



Laundry Management System for The Royal Laundry (Pvt) Ltd

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ABSTRACT

In the modern day context, technology has changed the game of business. Adaptation has become an absolute necessity for survival with the rapid bloom of entrepreneurship. In order to compete successfully businesses need to improve themselves and one of the best ways is to digitalise their systems.

The Royal Laundry (Pvt) Ltd is a retail laundry service provider in Sri Lanka. They have been providing the very best services in washing, drying, ironing and dry cleaning since 2016 using modern cleaning technologies and world class detergents but they are using a manual system for the management and maintenance of critical information. They are looking towards the future and aims to establish a standardized process of work flows for the core components of its business. They have been looking for a product to manage their business model for some time. Success of this product will open multiple opportunities for them and improve their overall sales and help create a larger market.

An important part of the operation of any laundry firm involves the acquisition, management and timely retrieval of large volumes of information. This information typically involves; customer personal information and clothing records history, user information, cost of the service and retrieval period, users scheduling as regards, customer feedback about the service rendered. The proposed system will satisfy the key functional requirements of the laundry while allowing easy data recording and fast information retrieval along with reduced data redundancy thus improving efficiency and ease for both the customer and the staff. I hope to innovatively address the common issue of customer cloth mix-ups by improvising a washable barcode tagging mechanism and the untimely retrieval and delivery of clothes too by implementing a disciplined system with proper notifications . The system will also provide complete, updated and accurate reports which will allow the management to develop better goals, strategic plans, company policies, and make decisions on the direction of the business.

The system will be developed using PHP as the server-side programming language and MySQL as the database language for designing the database. Further, JavaScript and Bootstrap will be used as client-side technologies whilst XAMPP will be used to run the project and NetBeans has been selected as the IDE. The framework will be Laravel.

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CHAPTER 01: INTRODUCTION

1.1 About the Client

The Royal Laundry (Pvt) Ltd is a large scale commercial and retail laundry service provider in Sri Lanka. They have a proven track record for providing quality laundry services since their inception in 2016 using modern cleaning technologies combined with world class, safe and environmentally friendly detergents. They have consulted the world's leading industry experts and procured the best available laundry equipment. This means that it incorporates the latest European technology to meet customers' high standards for health, hygiene and quality. Each and every one of their laundry attendants and staff are thoroughly trained to each task and has completed all of the necessary safety training. As a family owned business, they wanted to create a laundry pick up and delivery service that delivered high quality, value and time savings to customers. Their vision is to free as many customers as they can from heavy, tedious, time-consuming laundry chores whilst their mission is to change lives through laundry.

1.2 Motivation for the Project

- The Individual Final Year Project of the BIT degree program offered by the UCSC is an integral goal for me to achieve my aim of becoming a software engineer.
- Successful completion of this project will introduce me to a path in the software industry, that will lead me to career success and self-fulfillment.
- This project will offer me a chance to work on requirements which I am yet to explore and gain unknown domain knowledge that will undoubtedly be handy in any similar projects faced in future.
- I have an opportunity to automate and improve the day to day tasks & operations of the business and thereby help reduce the workload of the staff which will inturn, like the butterfly effect, help improve their standards of living.
- The management of The Royal laundry (Pvt) Ltd, have shown great support and determination towards the success of this project.

1.3 Objectives of the Project

- **OBJ01:** Increase the efficiency of operations by simplifying the users operations and enabling them to set targets, on-time service delivery and service evaluation.
- **OBJ02:** Increase the accuracy of the data that is being provided by the system for better decision making and also reduce data redundancy.
- **OBJ03:** Provide more analytical data through reports which the management can use to base their decisions.
- **OBJ04:** Increase the number of services completed per time unit (per-hour).
- **OBJ05:** Set-up more effective schedules and work-shifts in order to avoid idle time of the staff and hence improve the efficiency.
- **OBJ06:** Process improvements of the laundry operation.
- **OBJ07:** Enable the customers of the laundry to effectively manage their service schedules (pickup and delivery).
- **OBJ08:** Minimize the time spent by a customer at the laundry to obtain its services.
- **OBJ09:** Attract more customers with the overall improved model.

1.4 Scope of the Project

- **Customer Registration:** Customer has the option to register themselves through the system by giving basic details.
- **Customer Login:** Upon registration, customer can login to the system via login screen.
- **Service Booking - Customer:** There will be two types of booking; registered customer and guest bookings. Bookings will be traced by taking the NIC number as the primary key. Once logged-in, the user will be able to place a request and they will be able to select what sort of jobs are be completed in order to be specific in performing the job at the laundry.
- **Service Booking - Staff:** Laundry staff will also be given a screen to select customers and make bookings since there will be direct visits to the laundry for cleaning jobs.
- **Job Card:** Once the clothes from a specific client reach the laundry, workshop staff need to open a job card by referring to the job order placed via booking. Once

the job is done, job card needs to be completed upon which a receipt can be printed.

- **Barcode Generation:** A barcode will be generated by the system to be printed on a special washable material to be tagged onto the clothes of the customer for identification.
- **Inventory management:** This will be a basic inventory system where Item ID, Name, Description etc. can be maintained for every cloth item collected from the client and relate stocks used for cleaning jobs.
- **Online payment:** Once the booking is placed, the customer is required to pay an advance payment. There will be an option to select whether a refund is required or not in case of no cloth drop off by the customer or no collection by the laundry staff. Refunds will not be handled in the system where claims must be done by visiting the Laundry.
- **SMS:** An SMS is expected to be sent upon job completion to the customer, requesting feedback about the job and reminders such as delivery times.
- **Dashboard:** Couple of widgets will be added to a dashboard which displays laundry bookings, completed jobs etc.
- **Report module:** Employee performance, machinery efficiency, job efficiency, job history, job predictions based on dates and history records.

1.5 Structure of the Dissertation

This dissertation consists of six key chapters including the introduction chapter. It describes the outline flow of the software development process which is the main focus of this project and is aimed at providing a clearer understanding of the delivered system.

1.5.1 Chapter 2: Analysis

The main focus of this chapter is the Requirements Analysis phase of the SDLC, where the project's requirements are identified and defined along with important information about the problem domain and the techniques used during this phase.

1.5.2 Chapter 3: Design

This chapter focuses on the Design phase of the SDLC, where modeling techniques are used to get a better understanding on how the developing solution should be architected.

1.5.3 Chapter 4: Implementation

Focuses on the implementation phase of the SDLC. Where the requirement specification is converted into the practical world application.

1.5.4 Chapter 5: Evaluation

Focuses on the testing phase of the SDLC. The methods taken to perform tests on the developing software and after development to confirm that the system addresses the problems identified initially.

1.5.5 Chapter 6: Conclusion

This chapter focuses on the outcome of the delivered project along with any future enhancements/modifications planned.

1.5.6 References

A defined list of references acknowledging material published by other entities which has been adapted into this project dissertation.

1.5.7 Appendices

Appendix A: System Documentation – Technical Documentations which provides configurations, illustrations and hardware and software requirements are included.

Appendix B: Design Documentation – Entity relationship, use case diagrams and UML diagrams used in design stage are included.

Appendix C: User Documentation – Comprehensive documentation which describes how to use the system is included.

Appendix D: Management Reports – All reports including administrative reports with samples.

Appendix E: Test Results – Actual test results which were used to validate system are included.

Appendix F: Client Certificate – Client Certificate which indicates the client requirement are met and provided a satisfying system.

1.5.8 Glossary

Definition of technical terms used.

1.5.9 Index

An extensive index.

CHAPTER 02: ANALYSIS

2.1 Introduction

Requirements analysis is the process of determining user expectations for a new or modified product. In systems engineering and software engineering, requirements analysis focuses on tasks that determine the needs or conditions to satisfy the new or altered product or project, taking into account the potentially conflicting requirements of the various stakeholders analyzing, documenting, validating and managing software or system requirements. Analysis of requirements is important to the success or failure of a system or software project. The specifications should be recorded, actionable, measurable, testable, traceable, relevant to the business needs or opportunities identified, and specified to a reasonable level of detail for system design.

2.2 Structure and the Workflow of the Current System

The Royal Laundry (Pvt) Ltd is a large scale commercial and retail laundry provider in Sri Lanka. The mission of the business is to establish value laden relationships with its clients by providing them with convenient, professional, eco-friendly, efficient, effective and hygienic oriented dry cleaning and laundry management solutions. Their vision is to move the laundry service industry forward by creating a sustainable and prosperous future while giving back to their stakeholders. They want to be the industry leader and laundry service provider of choice through their consistent pursuit of excellence in all that they do.

The general business process of the existing system has been outlined below:

Customers have to visit the laundry and request the staff for a laundry order. The staff will accept the order and open a job card. The customer then has to hand over their load of clothes which will be weighed and recorded by the staff. The clothes will then be sorted by trained staff separating the white from the coloured. Using their high capacity industrial washing machines, the clothes are then thoroughly washed according to the standards and guidelines for each industry. Wet laundry is then placed in large capacity dryers and dried well. Once the clothes are dry they are checked thoroughly to ensure that they have been properly washed and then manually folded by the staff. The clothes are then tallied with the job cards and sorted accordingly with respect to ownership. If the customer has requested the added service of ironing his/her clothes are ironed. The clothes are rechecked once more before packing them to be picked up by the respective customer to confirm that all the items collected are ready for collection. The customer is then manually notified via a phone call. The customer visits the laundry and examines that all the clothes are present and makes the payment. The job card is closed by the staff.

2.3 Drawbacks of the existing system

D01: Data redundancy

Because of the manual recording and storage of data, data gets replicated unnecessarily taking up a lot of physical space.

D02: Time wastage and delays

Manual data recording, processing and retrieval is time consuming and results in unnecessary delays.

D03: Extra effort

Parties involved often have to provide an extra effort for all the job tasks, from the creation of the job card to processing of the laundry and even customer notification.

D04: Inefficient maintenance of records

Customer records are not maintained efficiently and in abnormal situations like a complaint or very late collection things get complicated.

D05: No item tracking mechanism

There is no method to track and identify items other than by description in the job card.

D06: No report generation mechanism

Since all data is manually collected, processed and stored there is no existing report generation mechanism and the management have a limited range of information available to consider for decision making.

D07: Human errors

Since data entry and processing is done manually more mistakes are liable to be made, specially when it comes to billing and invoice processing.

D07: No pickup or delivery management mechanism

Customer has to visit the laundry and hand over the clothes after requesting for a laundry order and likewise visit the laundry for collection.

2.4 Current System Use Case Diagram

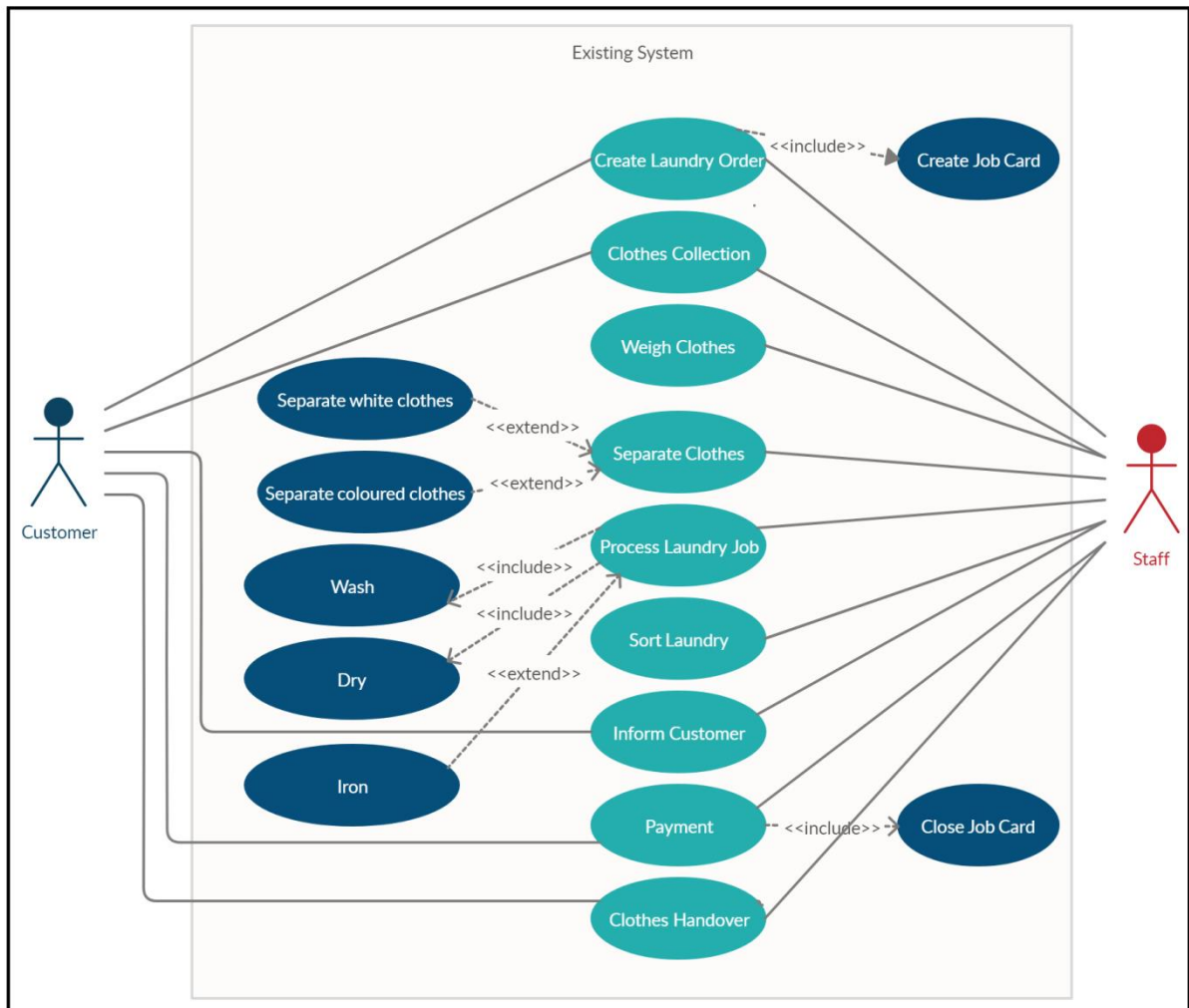


Figure 2. 1 : Current System Use Case Diagram

2.5 Similar system comparison

2.5.1 LinenTech

LinenTech is a product of Nextek Systems, an ERP software solutions company with focus on Laundry Management Softwares. It is a cloud based commercial laundry software designed to automate and optimize laundry management operations. With LinenTech you can keep a track of every item you have processed. LinenTech has a unique billing and invoicing system designed. It also allows inventory management for the customer's linen as well as other related stock. The system provides various software access levels based on the user role at the laundry and through that they offer ease of use and high productivity for the end users.

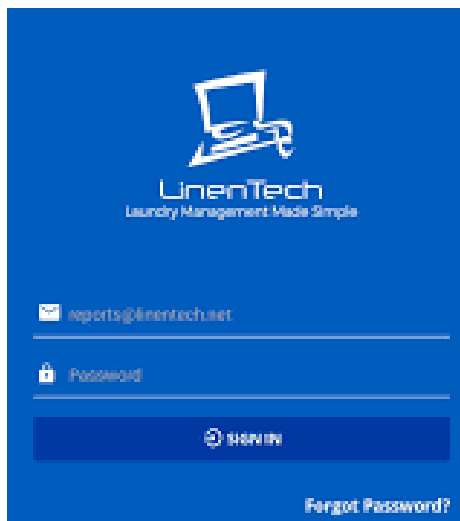


Figure 2. 2 : LinenTech UI

2.5.2 ABSSolute V9

ABSSolute V9 is the latest generation of laundry software offered by ABS Laundry Business Solutions, in which they have implemented the most cutting edge technology available and cover all business lines for multi-plant organizations, stand alone laundries and OPLs in the Textile Rental Business. Using a modular approach they tailor each installation to suit the demands of the customer. Linen Supply, Garment Scanning & Locating, UHF RFID, Residential Work, Operating Room Service and Dust Control are the key modules they offer. All modules offer integrated invoicing and E-commerce.

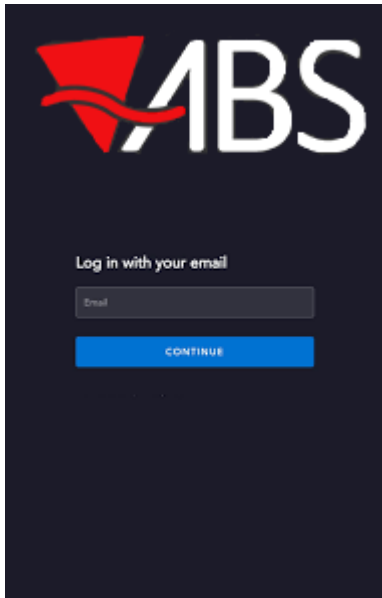


Figure 2. 3 : ABSSolute V9 UI

2.5.3 Similar systems and proposed system features comparison

Feature	LinenTech	ABSSolute V9	Proposed System
Modularized System	No	Yes	Yes
User access controls	Yes	Yes	Yes
Billing and Invoice	Yes	Yes	Yes
Garment Tracking	Yes	Yes	Yes
Garment Tagging (Barcode/Rfid)	No	Yes	Yes
Clothes Inventory Mangement	Yes	Yes	Yes
Stock Inventory Management	No	No	Yes
Customer Pickup Management	No	No	Yes
Customer Delivery Management	No	No	Yes
SMS Notification	No	No	Yes
Dashboard	Yes	Yes	Yes
Workload management	No	No	Yes

Table 2. 1 : Similar Systems and Proposed System Features Comparison

2.6 Requirements Gathering Techniques

2.6.1 Introduction to fact finding techniques

Analysis of requirements covers all of the tasks involved in investigating, scoping and defining a new or altered system. During the preliminary investigation data collection is very important and the fact finding techniques can be used for this.

The following fact finding techniques have been used for collecting the data:

➤ **Interviews**

Analysts can use interviews to gather information from potential users about the current system. Here the analysts discover the areas of misunderstandings, unrealistic exceptions and descriptions of activities and problems along with resistance to the proposed new system. Interviews consume a lot of time.

➤ **Questionnaires**

The researchers will collect data from large groups here. Questionnaires may be Open-ended or Close-ended questionnaires. Open-ended questionnaires are used for learning feelings , opinions, general experiences about detail of the process or problem. In it questions are answered in words of their own. Where, as in the case of closed questionnaires, a set of prescribed responses is used and the specific responses should be selected. This is generally a costly affair as the questions should be printed out but thanks to advancements in technology this can be done digitally online.

➤ **Onsite observations**

This is a skill to be developed by the analysts. The analysts have to find the right details and pick the right person to look at the right position to achieve their target. He should have a clear view of how each department functions and interacts between them and should be a good observer for this.

2.6.2 Interviews

Several long interviews were conducted with the customer and his staff to get a detailed understanding of what the software product requires: the functional requirements and the non functional requirements needed to satisfy the main purpose of the system as well as all stakeholders of the system. The details of the interviews have been included in the dissertation.

2.6.3 Questionnaires

Questionnaires can be an effective means of measuring the behavior, attitudes, preferences, opinions and, intentions of relatively large numbers of subjects more cheaply and quickly than other methods. A questionnaire was created and distributed online amongst a selected but diverse list of people to get their opinions on what they expect from a good laundry service provider. It helped to prioritize the requirements. The details of the questionnaires, responses and statistics have been included in the dissertation.

2.6.4 Onsite Observations

Onsite observations were made on the 10th and 12th of March in order to get a better understanding about the workflow of the existing system. Vital information was drawn from the observations about the flaws of the existing system and possible improvements that can be done to address them.

2.7 Functional Requirements

FR 01: Customer Registration

Customer should have the option to register themselves through the system by giving basic details.

FR 02: Customer Login

Upon registration, customer should be able to login to the system via login screen by providing the necessary login details.

FR 03: Service Booking – Customer

Once logged-in, the user should be able to place a laundry request and select what laundry jobs are to be completed on their clothing.

FR 04: Service Booking - Staff

Laundry staff should be given a screen to enter customer details and make bookings since there will be direct visits to the laundry for cleaning jobs.

FR 05: Job Card

Once the clothes from a specific client reach the laundry, workshop staff should be able to open a job card by referring to the job order (laundry request) placed via booking and once the job is done, job card needs to be completed upon which a receipt can be printed.

FR 06: Barcode Generation

A barcode should be generated by the system to be printed on a special washable material to be tagged onto the clothes of the customer for identification.

FR 07: Inventory Management:

A basic inventory system where Item ID, Name, Description etc. can be maintained for every cloth collected from the client and also related stocks to be used in cleaning jobs.

FR 08: Online Payment:

Once the booking is placed, the customer should be able to pay an advance payment. There should be an option to select whether a refund is required or not in case of no cloth drop off by the customer or no collection by the laundry staff. Refunds will not be handled in the system where claims must be done by visiting the Laundry.

FR 09: SMS

An SMS is expected to be sent upon job completion to the customer, requesting feedback about the job and reminders such as delivery times.

FR 10: Dashboard

A dashboard with a few widgets which displays laundry bookings, completed jobs etc should be available for easy tracking of jobs.

FR 11: Report Module:

A report generation module is necessary to track employee performance, machinery efficiency, job efficiency, job history, job predictions based on dates and history records.

2.7 Non Functional Requirements

NFR 01: Maintainability

Maintainability can be defined as the ease with which a software system or component can be modified to correct faults, improve performance or other attributes, or adapt to a changed environment. The system has to be easily maintainable for the ease of both the customer and developer.

NFR 02: Robustness

Errors are pretty common in any system. Robustness can be defined as the ability of a computer system to handle errors during execution, and to handle error input.

NFR 03: Security

In today's business processes, a simple error can end up resulting in huge losses. Not even big enterprises are free of risks. The most common malicious attacks like SQL injections, command injections, buffer overrun, stack buffer overflow attacks can harm the reputation of any well-known company as the damage is remarkably huge. The system needs to be secure against any threats.

NFR 04: User Friendliness

User-friendly products are typically more successful than those with complex, convoluted interfaces that are difficult to use.

NFR 05: Reliability

Reliability is the probability that a system performs correctly during a specific time duration. The software has to be reliable for the client to trust and shift from the existing system to the new one.

NFR 06: Adaptability

Adaptability is the ability of a system to adapt itself efficiently and fast to changed circumstances. Unanticipated changes often require many parts of the system to be modified or redesigned and they are very costly most of the time.

CHAPTER 03: DESIGN

3.1 Introduction

The Design Phase is the process where the user requirements are transformed into some suitable form, which helps the programmer in software coding and implementation.

This chapter covers the methodology which will be used to develop the system. It further elaborates the proposed system's use case diagram followed by the design of the proposed system.

The design of the system is rather complicated and time consuming, and the report will provide the dynamic perspective of the system using activity diagrams and sequence diagrams, while a class diagram will be used to illustrate the static perspective.

The database design will also be done using an ER diagram and further the tables will be normalized up to the 3rd Normal Form.

3.2 Methodology

Development models are the various processes or methodologies that are selected for the development of the project depending on the project's aims and goals. There are many methodologies that have been developed in order to achieve different required objectives. Some of the development models or methodologies are as follows:

1. Waterfall model
2. Incremental model
3. RAD model
4. Agile model
5. Iterative model
6. Spiral model

Choosing right model is very important when developing of the software product or application. Based on the model the development and testing processes will be carried out.

3.2.1 Waterfall Model

In a waterfall model, each phase must be completed fully before the next phase can begin. The waterfall model is basically used for projects which are small and the requirements are clear and are not uncertain. At the end of each phase, a review takes place to determine if

the project is on the right path and whether or not to continue or discard the project. In this model the testing starts only after the development is complete. In the waterfall model, the phases do not overlap.

3.2.2 Incremental Model

In an incremental model the whole requirement is divided into various builds. Multiple development cycles take place making the life cycle a “multi-waterfall” cycle. Cycles are divided up into smaller, more easily managed modules. Each module passes through the requirements, design, implementation and testing phases. A working version of software is produced during the first module, so you have working software early on during the software life cycle. Each subsequent release of the module adds function to the previous release. The process continues till the complete system is achieved.

3.2.3 RAD Model

The Rapid Application Development model (also known as RAD) is a type of incremental model. In s RAD model the components or functions are developed in parallel as if they were mini projects. The developments are time boxed, delivered and then assembled into a working prototype. This methodology gives the customer something to see and use and to provide feedback regarding the delivery and their requirements.

3.2.4 Methodology for the proposed system

Rational Unified Process model (RUP) was followed throughout the development. RUP is an adaptable process framework, where the elements of the process can be changed according to the user's need. Rational Unified Process (RUP) is an object-oriented and Web-enabled program development methodology. According to Rational (developers of Rational Rose and the Unified Modeling Language), RUP is like an online mentor that provides guidelines, templates, and examples for all aspects and stages of program development. RUP and similar products such as Object-Oriented Software Process (OOSP), and the OPEN Process are comprehensive software engineering tools that combine the procedural aspects of development (such as defined stages, techniques and practices) with other components of development (such as documents, models, manuals, code, and so on) within a unifying framework.

RUP establishes four phases of development, each of which is organized into a number of separate iterations that must satisfy defined criteria before the next phase is undertaken: in the inception phase, developers define the scope of the project and its business case; in the elaboration phase, developers analyze the project's needs in greater detail and define its architectural foundation; in the construction phase, developers create the application design and source code; and in the transition phase, developers deliver the system to users. RUP provides a prototype at the completion of each iteration.

3.3 Proposed System Use Case Diagram

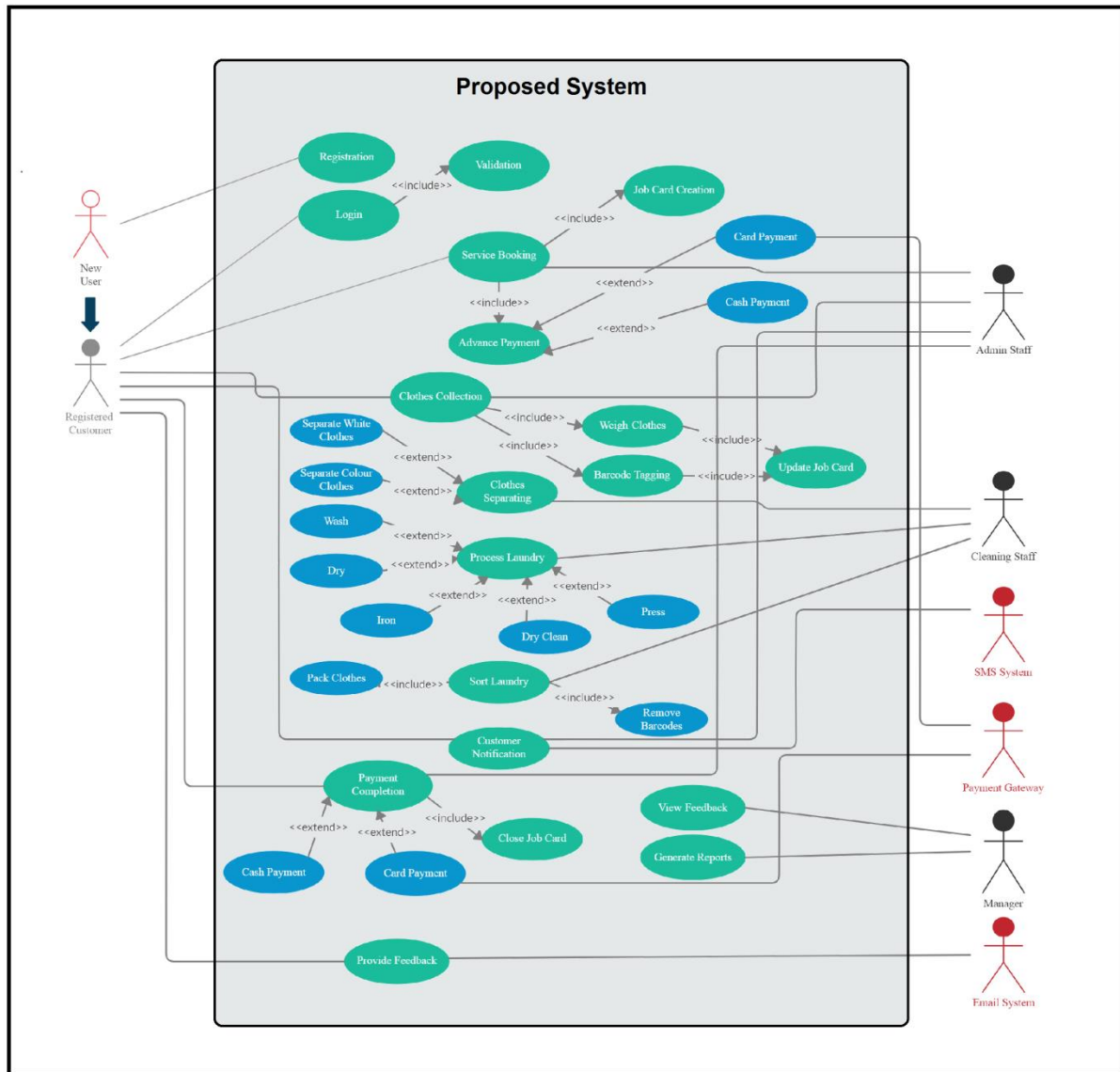


Figure 3. 1 : Proposed System Use Case Diagram

3.4 Proposed System Class Diagram

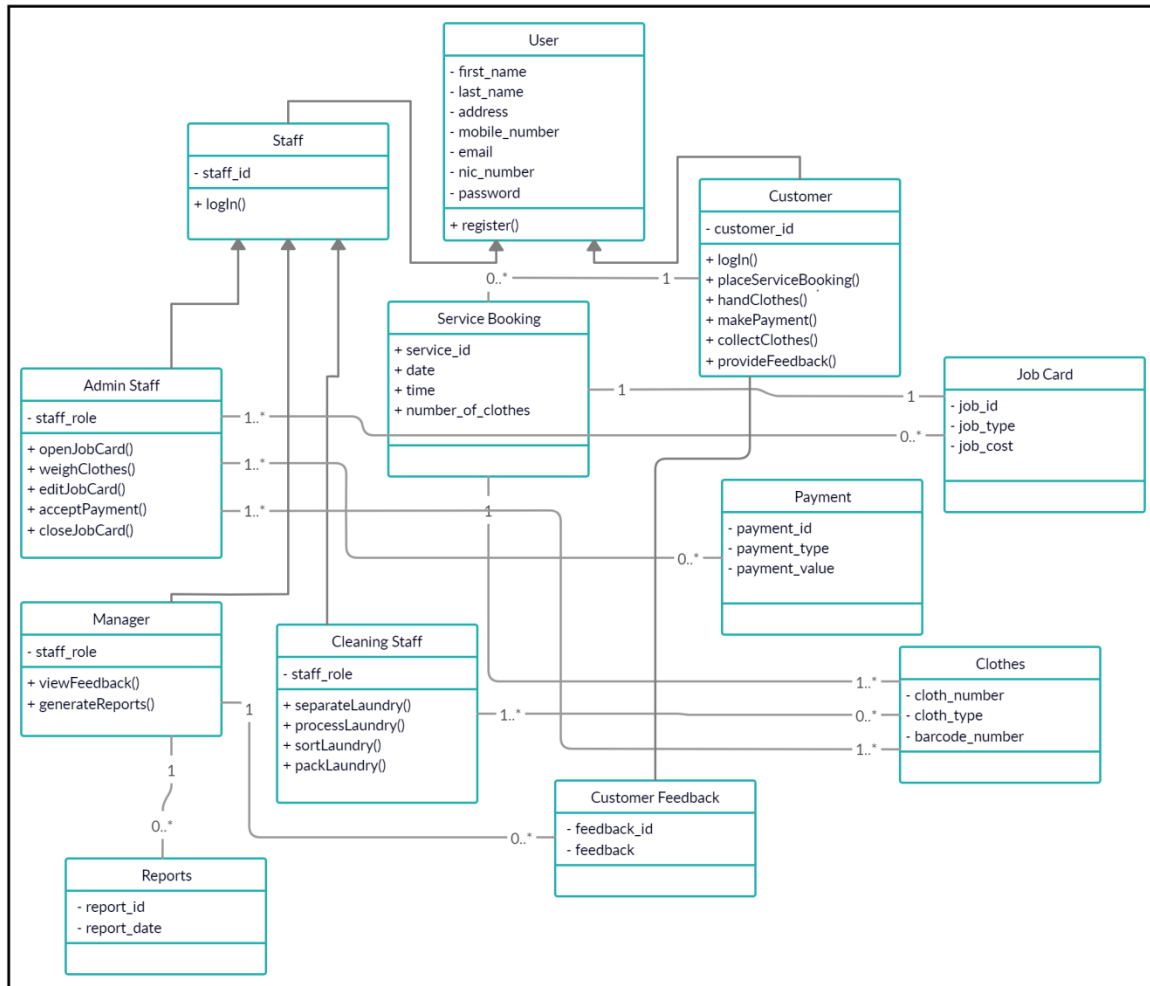


Figure 3. 2 : Proposed System Class Diagram

3.5 Proposed System Entity Relationship Diagram

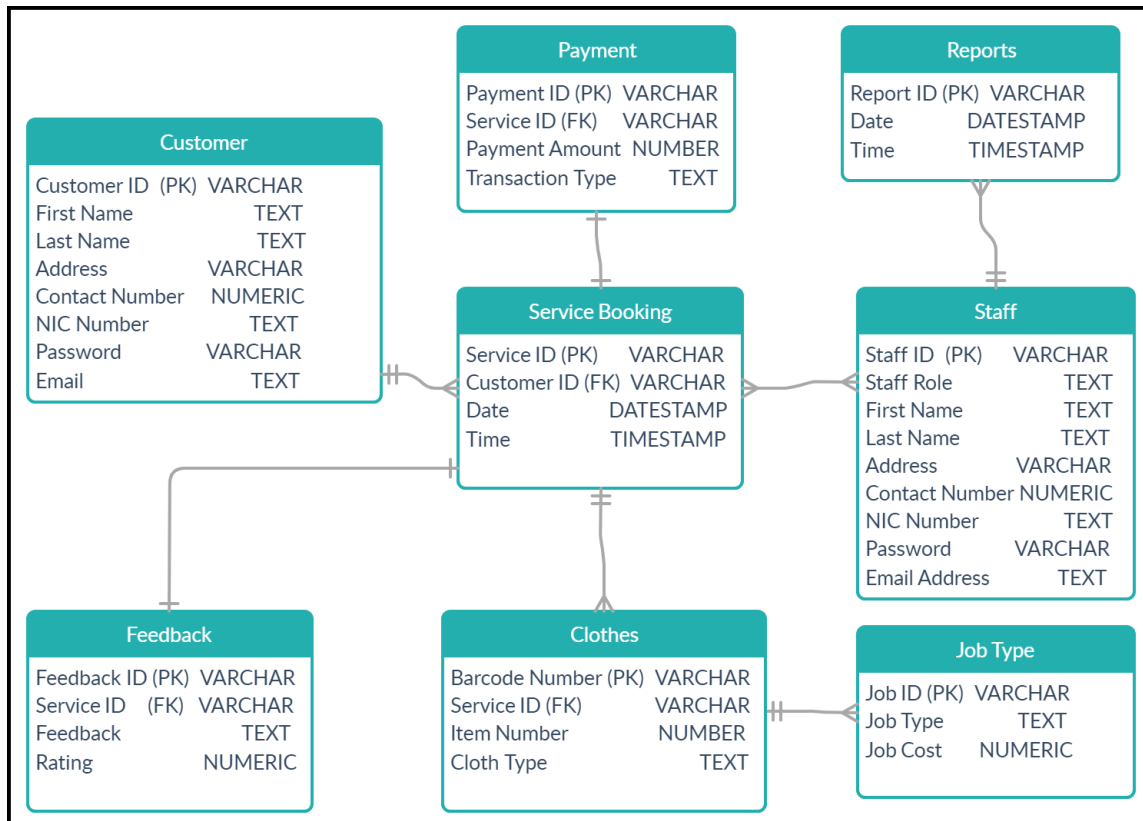


Figure 3. 3 : Proposed System Entity Relationship Diagram

