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LECTURER	: ASSOC. PROF. TS. DR. ASLINA BAHARUM
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Table of Contents

dobiQueen Laundry Tracking System

1.0 Introduction to the Organization

DobiQueen is a Malaysian self-service technology-driven laundry SME founded by Nini Tan and Senglee Tan in 2015. In just 8 years, it has grown to over 80 outlets across the Klang Valley (Khaw, 2024). Operating 24/7, each outlet is equipped with professional-grade Electrolux machines and uses premium detergents for lasting freshness at affordable rates (Media Outreach, 2023). Customers can choose between self-service, staff-assisted transfers, or app-powered pickup and delivery, including same-day and 6-hour turnaround options (Iffah, 2023). Users can schedule laundry pickups, monitor cleaning progress, and receive real-time delivery updates through its mobile app. These services cater to busy individuals seeking both quality and convenience in laundry care.

Figure 1: dobiQueen Logo

While app-based customers benefit from automated tracking and notifications, walk-in customers experience limited automation. They must manually monitor laundry cycles, often waiting on-site or returning to check machine status, which leads to idle waiting, missed cycle completions, and slower machine turnover during peak hours. Customers often experience frustration due to lack of visibility into when their laundry cycle completes. There was an incident where a customer expressed annoyance when a machine remained occupied for over 30 minutes after the cycle ended, blocking it from others (Suresh, 2023). These emphasize the need for proactive cycle notifications to reduce inefficiencies and ease customer anxiety. An analysis highlights that implementing real-time monitoring enhances operational efficiency and trust in service environments (Tharik et al., 2025).

2.0 System Planning and Feasibility Study

2.1 Goals of the Proposed System

The system aims to enhance dobiQueen's walk-in customer experience by implementing a QR-based web tracker that delivers real-time laundry cycle updates. This solution was identified through reviewing similar implementations, such as Dewi Jaya Laundry's website-based real-time tracking system, which improved convenience by allowing customers to monitor laundry remotely (Cahyaningrum & Norhikmah, 2023). Studies like Smartlaundry (Portase et al., 2024) show real-time cycle tracking reduces waiting and optimizes machine usage. Therefore, implementing laundry monitoring and notifications significantly enhance user convenience (Kirchner, 2023).

2.2 Feasibility Analysis

The feasibility study was conducted through secondary research on laundromat best practices, and analysis of existing laundry tracking solutions. Findings were adapted to dobiQueen's operational, technical, and financial context.

2.2.1 Operational Feasibility

The solution integrates easily with dobiQueen's current self-service procedure. Since customers currently run washers and dryers by hand, a voluntary digital check-in system using QR codes won't disrupt existing operations. Customers can choose to scan the QR code using their mobile camera. This design aligns with SmartLaundry's model of real-time status visibility to end users via mobile interfaces, which reduce wait times and optimize machine usage in public laundry settings (Portase et al., 2024).

2.2.2 Technical Feasibility

The solution can be developed using cloud-based timing, QR code linking, and modern web technologies. Consumers scan a QR code attached to a machine, initiate a predetermined countdown. The system manages countdown tracking and reminders through browser. A similar browser-based approach used by Dewi Jaya Laundry enabled customers to track washing progress without specialized hardware (Cahyaningrum & Norhikmah, 2023). Cloud hosted laundry monitoring systems, as seen in SmartLaundry deployments, ensures scalability, reliable performance and ease of development (Portase et al., 2024).

2.2.3 Economic Feasibility

Since the solution uses low-cost physical QR labels and simple software development, it requires less capital investment. Dewi Jaya Laundry's case shows that implementing a web-based tracking system can be achieved without significant hardware upgrades (Cahyaningrum & Norhikmah, 2023). Additionally, SmartLaundry's notification features have been linked to improved machine turnover rates and higher customer satisfaction (Portase et al., 2024). These improvements enhance long-term brand loyalty and increase customer satisfaction.

2.3 Key Stakeholder Involved

Key stakeholders include self-service customers as they gain improved convenience and automated reminders, dobiQueen management to ensure alignment with business goals, and developers to design and maintain browser-based system. Staff can assist in onboarding and encouraging adoption during rollout, ensuring smooth integration with existing workflows.

3.0 Requirement Analysis

The requirements for the proposed QR-based laundry cycle tracker were identified through secondary fact-finding by interpreting operational needs from feasibility studies, observing user behaviour in self-service laundries, and reviewing proven solutions.

3.1 Functional Requirements

The functional requirements were derived from academic and practical insights into laundry operations. Studies like Portase et al. (2024) show that real-time tracking and notification systems reduce idle machine time and improve allocation efficiency. Similarly, Kalo and Amron (2023) emphasize how user-centric interfaces including scheduling and status updates, enhance customer satisfaction and reduce uncertainty. The proposed solution enables customers to launch a browser-based countdown timer and issue notification such as “5 minutes remaining” and “Cycle complete”, by scanning a QR-code specific to each machine. Admins can track activities, update cycle, and registering machine QR codes.

3.2 Non-Functional Requirements

Performance ensures the system responds quickly during use. Portase et al. (2024) highlights real-time laundry monitoring systems must deliver status updates without noticeable delay. In this solution, scanning a QR-code should load the countdown timer within 2 seconds, and notifications should trigger within one second of their scheduled time. This responsiveness builds trust and ensures smooth user experience.

Scalability ensures the system can handle business growth without major redesign. If dobiQueen expands to new branches, the backend should support adding machines and QR codes without affecting existing operations. Menachery and Johnson (2021) demonstrated that non-invasive IoT monitoring methods can scale to hundreds of machines across large premises, showing such systems can expand without hardware changes. This ensures solution remains future-proof, supporting more users and locations with minimal effort.

3.3 Use Case Diagram

Figure 2 below is the use case diagram. The diagram highlights three primary use cases which are scanning a QR code to start the cycle, tracking the time remaining, and receiving notifications.

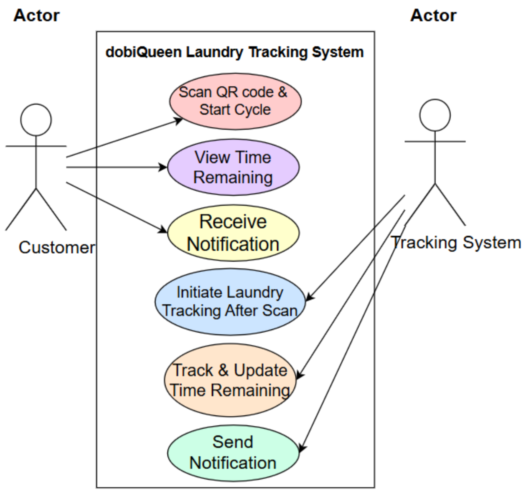

Figure 2: Use Case Diagram

3.3.1 Use Case 1: Scan QR code and Start Cycle

The customer scans the machine's QR code to start a laundry cycle. The systems register a new session and begin the countdown.

Precondition: The machine is available, and the QR code is accessible.

Postcondition: A session is registered, and the timer starts.

Alternate Flow: Manual entry of machine code if QR scan fails.

Exception Flow: Error message if machine is in use.

3.3.2 Use Case 2: Track Time Remaining

Customers view the real-time countdown for their laundry session via the browser interface.

Precondition: An active session is linked to the customer's device.

Postcondition: Remaining time is displayed accurately.

Alternate Flow: Customer refreshes page if auto-update lags.

Exception Flow: "Unable to fetch status" error for server or connection issues.

3.3.3 Use Case 3: Receive Notifications

Customers receive browser notifications 5 minutes before the cycle completes and at cycle ends.

Preconditions: Active session with browser notification enabled.

Postconditions: Notifications are received on time.

Alternate Flow: Status can be checked manually if notifications are missing.

Exception Flow: “Unable to fetch status” error for service or connection issues.

3.4 System Actors and Their Interactions

There are 2 actors, which are the walk-in customers and the tracking system. The walk-in customer is the user who interacts with the tracking system to scan QR codes, view remaining time, and receive notifications. The tracking system processes scans, updates countdowns, and send notifications.

3.5 Activity Diagram

The figure below shows the activity diagram that illustrates customers’ interaction with the laundry tracking system. It includes alternate paths for QR scanning issues, and system errors, as well as conditional flows for sending reminders and completion alerts.

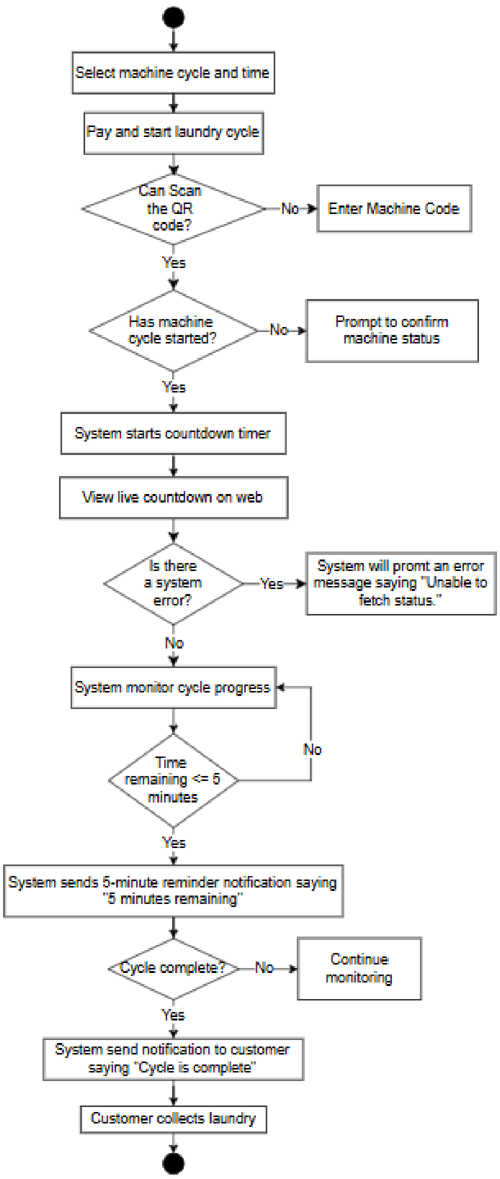

Figure 3: Activity Diagram

3.6 User Stories or Scenarios

While doing laundry at dobiQueen, a customer scans the machine's QR code on their phone. A timer starts instantly, showing the remaining time. They leave to run errands, and minutes before the cycle ends, they get a notification, so they return just in time to collect the laundry.

4.0 High-Level System Design

4.1 Context Diagram

The context diagram, as shown below, was developed after identifying all external entities that interact with the dobiQueen Laundry Tracking System, and the type of information exchanged. From the functional requirements and use case analysis, four main actors were found, customers, machines, admins, and the notification service. The diagram maps the primary data flows such as customer initiating QR scan requests and receive time updates, machines send cycle durations, and the notification service delivers alerts. Admins receive usage logs and reports to manage operations. This high-level model provides an overview of the system's boundaries and interactions without detailing internal processes.

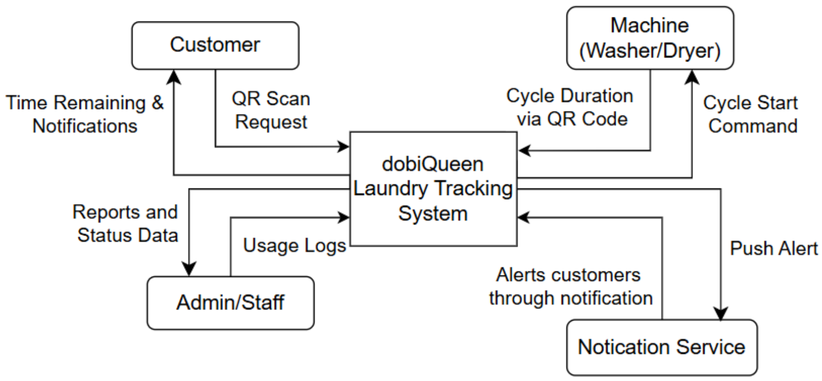

Figure 4: Context Diagram

4.2 System Architecture

The system architecture was informed by similar IoT-based real-time laundry framework. Like SmartLaundry by Portase et al. (2024), this design incorporates a modular, cloud-hosted client-server model where customer initiate session by scanning a QR code. This triggers backends services to start countdown, manage session data, and deliver notifications. An admin interface connects securely for machine registration and configuration. Communication is encrypted via HTTPS. Cloud deployment ensures scalability, enabling the system to efficiently serve expanding branches and peak traffic. The architecture ensures real-time responsiveness and user convenience, aligning with the functional and non-functional goals observed in SmartLaundry's data driven-driven, near real-time allocation model.

4.3 User Interface Design Mock-up

The UI was designed using Figma to create a clean, mobile-first layout optimized for quick interaction. Key screens include the QR scan in mobile camera app, real-time countdown in browser page, and notification pop-ups.

Figure 5: Scan QR

Figure 6: Countdown Page

Figure 7: 5 Minutes Reminder Notification

Figure 8: Cycle Ended Notification

4.4 How Design Supports User Requirements

Together, the notification system and the UI mock-up improves the user experience. Push alerts like “Washer #3 will finish in 5 minutes” will lessen the need for the users for manual checking. The push alert that says “Washer #3 has finished. Please collect your items” will notify the users that their laundry is done and that it is ready to be collected. Fast comprehension is ensured by a simple layout with bold text and easy-to-use navigation. Overall, the design satisfies user needs by being effective, accessible, and functional.

5.0 Reflection and Justification

5.1 System Development Life Cycle (SDLC)

The laundry timer system follows the Waterfall Model by following a methodical, transparent procedure. Stakeholder requirements were first gathered to do the initial analysis where it was found that that real-time cycle tracking, notification preferences, and easy navigation were the main user needs. The automation, easy accessibility to mobile or browser, and little interaction is highlighted.

These requirements are reflected in the UI mock-up for the following design, which has a clean layout, bold timers, and a clear push alert notification for reminder before the cycle ends and after the cycle ends. Clarity and usability are guaranteed by a visual hierarchy and simple controls.

The aim for the testing phase is to confirm the readability, responsiveness, and notification accuracy through usability testing. The usability testing, which emphasizes device compatibility and real-world scenarios, will make sure users can easily navigate the interface and receive alerts.

The finalized mock-up will be followed by the implementation phase, which aims to preserve design and functionality coherence. To meet the fundamental user needs, key features such as QR-based machine tracking and real-time updates will be created, by paying close attention to scalability and dependability.

5.2 Challenges in System Implementation

Implementation risks include hardware integration with QR-enabled machines, third-party API reliability and maintaining notification accuracy. A risk plan should address API downtime, compatibility issues, and fallback options for failed alerts. User adoption may face resistance from those unfamiliar with digital tools. Mitigating this require clear instructions, simple onboarding, and multilingual support. Regular testing and phased rollouts can reduce failures, ensuring dependable operation and user trust throughout the deployment process.

5.3 Reflection

As system analyst, this project strengthened my skills in planning, analysis, and design. Planning clarified objectives and identified risks early. Analysis allowed mapping user needs to functional and non-functional requirements. The design phase emphasized balancing simplicity with robust functionality, ensuring accessibility across devices. Considering sensitive cases like missed alerts improved resilience. This systematic approach creates solutions that are both technically sound and user-friendly, aligning with real-world operational demands and customer expectations.

(2000 words)

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Appendices

Link to clearer use case diagram:

https://drive.google.com/file/d/1wJq6JVnLonh2Z2ZGguDNlTE5UzTYMyQ8/view?usp=sharin
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Link to clearer activity diagram:

https://drive.google.com/file/d/1Q2AJPe_OQ3YPjbzTBtLLSB3bTQGjj3tY/view?usp=sharing

Link to clearer context diagram:

https://drive.google.com/file/d/145ZKZrieHG1nDPoPOUtck1Id7NN5V1Cf/view?usp=sharing

Link to UI Design:

https://drive.google.com/file/d/1KVxKYVfe4_A3dVWLck8p4JRIBHOc5PLn/view?usp=sharin
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