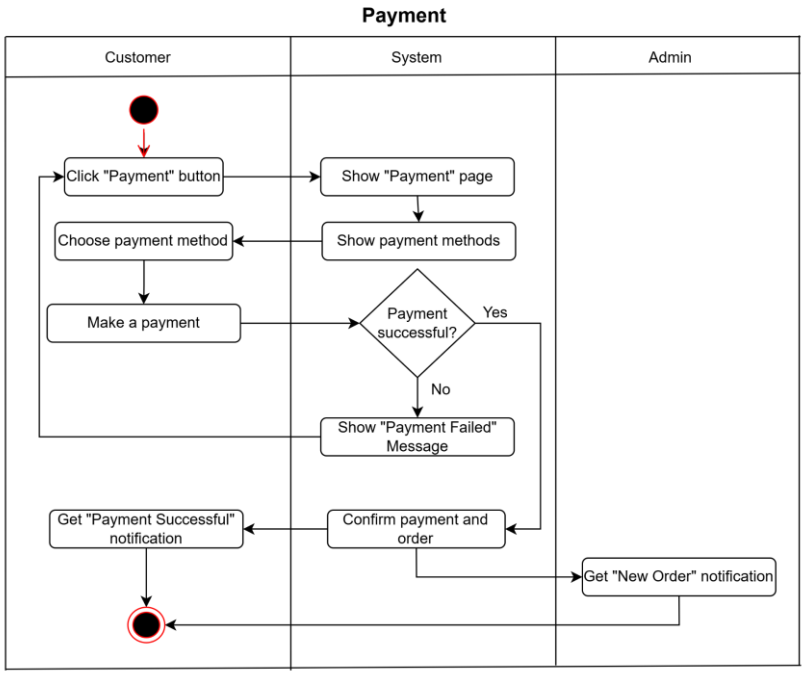

Figure 5. Activity Diagram of "Payment"

3. Entity-Relationship Diagram (ERD)

Presented below is the ERD of the laundry business application. This entity-relationship diagram is a visualization of the conceptual database design for the proposed system, providing a detailed idea on the relationship between entities behave in the database.

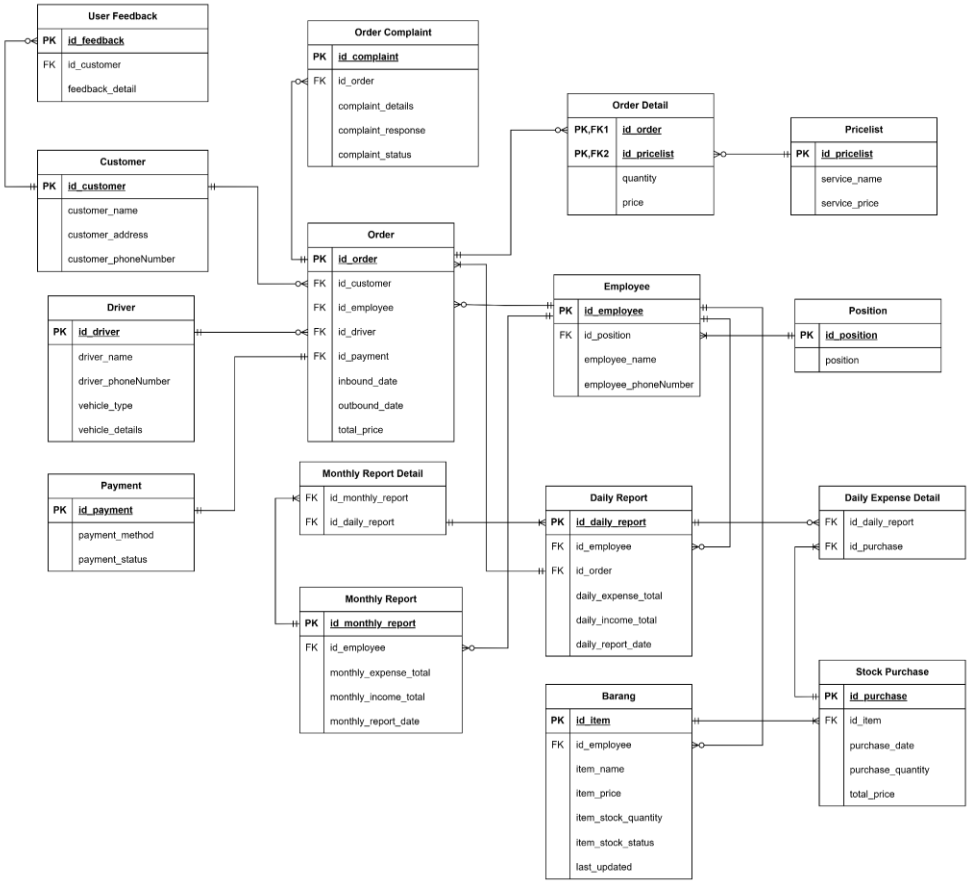

Figure 6. Entity-Relationship Diagram (ERD) with Crow's Foot Notation

4. Application Prototype

Below are the results of the Laundry Business application prototype named LaudroCat.

a. Onboarding, Login, and Registration Page

When the user opens the app, they will be greeted by the Onboarding page. The user can press one of two buttons on this page. If the user clicks "Join Us!", then they will be redirected to the registration page. If the user already has an account, then they can press on the blue "Log in" text to be redirected to the login page.

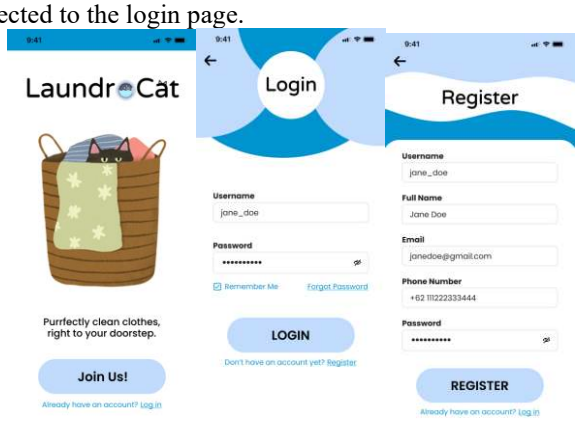

Figure 7. Onboarding, Login, and Register Mockup Page

b. Home page

After a successful login, the user will be redirected to the home page. The user will be provided with service information, order-related menus, and even an AI chatbot.

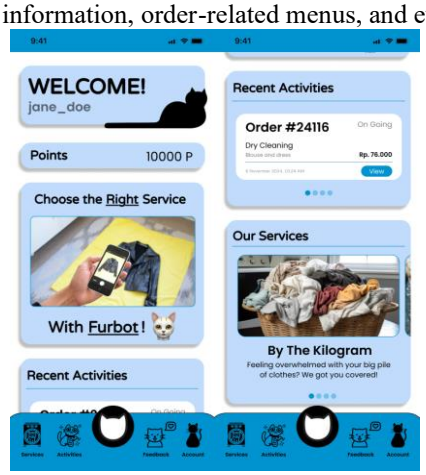

Figure 8. User Homepage Mockup

c. Account Information Page

By clicking the Account menu from the navigation bar, the user will be sent to the account information page. The user will be able to view and edit their information, submit a complaint, view an About Us page, as well as logout from their account.

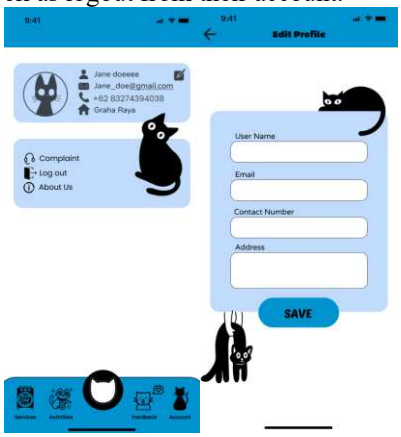

Figure 9. User Account Information

d. Submit Complaint Page

Pressing the Complaint button on the user information page will redirect the user to the Submit Complaint page. The user can choose one out of a list of complaints. The user will then be prompted to fill out forms and even provide photo evidence. After submitting, all complaints can be viewed in the Submitted Complaints tab.

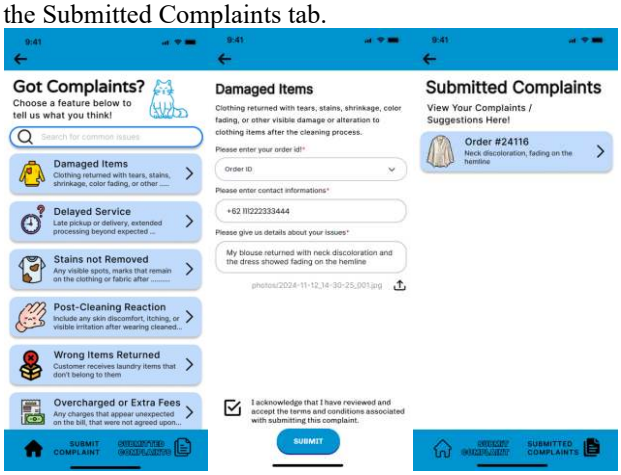

Figure 10. Submit Complaint Page

e. Feedback Page

The user can submit an application and service feedback by clicking on the Feedback menu on the navigation bar. It will show five illustrative buttons and a text-box for feedback details.

Figure 11. Feedback Page for Application and Service Quality

f. Activities Page

When the user clicks on the Activities button on the navigation bar, they will be shown their list of recent ongoing and finished orders. If a user clicks on the View button, they will either be shown the Order Finished page or be shown an Ongoing Order page. On an ongoing order, the user can track the driver's location, text the driver, and call the driver.

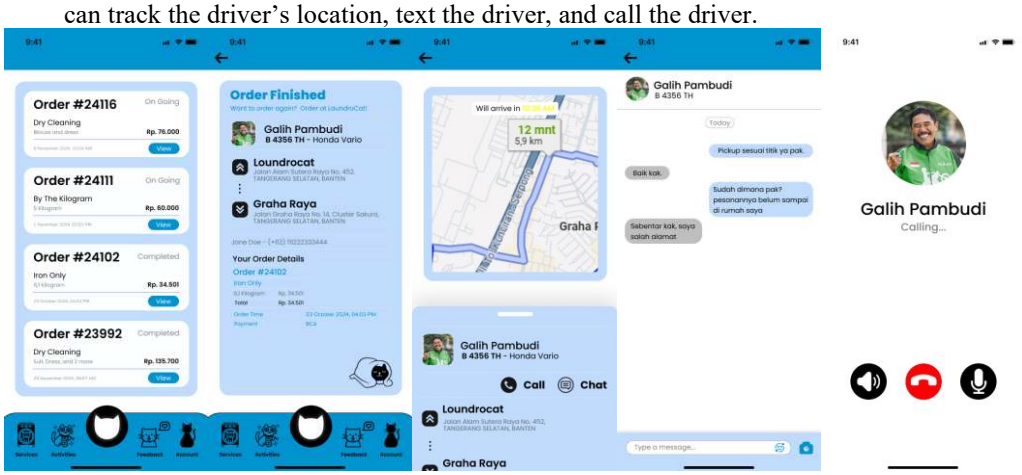

Figure 12. Recent Activities Page

g. Services Page and Ordering

By clicking on the Services menu on the navigation bar, the user will be shown service options the business provides. From there, the user can pick any service they want to order. Some services have a different way to order. For example, since dry cleaning counts charges per clothing item, the customer has to click the + button to add and - button to subtract the amount of clothing item shown.

After determining the amount of clothes, the user will choose the payment method supported by the business. If the user chooses QRIS, then a QR code will be displayed. After choosing the payment method and paying, the user will be prompted to view order details, which will redirect the user to the Activities page to view recently ordered services.

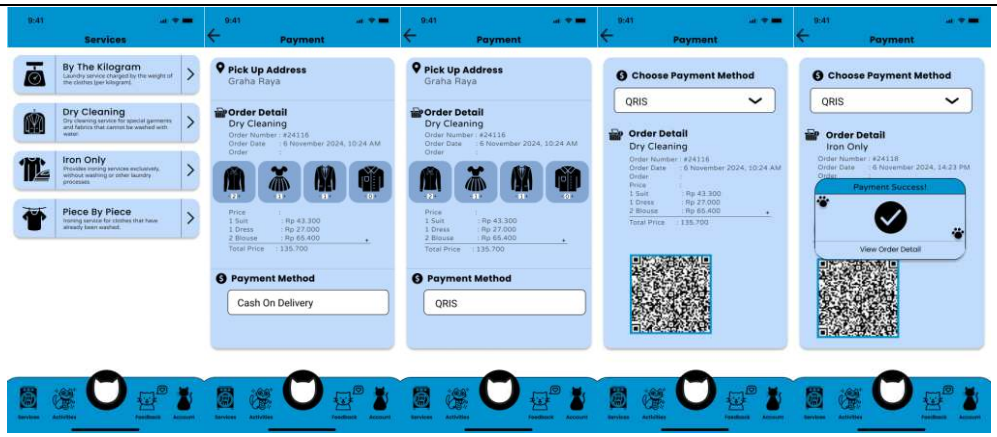

Figure 13. Service List and Ordering Page

h. App Notifications

The user will also get notifications from the LaundroCat app. Notifications can remind user to use the business' laundry services according to when users usually put in their orders and also provide users with live tracking of their order.

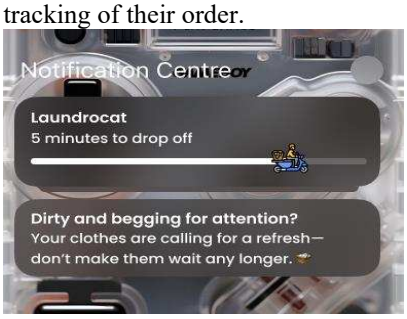

Figure 14. Notification Mockup

i. AI Chatbot

LaundroCat users can also chat with Furbot, an AI Chatbot that can provide suggestions on which service is appropriate for your clothing, how to remove any imperfections from clothing items, and much more. Furbot can recognize clothing items from pictures and analyze them to give the user a satisfying experience with the laundry service.

Figure 15. Furbot, LaundroCat's AI Chatbot

Based on the developed prototype, testing was conducted to evaluate the system's functionality and user experience. Testing was done using the black box testing method, which focuses on the evaluation of interfaces and functionality of an application without testing the program's code (Krisno & Bhisetya, 2023). Black box testing ensured that all features worked as intended, with no major defects detected. The results confirmed that the system met expectations, while user insights highlighted areas for refinement, ensuring a more seamless experience.

Table 1. Blackbox Testing

No	Test Scenario	Test Case	Expected Result	Test Result	Conclusion
1	Verify user login	Enter correct username and password	Login successful, redirect to home page	As expected	Pass
2	Verify user login	Enter incorrect username and/or password	Login failed, stay on login page	As expected	Pass
3	Verify user registration	Fill all forms on registration page	Registration successful, redirect to login page	As expected	Pass
4	Verify user registration	Leave some forms blank on registration page	Registration failed, stay on register page	As expected	Pass
5	Show Recent Activities page	Click on Recent Activities menu	See Recent Activities/Orders	As expected	Pass
6	Edit user account	Click on edit account menu and change user information	User information changes according to edits made	As expected	Pass
7	Complaint	Submit complaint as user by choosing corresponding issue and filling out all forms	Complaint successfully made and submitted	As expected	Pass
8	Log out	Click on profile, then click on logout button	Log out of account, redirect to login page	As expected	Pass

CONCLUSION

This study has outlined the development process of a mobile-based laundry business application prototype with a goal to improve service efficiency, customer experience, and business process automation. With laundry businesses heavily relying on customer retention, the application is able to become a solution to increase customer loyalty by complementing the laundry business' high demand with the convenience and automation of technology. The findings for this study validate these expectations with prototype testing and user feedback indicating that the system design and functionality have incited positive user experiences. While this study is limited to the design and prototype phase of software development, future research could touch on full-scale implementation, cross-platform compatibility, AI-driven personalization, and improved workload automation to further optimize business resources. The results of this research emphasizes the importance of technology implementation in business operations as a foundation for enhanced workflow with the help of technological advancements.

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