

CHAPTER I

Background of the Study

1. Introduction

Information systems play a crucial role in enhancing the operational efficiency and effectiveness of organizations across diverse industries. In the context of veterinary clinics, the adoption of advanced information systems can effectively address significant challenges associated with manual processes, thereby streamlining operations and improving overall service quality.

Pruderich Veterinary Clinic, renowned for its comprehensive range of services encompassing pet grooming, check-ups, and surgical procedures, currently confronts various operational hurdles due to reliance on manual processes. The clinic witnesses a substantial influx of patients, attending to an average of 3-5 patients on weekdays and 5-6 patients on weekends, with an additional 7 patients admitted weekly on average. This surge in patient volume, coupled with an estimated 50 records per patient, underscores the pressing need for a more efficient system for tracking and managing essential information.

The conventional method of relying on phone calls for appointment reminders has become increasingly impractical and time-consuming in light of the escalating patient numbers. Moreover, the existing approach to appointment scheduling lacks flexibility, requiring clients to modify their schedules via phone within a limited timeframe, hindering convenience and potentially leading to missed appointments.

The management of patient medical records and pet documentation has emerged as a formidable challenge, given the sheer volume of information.

Maintaining accurate and up-to-date records is paramount for ensuring the delivery of high-quality patient care, yet the clinic struggles to uphold these standards amidst growing administrative burdens.

The current manual process of appointment monitoring is fraught with inefficiencies, posing the risk of scheduling conflicts and underutilization of clinic resources. Additionally, managing patient bill balances has become increasingly complex, contributing to delays in financial transactions and posing potential revenue challenges for the clinic.

To address these challenges effectively, the implementation of a tailored information system is imperative. Such a system would streamline appointment scheduling, automate appointment reminders, and facilitate seamless modification of appointments online. Furthermore, it would centralize patient records, ensuring accuracy and accessibility while enabling efficient monitoring of appointments and billing processes.

The Pet Shop, which offers a diverse array of products ranging from medicines to pet accessories, grapples with inventory management issues stemming from manual tracking methods. These inefficiencies result in stockouts, overstock situations, and difficulties in managing product expiration dates, adversely impacting operational performance. An integrated inventory management system would optimize stock levels, mitigate the risk of stockouts, and facilitate proactive management of product expiration dates. By leveraging advanced information systems, Prudrich Veterinary Clinic and the Veterinary Store can enhance operational efficiency, improve service quality, and ultimately foster better outcomes for patients and clients alike.

2. Statement of the Problem

This study focuses on the problems faced by the Pruderich Veterinary Clinic and Pet Shop managing client information, appointment scheduling, point-of-sale, and inventory. Specifically, it aims to investigate the following questions:

- i. What functionality would the system offer to facilitate reminders regarding appointment scheduling for the pet owner?
- ii. How does the system handle appointment scheduling, pet schedule monitoring, record keeping, POS transactions, and inventory?
- iii. In what ways does the system assign distinctive features to various roles?
- iv. What processes does the system employ to generate reports, such as sales reports and inventory reports?

3. Objectives

The goal of this study is to design, develop, and implement a web-based Information System (IS) to address the current problems faced by the Pruderich Veterinary Clinic and Pet Store regarding the management of pet records, appointment schedules, point of sale and inventory. Specifically, the objectives are as follows:

- i. To implement a feature that allows email notifications to the pet owners.
- ii. To create interfaces that can handle appointment scheduling, pet schedule monitoring, record management, point of sale, and inventory.
- iii. To implement different features that are accessible only by specific roles.
- iv. To develop a feature that generates sales reports, inventory reports, financial reports and inventory replenishment reports.

4. Scope and Limitations

This project will create and install a web-based Veterinary Clinic Information System (VCIS) for the Pruderich Veterinary Clinic. The system will have modules for record administration, appointment scheduling, schedule monitoring, point-of-sale, and inventory. The system aims to improve the clinic's processes by utilizing technology. The system will also include an email for communication. The system will mainly be utilized by other veterinary clinics.

The Veterinary Clinic Information System is tailored to meet the specific operational needs of the Pruderich Veterinary Clinic, its direct applicability to other veterinary clinics may be limited only this year's data will be put into the system, from January to the present. The findings and policies formulated within the scope of this study are tailored to the Pruderich Veterinary Clinic, which may not necessarily align with those of other clinics, the successful implementation of the system is contingent upon various factors such as the existing technological infrastructure of the clinic, resource availability, and staff training, the clinic's specialization in certain breeds, particularly cats and dogs, necessitates a program with a specific focus on these species, potentially limiting the system's suitability for clinics with different specialty areas.

5. Significance of the Study

The development of the Veterinary Clinic Information System (VCIS) will be significant for the Pruderich Veterinary Clinic and external stakeholders. By implementing VCIS, the following key benefits will be:

- i. Veterinarians

Veterinarians are the primary beneficiaries of the Veterinary Clinic Information System (VCIS), as it significantly improves their efficiency and productivity in managing various aspects of their practice. With streamlined operations facilitated by modules such as appointment scheduling and patient monitoring, veterinarians can dedicate more attention to delivering quality care to their animal patients. The records management module ensures quick access to comprehensive health histories, empowering veterinarians to make well-informed decisions regarding diagnosis and treatment. Moreover, the reporting feature offers valuable insights into clinic activities, assisting veterinarians in refining their practices and enhancing patient outcomes.

ii. Clinic Administrators and Staff

Clinic administrators and staff members also reap substantial benefits from the implementation of VCIS. Administrators gain access to the admin module, enabling them to efficiently track and organize information about pets and patients within the system. Staff members utilize the appointment scheduling interface to effectively plan appointments, thereby ensuring seamless clinic operations. Furthermore, the reporting option enables authorized employees to generate insightful reports, facilitating decision-making and improving overall clinic performance.

iii. Pet Owners

Pet owners experience enhanced convenience and satisfaction with the adoption of VCIS in the veterinary clinic. The system's user-friendly tools, such as records management and appointment scheduling, ensure that their pets' health records are well-organized and appointments are promptly scheduled. The patient monitoring module provides reassurance by allowing pet owners to stay updated about their pets' health progress and upcoming vaccination and check-up schedules.

Additionally, the POS module ensures smooth and efficient payment transactions, thereby enhancing the overall customer experience at the clinic.

Overall, the implementation of VCIS is anticipated to improve clinic workflow, enhance patient care, and enhance client satisfaction for internal stakeholders, including veterinarians and staff, as well as external stakeholders, including pet owners.

CHAPTER II

REVIEW OF RELATED LITERATURE

In this chapter, the literature review of related studies and related systems of the Veterinary Clinic Information System will be presented, addressing the challenges, and potential of the Information System.

1. Review of Related Concepts

i. Maximizing Veterinary Clinic Efficiency Through Technological Solutions

According to Abdalameer (2016), the integration of electronic applications and telecommunication technology has resulted in the emergence of transformational digital healthcare initiatives. This change highlights the significant influence of using technology, such as the Veterinary Clinic Information System (VCIS), to improve efficiency and efficacy in the field of veterinary medicine.

Despite the recognized need for a Veterinary Clinic Information System (VCIS), it is critical to understand that its successful implementation necessitates careful planning and consideration of a variety of issues. Financial resources, technology infrastructure, staff training, and user approval are among the considerations considered. Additionally, regulatory compliance and data security are essential considerations that shouldn't be disregarded. As a result, while the need for VCIS is clear, its development and implementation must be treated with care and effort to ensure its usefulness and success in veterinary clinic settings.

ii. Improve Veterinary Practice Operations

Dullayachai and Changkamanon (2020) introduce the electronic veterinary management (EVM) system as a way to improve clinic efficiency. Their solution is consistent with the goals of VCIS, particularly its emphasis on increasing productivity through features such as point-of-sale and inventory management.

Dela Cruz et al. (2020) describe VCIS as a significant development in veterinary practice management. They discuss how VCIS's modules, such as appointment scheduling and records management, help to streamline clinic operations and improve patient care.

Possenti et al. (2020) examine the Veterinary Information System for Non-Epidemic Emergencies (SIVENE), focusing on its architecture and components that aid in effective emergency management. They emphasize the necessity of preparedness and reaction capacities in veterinary emergencies, which are aided by systems such as VCIS.

In another investigation, Dzakiyyah et al. (2024) explore the creation of web-based veterinary clinic information systems. They stress the importance of technology in increasing accessibility and efficiency in veterinary care delivery, which is consistent with VCIS's goal of streamlining processes and improving user ease through organized development methodologies.

Furthermore, Bukhari et al. (2023) examine the levels of IT adoption and utilization in healthcare settings. Their findings offer significant advice on optimizing IT systems within clinics, a principle that is directly relevant to the development and implementation of VCIS in veterinary clinics.

These outcomes emphasize the importance of the Veterinary Clinic Information System (VCIS) in streamlining veterinary office operations. VCIS plays an important role in improving clinic efficiency, promoting stakeholder engagement, improving patient care, facilitating emergency management, and optimizing IT systems in veterinary practices.

Iqbal et al. (2021) address the impact of technological improvements on veterinary medicine, pointing out persisting concerns with data security and reliability in older systems. They introduce RIVIMS, a pioneering blockchain-based technology that incorporates machine learning for predictive analytics. RIVIMS aims to transform veterinary healthcare by improving data security and empowering practitioners to predict future needs and optimize patient care. The authors emphasize the importance of comprehensive evaluations, citing RIVIMS's effectiveness in ushering in a new era of data-driven veterinary practice.

Sutton et al. (2020) study the evolution and impact of computerized clinical decision support systems (CDSS) in modern healthcare, including implications for veterinary clinic information systems. They emphasize CDSS's function in assisting doctors with decision-making while also discussing potential benefits and hazards. Their insights can help veterinary clinics implement CDSS, navigate difficulties, and improve patient care and practice administration.

2. Review of Related Systems

i. Optimizing Pet Store Operations

Dzakiyyah et al. (2024) addressed operational issues experienced by pet businesses through website creation. Their findings are consistent with the goals of VCIS, stressing the potential to improve operations and efficiency in pet businesses. They

recommend adopting approaches such as Rational Unified Process (RUP) and emphasizing user-centric design to achieve these objectives.

Additionally, Pawar et al. (2024) provide insights into optimizing inventory management, which can help pet stores improve their operations. They recommend exploring software options and implementing effective inventory management systems to increase efficiency and customer satisfaction.

In another study, Sharma and Yadav (2023) address the importance of POS terminal technology in a variety of businesses, including its potential use in pet store operations. They illustrate how POS systems may help pet retailers increase efficiency and profitability by streamlining transactions, managing inventory, and improving customer experiences.

Furthermore, Utami et al. (2023) explore the implementation of integrated sales and inventory systems in small and medium-sized businesses (SMEs), such as pet stores. They underline that deploying such systems allows pet retailers to precisely track transactions and monitor stock levels in real time, resulting in increased efficiency and profitability in managing pet supplies and inventories.

Overall, these studies highlight the necessity of streamlining operations in pet stores, which aligns with VCIS's goals. By embracing technology and establishing efficient systems, pet stores can improve their operations, improve customer experiences, and ultimately achieve more success in the competitive pet market.

CHAPTER III

TECHNICAL BACKGROUND

Veterinary Clinic Information System, is a web-based application designed to improve the efficiency of the operations and enhance communication within the veterinary clinic. This web-based application will be created using a clever combination of Bootstrap, Laravel, and MySQL.

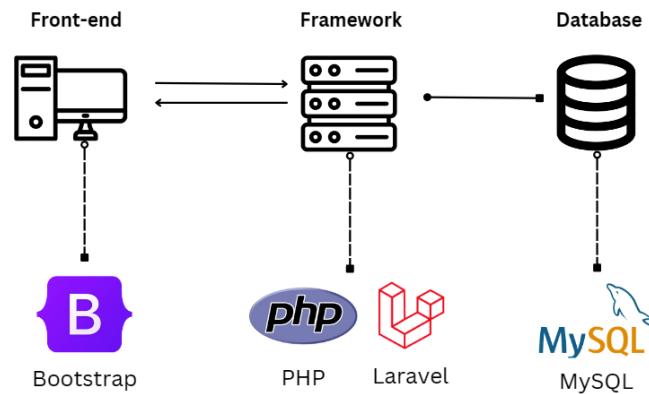


Figure 1. Tools Interaction

Figure 1 shows the technologies we would be utilizing in the development of the Veterinary Clinic Information System. With the help of these technologies, we can achieve the objectives of the proposed system.

1. PHP

PHP is a general-purpose scripting language geared for web development. PHP is known for its simplicity, speed, and flexibility, being one of the popular languages for developers. PHP supports many databases such as MySQL, PostgreSQL, and SQLite. PHP works along with the common web servers like Apache and Nginx. In addition to that, PHP has a powerful ecosystem full of frameworks (such as Laravel, Symfony and CodeIgniter) and even more extensions and tools that help programmers avoid monotony and increase their efficiency. The experts will use PHP jointly with Laravel, which is a popular server-side scripting framework for PHP. Through these technologies, the proponents would create the system to be effective.

2. Laravel

Laravel is a well-known server-side scripting framework that is based on PHP, an open-source scripting language primarily used for web development. It aims to simplify and facilitate common tasks like routing, authentication, and caching for developers. Laravel follows the Model-View-Controller architectural pattern, which helps to separate the application's logic, user interface, and data storage, making the code more organized and maintainable.

One of the key strengths of Laravel is the ability to create a database structure that ensures data integrity and accuracy. The use of Laravel's Eloquent ORM (Object-Relational Mapping) allows for the structuring of the necessary database entities for the system. Eloquent provides an interface for interacting with the database tables and fields, enabling multiple queries to be handled by a single model class (Stauffer, 2019). This allows for efficient and accurate retrieval and storage of data, as a model class can be tailored to handle specific functions for the system's modules.

Laravel's Blade templating engine provides a powerful and straightforward solution for building dynamic web applications. Blade's support for PHP code integration, control structures, conditional statements, extendable layouts, and reusable views improves performance and simplifies the development process. By leveraging Blade, the proponents can easily utilize HTML, CSS, and JavaScript, creating a seamless integration of fundamental coding structures.

Additionally, the Laravel Breeze authentication tool for Laravel is designed to simplify the development process and enhance code readability. It provides a secure and user-friendly authentication system that integrates easily with third-party libraries. Laravel Breeze's robust security measures protect user data, and its database interaction is efficient. By utilizing Blade as an authentication tool for the system, it will enable the proponents to create a secure and scalable system for the Veterinary Clinic Information System.

The utilization of Laravel's comprehensive features and tools, such as Laravel's Eloquent ORM, Blade, and Breeze, makes it an essential framework for developing the Veterinary Clinic Information System. Providing the proponents with the capabilities to build a secure, efficient, scalable and maintainable system.

3. Bootstrap

The proponents will utilize Bootstrap, a widely used CSS framework, to create an interface that is visually appealing and functional for clinic staff and pet owners. Bootstrap's extensive library of components such as navigation bars, forms, and buttons, will enable the proponents to create an interface that meets the needs of both groups. Bootstrap's responsive design features will ensure that the interface remains functional, despite the device being used.

4. MySQL

The proponents will use MySQL to handle all of the relevant data needed for the system. Its robust features, including support for transactions, indexing, and querying, ensure optimal performance and reliability. Moreover, MySQL's scalability and flexibility accommodate the evolving needs of the veterinary clinic, enabling seamless expansion and adaptation over time.

5. KVM 4

The Veterinary Clinic Information System is hosted on a Virtual Private Server (VPS) utilizing Hostinger's KVM 4 package. This robust package provides ample resources, including 4 virtual CPU cores, 16 gigabytes of RAM, 200 gigabytes of storage, and 16 terabytes of bandwidth. This choice offers flexibility in customizing the operating system, control panel, and software stack to precisely match the system's requirements.

6. Navicat

Navicat is employed as the database management software, facilitating seamless and efficient management of the MySQL database. Its intuitive interface and comprehensive features streamline database administration tasks, ensuring optimal performance and data integrity.

7. VSCode

The development process is optimized through the use of industry-standard tools. VSCode, a versatile and feature-rich text editor, provides developers with a

highly customizable environment for writing code. Its extensive plugin ecosystem further enhances productivity by offering additional functionalities tailored to specific needs.

8. Composer

Composer, a dependency manager for PHP, simplifies package management and dependency resolution, enabling seamless integration of third-party libraries and frameworks into the project. This ensures efficient development and maintenance of the system's backend components.

9. Node.js

Node.js, a powerful JavaScript runtime, serves as the package manager for JavaScript, enabling developers to leverage a vast ecosystem of libraries and tools for front-end development. With Node.js, developers can efficiently manage dependencies, automate repetitive tasks, and build scalable and performant web applications.

By utilizing these tools, the Veterinary Clinic Information System benefits from streamlined workflows, efficient collaboration, and robust code management practices, ultimately leading to the delivery of a high quality and reliable software solution. These technologies empower veterinary clinics to streamline workflows, improve patient care, and foster greater engagement with pet owners.

CHAPTER IV

METHODOLOGY

1. Conceptual Framework

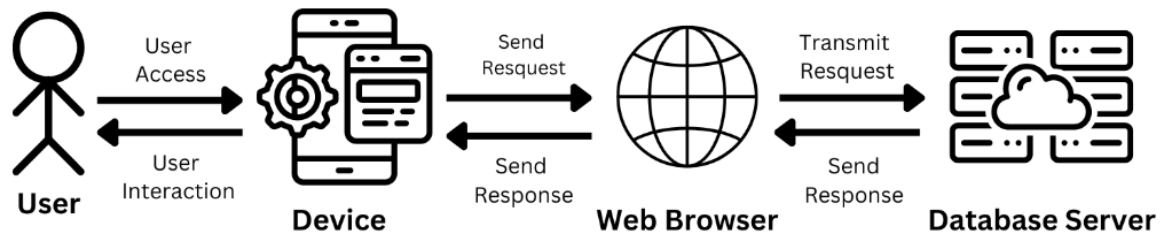


Figure 2. Veterinary Clinic Information System Conceptual Framework

Figure 2, shows the conceptual framework of the Veterinary Clinic Information System illustrates how users will interact with the system. It involves a user interface (UI) through which users access the system using devices. Users initiate requests through the UI, which are then submitted to a database server via a web browser, acting as a mediator to access the database server containing the requested information. The database server then sends a response to the server, which is subsequently routed back to the user's browser and system. Finally, the response is delivered to the user via the browser and system interfaces, enabling seamless interaction and data retrieval within the system architecture.

2. System Development Methodology

In this chapter, the proponent will discuss the methodology that will be used in developing the system.

The proponents will use agile methodology in the development of the Veterinary Clinic Information System because of its capability to adapt to abrupt changes to the

system and user requirements. Furthermore, the use of agile's project management approach will be ideal for the proponents as it splits the project into phases which focuses on creating certain features of the system making it more manageable and flexible.

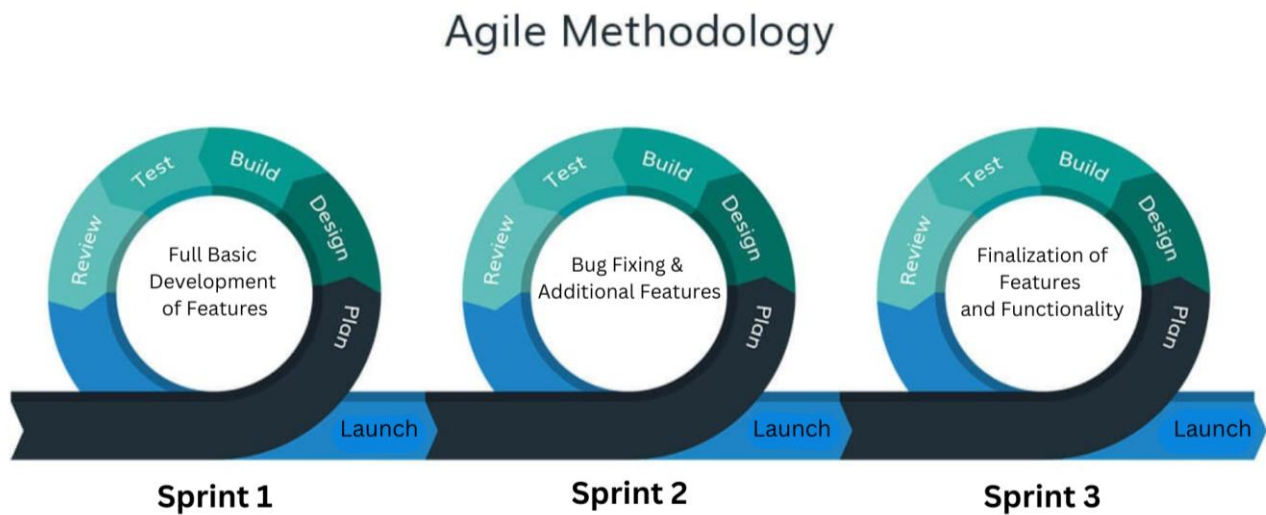


Figure 3. Agile Methodology Model

i. Planning

In every sprint that will occur the proponents will determine the objectives and requirements of the sprint, taking into account the scope of specific features or modules determined for the system. Gathering data and information about the user's requirements to come up with the system functionalities is essential in achieving this stage of development.

Specified Sprints

b. Sprint 1: Development of the system's main features

The proponents will start the development of the system, which will cover the core functionalities of the system which are appointment scheduling, record management, vaccine and check-up schedule monitoring, point of sale, and inventory.

The proponents will be allotted 6-8 weeks of development for this sprint as it will tackle the major parts of the system

c. Sprint 2: Addressing bugs and errors and adding additional features

The proponents will solve the problems encountered on the first testing of the system, this sprint will primarily focus on improving the system's functionality and making necessary changes to the system. Additionally, the proponents will also include new features that were suggested or identified in the previous sprint's review which will be allotted an additional 4 weeks of development.

d. Sprint 3: Finalizing features and functionality

The proponents will be finalizing the features and functionalities of the system considering the result of the previous sprint, this sprint will focus on refining system functionality, refactoring the written code for better readability, and applying coding principles such as single responsibility principle (SRP).

ii. Design

The system will be designed following the requirements identified in each sprint, in this phase, the architectural and system design as well as the user interface and database schema will be created based on the objective of each sprint. Additionally, after the first sprint, the design phase will be mostly focused on user interface improvements and conceptualizing new features.

The database schema will be created using Laravel's eloquent object-relational mapper (ORM) primarily because it helps the programmer visualize the database schema and relationships through objects and classes which they are familiar with.

This method allows the developer to interact with the database without using database management software (Stauffer, 2019).

Design phase of each Sprint

a. Sprint 1: Development of the system's main features

The proponents will start the designing of the system starting with the user interface (UI) of the system which includes appointment scheduling, pet record management, vaccine and check-up schedule monitoring, point of sale, and inventory. The backend will be designed simultaneously, this includes the database design for the crud operations and the basic models and controllers that will be used by the system.

b. Sprint 2: Addressing bugs and errors and adding additional features

In this sprint the proponents will revise the designs that were implemented based on the comments and suggestions of the client, finalizing the database schema, controllers, and models will also be done in this sprint. Changes in the UI may also be performed in this sprint if the client suggests a better design.

c. Sprint 3: Finalizing features and functionality

The proponents will be finalizing the designs based on the outcome of the previous sprint, this sprint will primarily focus on the added features that have been implemented and will focus on improving them or the users

iii. Build

The system development process will occur in this phase, as with the system design this phase will follow the requirements identified in the planning stage, this will

allow the development to progress smoothly as it is guided by the output of the previous phases. This phase will primarily be composed of the development of the system to ensure a working system in each iteration. Furthermore, after the first iteration, the build phase will be primarily composed of debugging and adding additional features and functionalities to the system.

The development team will implement the tools they have discussed namely Laravel together with Blade as the template engine and MySQL as the database. The use of these tools is primarily based on the consideration of the development team regarding reusability, simplicity, and compatibility with each other.

Build phase of each Sprint

a. Sprint 1: Development of the system's main features

The proponents will be starting the development of the core functionalities of the system, which includes appointment scheduling, pet record management, vaccine and check-up schedule monitoring, point of sale, and inventory. this sprint will cover all the basic create, retrieve, update, and delete operations of the said modules.

b. Sprint 2: Addressing bugs and errors and adding additional features

The proponents will start the development of the additional features that are identified for this sprint, this includes e-prescription for medical records, generating reports for sales and inventory, tracking of vaccination and check-up schedules, and any other features suggested by the client.

c. Sprint 3: Finalizing features and functionality

The proponents will be finalizing the features and functionalities of the system considering the result of the previous sprint, this sprint will focus on refining system functionality, refactoring the written code for better readability, and applying coding principles such as single responsibility principle (SRP).

iv. Test

In this phase the proponents will be testing the system, the chosen method for testing is unit testing as the proponents aim to test the functionalities of individual modules to ensure that they meet the requirements determined in the planning stage. This phase will also use integration testing, especially for the point of sale and inventory modules to ensure that the system will display consistent data across all modules. Furthermore, the proponents will use system testing to test the whole system's features and functionality.

By using user acceptance testing (UAT) the proponents will ensure that users approve of the system's functionality, it will also determine if the system has met the requirements in the planning phase. The system will be tested through the use of alpha and beta testing which will be actively participated by the client, users, and developers, it will determine if the software can function in real-world scenarios, and it will also be a way to look for bugs and errors in the system.

Test phase of each Sprint

a. Sprint 1: Development of the system's main features

The proponents will be testing the system via unit testing, this is done before the user acceptance testing as it ensures that the system is working properly and prevents debugging on-site for the UAT.

b. Sprint 2: Addressing bugs and errors and adding additional features

The proponents will be testing the system with unit testing for the current and added functionalities, these tests will include the bugs that have been discovered from the previous testing. In the case of the system not passing the user acceptance test, the proponents will be issuing a second test for the revised system, this is to ensure that the system meets the demands of the users.

c. Sprint 3: Finalizing features and functionality

The final testing will again include unit testing as the prerequisite for the UAT, this is so that the system is ready for any situation that may be faced during the test with the users.

v. Review

In this phase a review meeting will take place among the proponents and the stakeholders to demo the completed system that was implemented during the first sprint and refined with the following sprints, it is in this phase that the stakeholders will provide feedback on the system where they may ask questions or discuss potential adjustments to the user requirements or product backlog. Moreover, this phase will review the increment of work to determine whether the system meets the client's requirements, and needs, and if the system is ready for release. Discussions about what went wrong or what can be improved during the development process are also executed in this phase.

Review phase of each Sprint

a. Sprint 1: Development of the system's main features

The proponents will be reviewing the challenges faced by the development team during the sprint together with the client, advisers, and the development team. This will help address the problems that were hindering the development and to address the next steps to take for the second sprint.

b. Sprint 2: Addressing bugs and errors and adding additional features

The proponents will review the progress of the system, this part of the sprint is primarily focused on the delivery of the project. Adjustments to the project dates and the system requirements may also be discussed in this review.

c. Sprint 3: Finalizing features and functionality

The proponents will perform a final review of the system before it is launched, this will be primarily composed of discussions on whether the system has met its requirements and if it is ready to be used by the users. The results from the testing will be a big factor in this review as it will determine whether the system will be launched or not.

vi. Launch

In this phase the module is launched to the users after being tested using the three testing methods for the system that was mentioned, the UAT will be done together with the launching of the system to receive feedback and to encourage improvements in the next iteration. This phase will also serve as a training seminar for the users to ensure that they understand how the system is used.

Launch phase of each Sprint

a. Sprint 1: Development of the system's main features

The proponents will launch the first version of the system as soon as it passes the UAT, this will provide the proponents the opportunity to beta test the system with the users, gathering feedback from this phase will also be vital as responses will be based on real-world scenarios

b. Sprint 2: Addressing bugs and errors and adding additional features

The proponents will launch the second version of the system together with its improved features and functionality, this version will be the basis for what changes may happen on the final version of the system.

c. Sprint 3: Finalizing features and functionality

The proponents will launch the final version of the system which will be done online, the system will then be operational and will be checked for maintenance.

3. System Analysis

i. Flowcharts

Appendix A provides a complete explanation of the Veterinary Clinic Information System's processes. It begins with Figure 4, which demonstrates the login procedure, in which users enter their email addresses and passwords to access the system. Following that, Figure 5 illustrates the admin side appointment booking procedure, which begins with selecting a pet and ends with scheduling the appointment and checking availability before entering it into the database.

Figure 6 shows the admin of appointment requests, which allows administrators to accept, refuse, or reschedule appointments. Figure 7 demonstrates introducing a pet to the system, in which users enter necessary pet information. Figure 8

demonstrates enhancing pet information, which allows users to change existing pet details.

Figure 9 shows how to register a pet owner, which allows admins to enter owner information and assign them as owners of registered pets. Figure 10 depicts the process of enhancing pet owner information, which allows administrators to change owner details. Figure 11 demonstrates the registration process, in which admin can add new employees and designate roles. Figure 12 shows editing staff information.

Figure 13 depicts adding pet prescriptions, which allows administrators to insert prescriptions for specific pets and subsequently send them to pet owners. Figure 14 depicts registering products into the inventory by entering the appropriate details. Figure 15 illustrates how to edit product information, which allows users to change existing product details.

Figure 16 depicts adding product stocks to the inventory, which allows users to improve stock levels of certain products. Figure 17 demonstrates the point of sale process, which allows users to pick products for sale. Figure 18 displays report generation, which allows users to create a variety of reports by selecting the report type.

Figure 19 depicts appointment requests on the client side, in which clients enter appointment information that is then transmitted to the database for admin approval.

ii. Data Flow Diagram

The Figures from Appendix B presents Figures 20 and 21 show an overview of the system's data flow, with a focus on appointment and pet information management, as well as point of sale and inventory operations.

Figures from Appendix C presents the use case under the Organizational Owner and General Use Case. Figure 22 illustrates the Use Case diagram, which displays interactions between users and the system.

Figure 23 demonstrates the suggested database structure, which depicts the relationships between entities that interact with the system, namely users and clients. The following figures provide a full overview of the Veterinary Clinic Information System's functionality and data flow.

4. System Requirements Specification

i. Functional Requirements

In appendix D, the functional requirement of this project includes managing pet records as this would be vital in the operations of the veterinary clinic, additionally, the system will also be able to manage appointment schedules and monitor the check-up and vaccination schedules of pets, furthermore, the system will also provide a Point of Sale (POS) and Inventory system which will allow the clinic to handle purchases in their store. The system will also provide additional functionalities like data analytics and user management.

ii. Non-Functional Requirements

Security

a. Password Hashing

All account passwords registered to the system will be hashed according to Laravel's hashing algorithm using the "hash()" function.

b. Scalability

The system is created with MySQL which allows it to be scalable together with the clinic's expansion and growth.

c. Availability

The system will be hosted with hostinger so that it can be accessible 24/7 and it is also accessible through web allowing users to use any device in accessing.

iii. Other System Requirement

a. Minimum Hardware Requirements

Desktop

For the other requirements, the minimum hardware specification include a desktop computers running either Windows 7 or later, macOS, or Linux are suitable for accessing the web-based system. The desktops should be equipped with at least an Intel Core i3 processor or an equivalent, ensuring smooth performance while using the system. A minimum of 4GB RAM is recommended to handle web browsing and system operations efficiently. Additionally, users should have at least 100MB of free storage space to accommodate temporary files and browser cache. Desktops can connect to the internet via Ethernet or Wi-Fi, providing flexibility in network connectivity options.

Laptop

Similar to desktops, laptops running Windows 7 or later, macOS, or Linux are compatible with the web-based system. The hardware requirements for laptops are identical to those of desktops, including an Intel Core i3 processor

or equivalent, 4GB or higher RAM, and 100MB of free storage space. Laptops offer the advantage of portability, allowing users to access the system from various locations. Like desktops, laptops can connect to the internet using Ethernet or Wi-Fi, ensuring reliable connectivity.

Tablet

Tablets running iOS 11 or later, Android 7.0 or later, or Windows 10 are suitable for accessing the web-based system. Tablets typically feature ARM-based processors or equivalents, providing sufficient computing power for web browsing and system interaction. A minimum of 2GB RAM is recommended for smooth performance, along with 100MB of free storage space. Tablets offer the advantage of mobility, allowing users to access the system on-the-go. Internet connectivity options for tablets.

Mobile Phone

Mobile phones running iOS 11 or later or Android 7.0 or later are compatible with the web-based system. Mobile phones feature ARM-based processors or equivalents, ensuring adequate performance for accessing the system via a web browser. Similar to tablets, a minimum of 2GB RAM and 100MB of free storage space are recommended for optimal performance. Mobile phones offer the highest level of portability, allowing users to access the system from virtually anywhere. Internet connectivity options for mobile phones include Wi-Fi or cellular data, providing seamless access to the system regardless of location.

b. Minimum Software Requirements

Browser

For the minimum software requirements, the system should have a compatible web browser such as Chrome version 92.0.4515.159 64-bit, Firefox version 91.0.2 64-bit, or Microsoft Edge version 92.0.902.84 64-bit. These specific software requirements are recommended to ensure compatibility and optimal performance with the system. Regarding the web browser versions, it's important to specify the minimum versions to ensure that the system's web-based components and features are supported and function correctly

Virtual Private Server (VPS)

The system will be hosted online using a virtual private server provided by Hostinger or a similar hosting service. The VPS should meet the necessary specifications to support the system's operation, including sufficient CPU, RAM, storage, and bandwidth resources. Additionally, the VPS should support PHP and MySQL, the primary components of the system's development stack.

PHP

PHP is the primary programming language used for developing the system. The VPS should have PHP installed, preferably the latest stable version compatible with the system's requirements. PHP enables server-side scripting, allowing the system to dynamically generate web pages and interact with the database.

Laravel Framework

The development of the system utilized the Laravel framework, a PHP web application framework renowned for its elegant syntax, developer-friendly features, and robust ecosystem. The VPS should support Laravel, including any dependencies or extensions required by the framework to operate efficiently.

MySQL Database

MySQL serves as the primary database management system for storing and managing data used by the system. The VPS should have MySQL installed, preferably the latest stable version compatible with the system's requirements. MySQL provides relational database capabilities, enabling efficient storage, retrieval, and manipulation of structured data.

iv. Input Requirements

a. Login

The users together with the clients will have to input their email and password for authentication. The system verifies the email and password from the database and redirects them to the dashboard if verification is successful.

b. Registration

For clients a registration page will be available which will ask them for basic information such as name, birth date, and contact information.

c. Adding of pet and pet record

the user specifically the secretary/assistant will fill a form with basic information about the pet such as name, breed, sex, birth date, and owner, this will

then be passed to the database as a new pet and in creating the pet medical record the secretary/assistant will also provide basic medical information like such as vital signs, medications, and procedures performed. The pet record will be imputed after the pet has undergone treatment.

d. Adding of User

The admin will fill a form with the user's email and their user type, a default password will then be given which the user can change after logging in.

e. Adding of Products

The admin will fill another form consisting of basic product information such as product name, price, and unit of sale.

f. Adding Appointments

The staff or the client will be provided with a form that will collect data such as appointment date and time which the admin will approve.

v. Output Requirements

The output for this project is a system consisting of the following modules:

- a.** Admin Module
- b.** Secretary/Assistant Module
- c.** Doctor's Module
- d.** Client Module
- e.** Point of Sale Module
- f.** Inventory Module

Which will be capable of handling features such as user management, appointment management and monitoring, record management, sales, and inventory management.

5. Project Management

In appendix E, the project plan shows how we'll spend eight months, from March to October 2024, making a software system. We're splitting it into three parts called sprints. Each sprint lasts a month and includes steps like gathering what we need, working on the software, testing it, checking it, and releasing it. After the three sprints, we'll do thorough testing, release the software, and write down how it all works. We're starting on March 5, 2024, and finishing on October 31, 2024.

6. Testing Methodology

i. Beta testing

The type of beta testing to be used is traditional beta testing where the system is distributed to the target users which in this case are the staff and veterinarians of Pruderich Veterinary Clinic. All participants will be given their respective UAT questionnaires while the system is being tested.

ii. Review

After the test, the proponents will collect the questionnaires as well as gather feedback from the users on their experience with the system.

iii. User Acceptance Testing (UAT)

In appendix C, to ensure that the system meets the expectations of the end users or clients and is ready for release, the proponents have chosen the User Acceptance Testing (UAT) method for this project. UAT involves testing the software

in a real-world environment with the end users or clients providing feedback on the system. This approach allows us to identify any issues and make improvements based on user feedback. The UAT process involves several steps, including test initiation, test design, test execution, and test closure. By crafting test cases that test the system's performance and capabilities, we can ensure its quality. The results of the testing are compiled into a user acceptance report that provides stakeholders with an overview of the testing outcomes, highlights any outstanding issues, and serves as a formal agreement that the system meets the required standard.

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APPENDICES

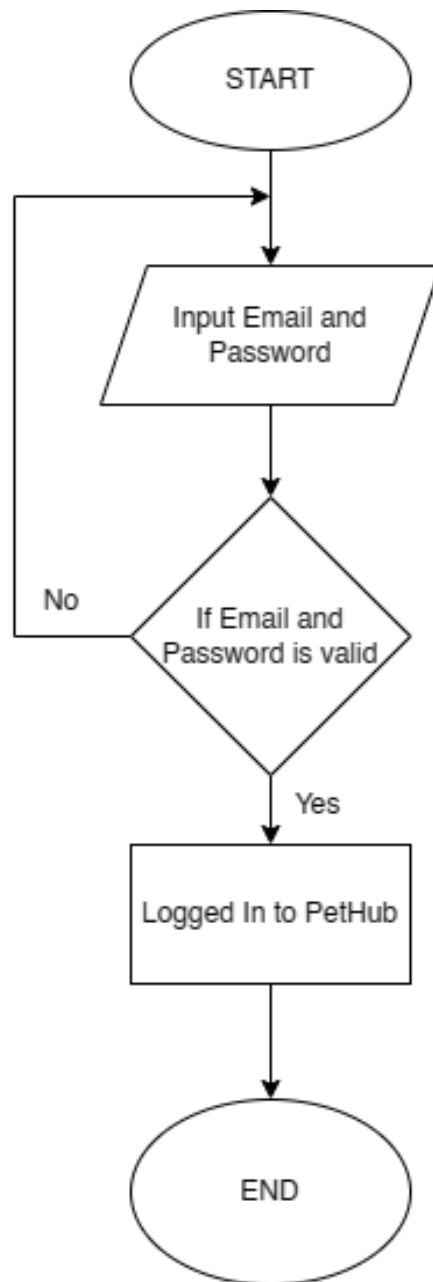


Figure 4. Login Flowchart

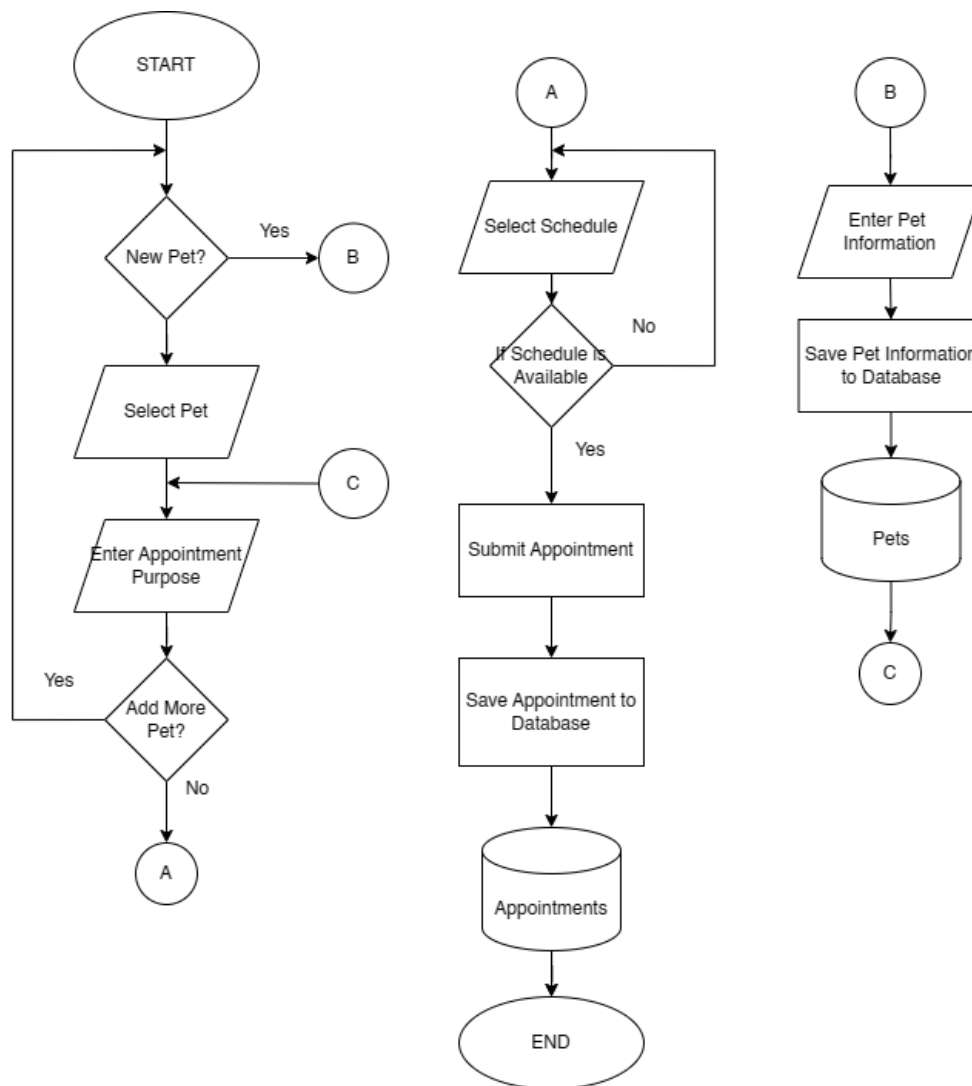


Figure 5. Booking of Appointments Flowchart

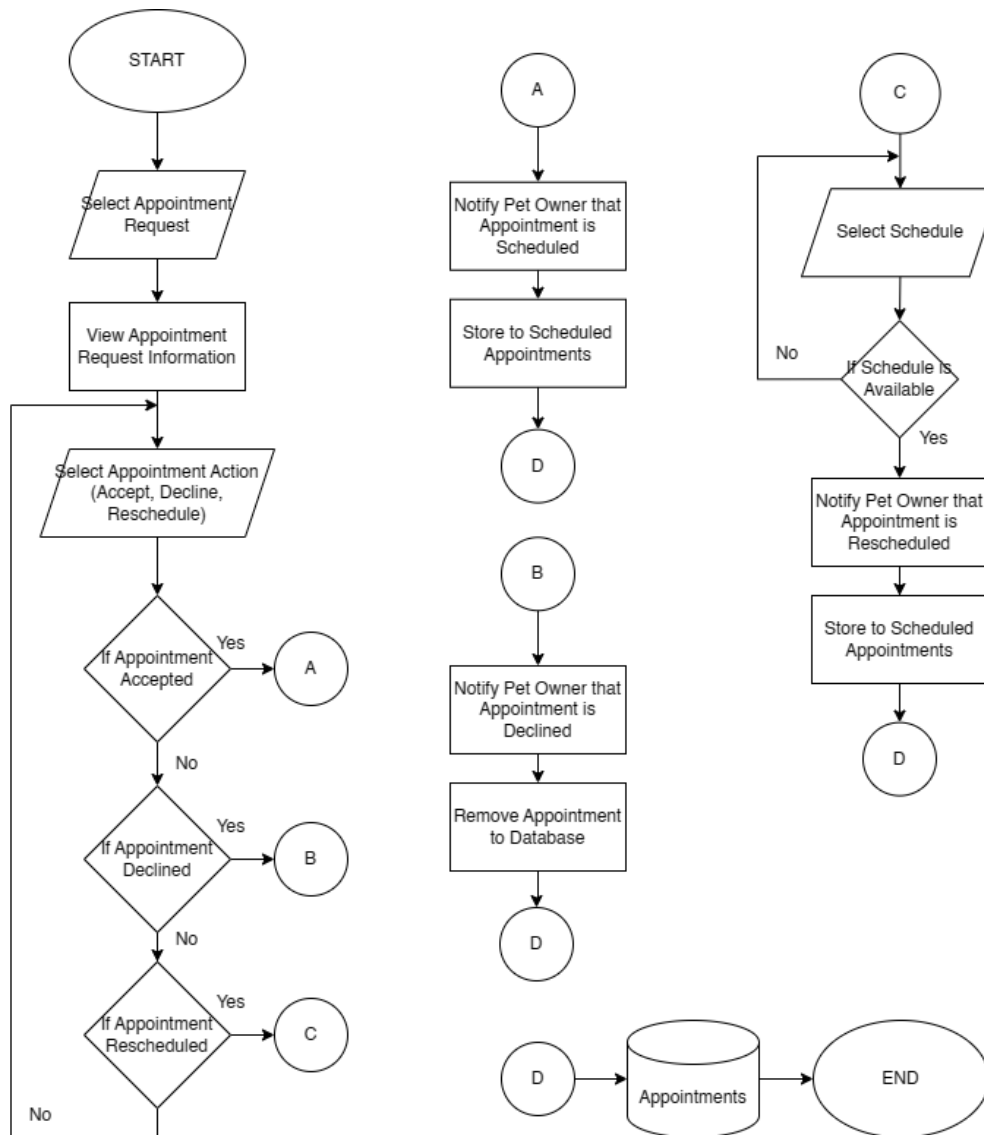


Figure 6. Managing of Appointment Requests Flowchart

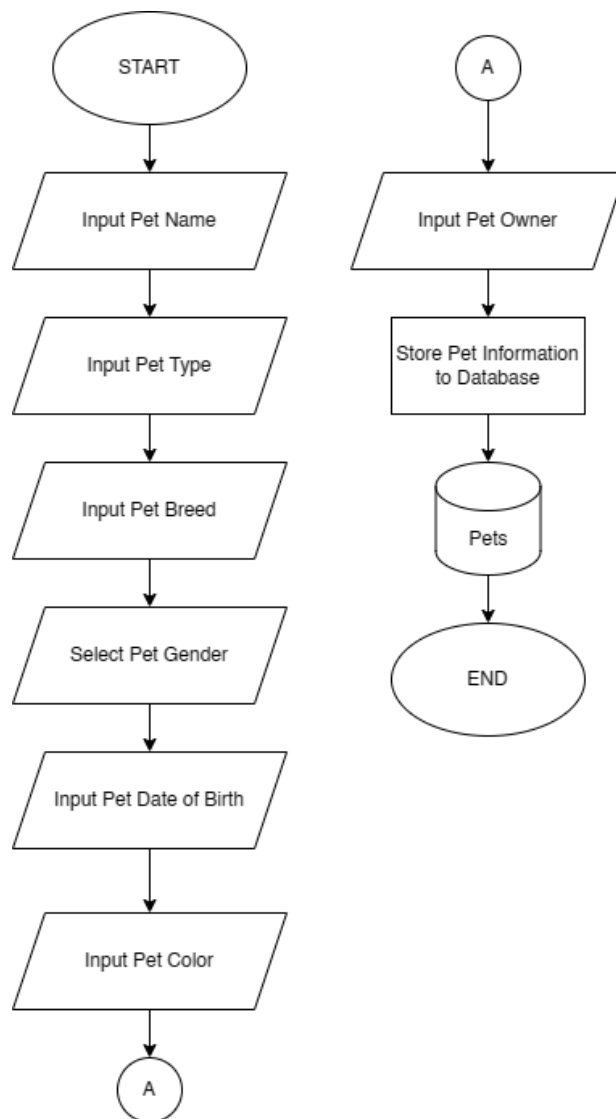


Figure 7. Adding of Pet Flowchart

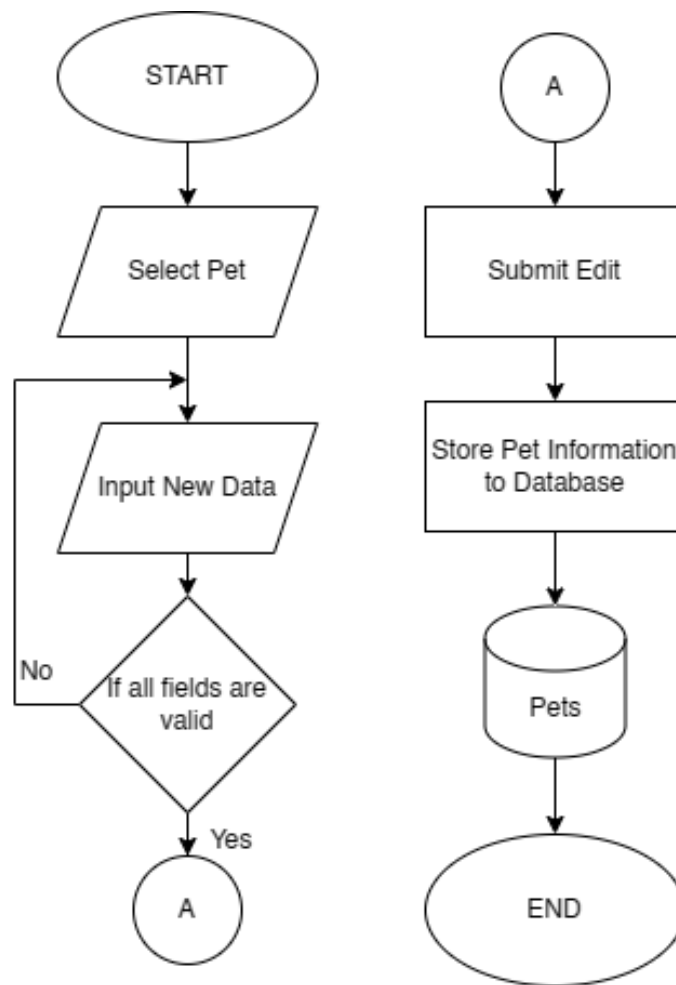


Figure 8. Editing of Pets Flowchart

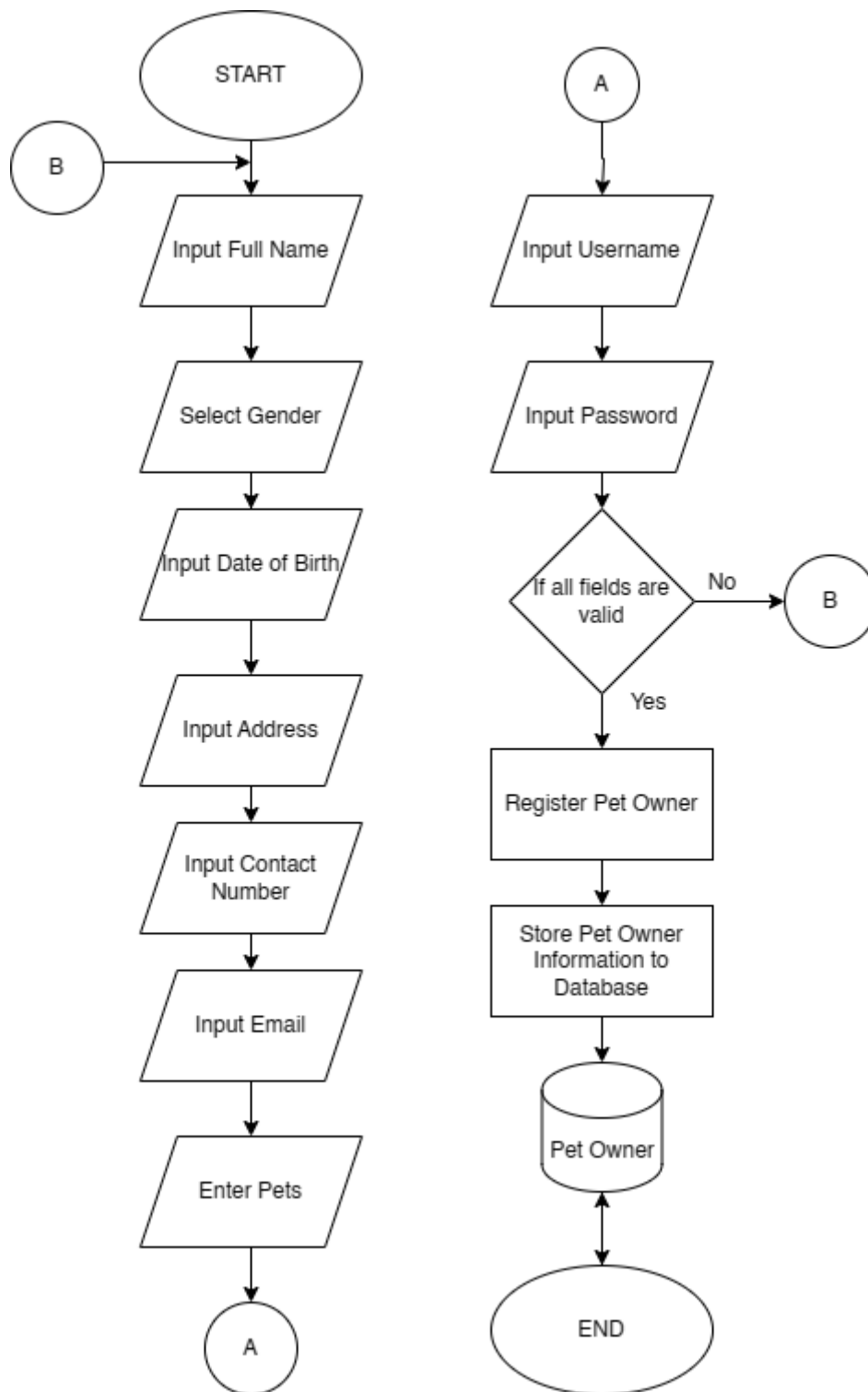


Figure 9. Registering Pet Owner Flowchart

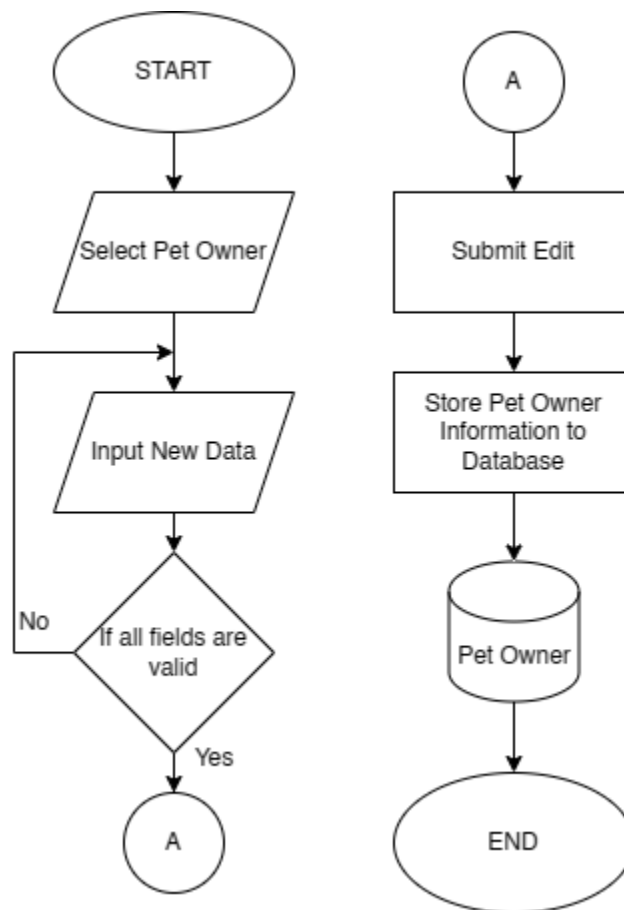


Figure 10. Editing Pet Owner Flowchart

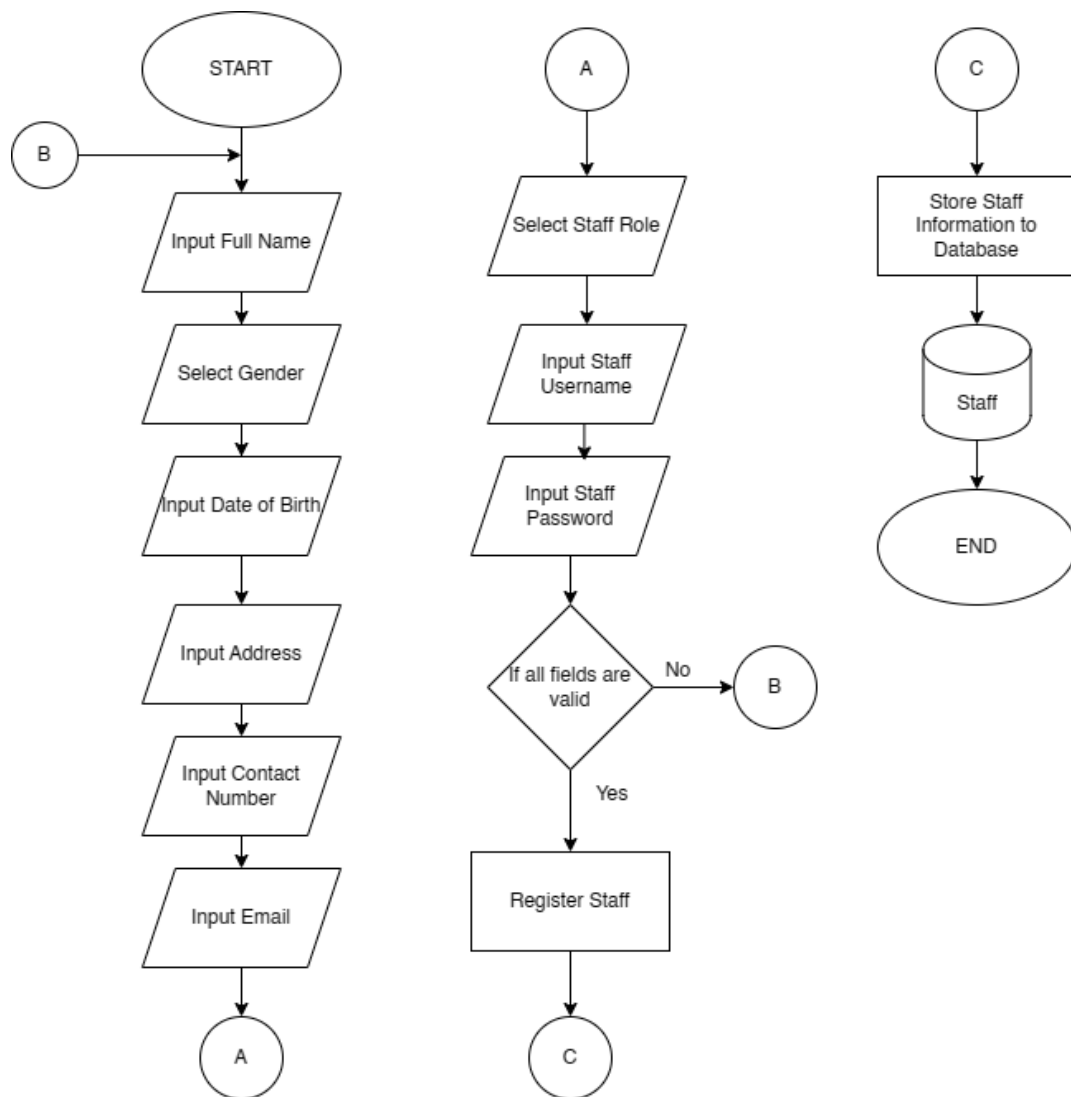


Figure 11. Registering Staff Flowchart

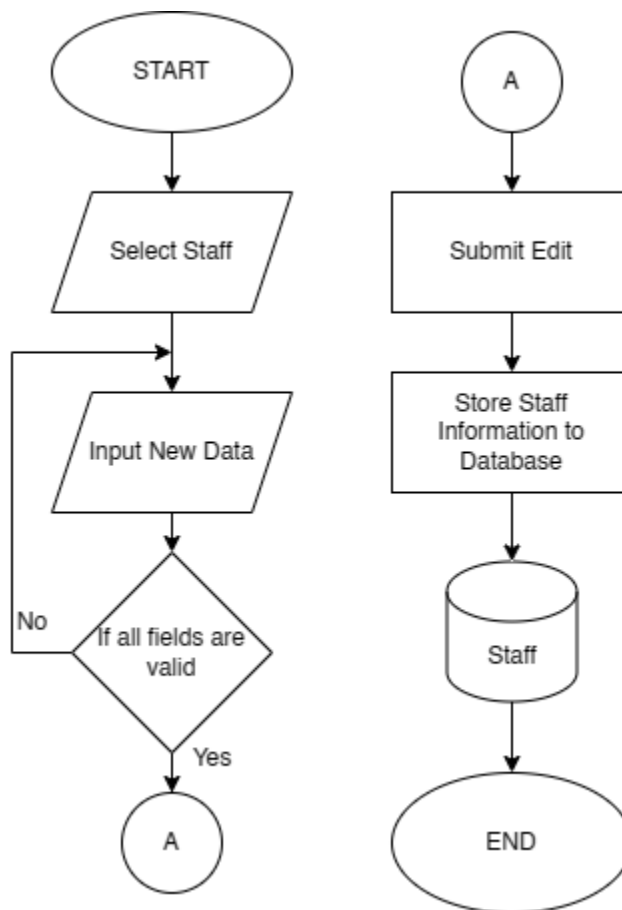


Figure 12. Editing Staffs Flowchart

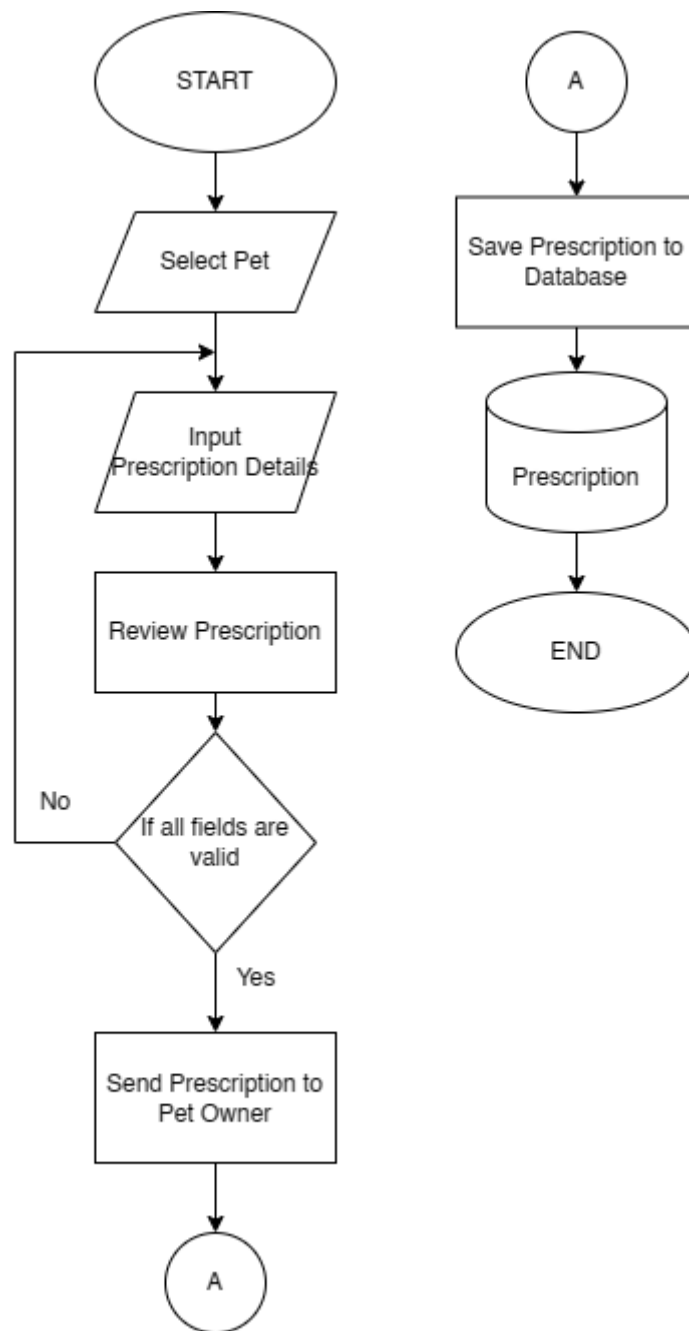


Figure 13. Adding of Prescriptions Flowchart

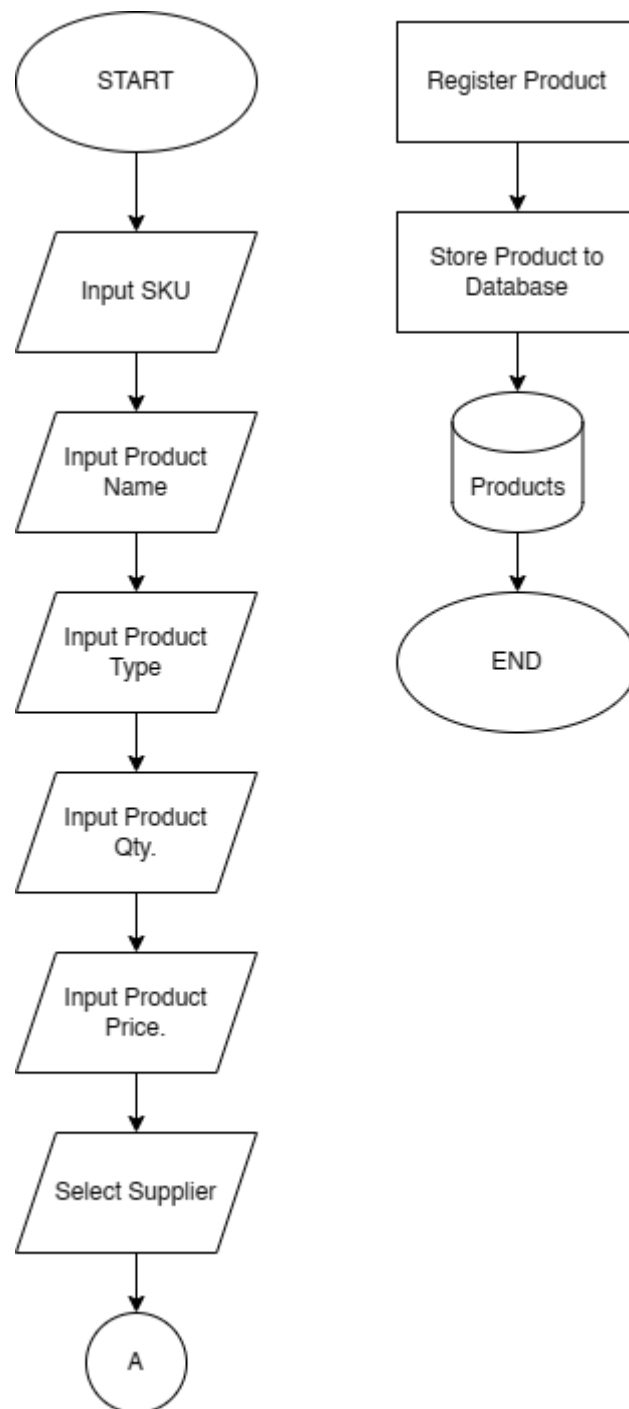


Figure 14. Registering Product Flowchart

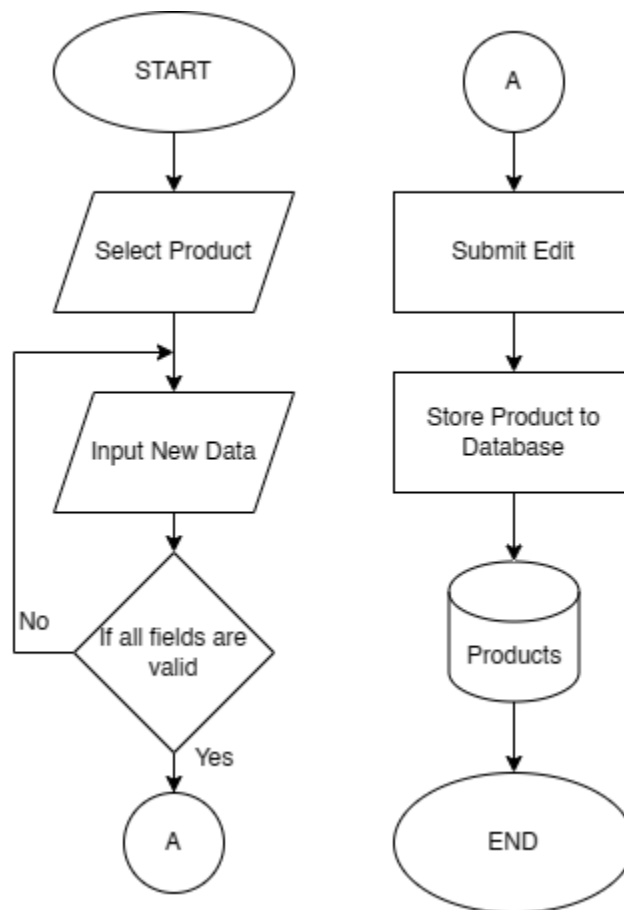


Figure 15. Editing Product Flowchart

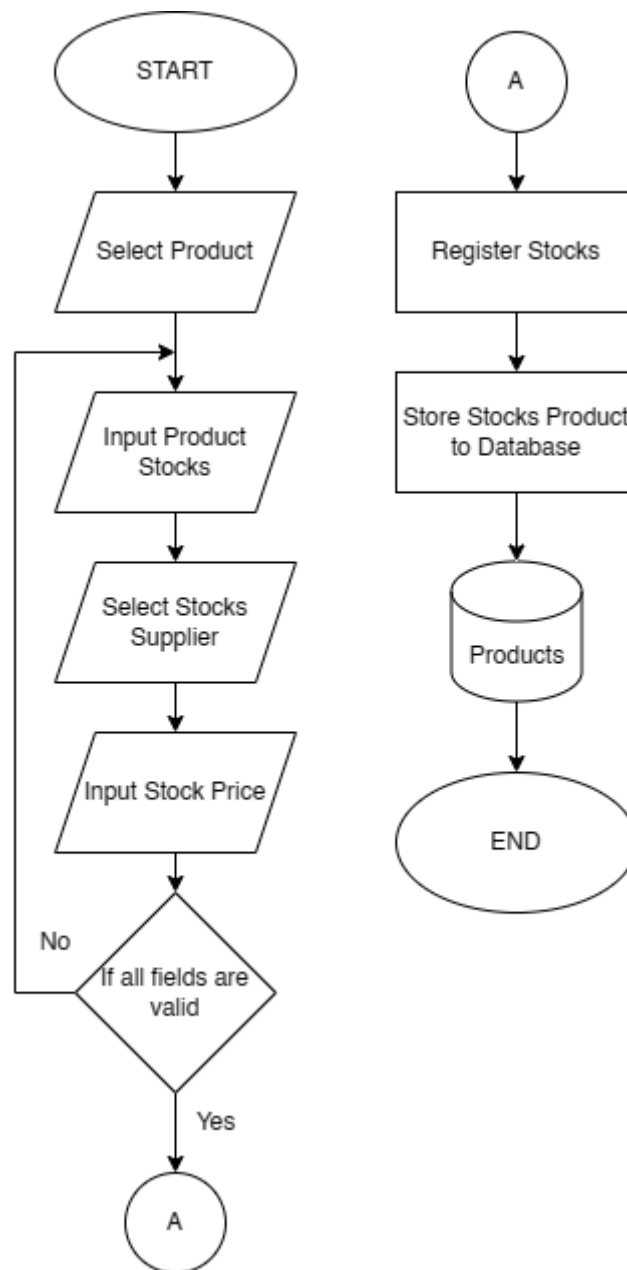


Figure 16. Adding of Product Stocks Flowchart

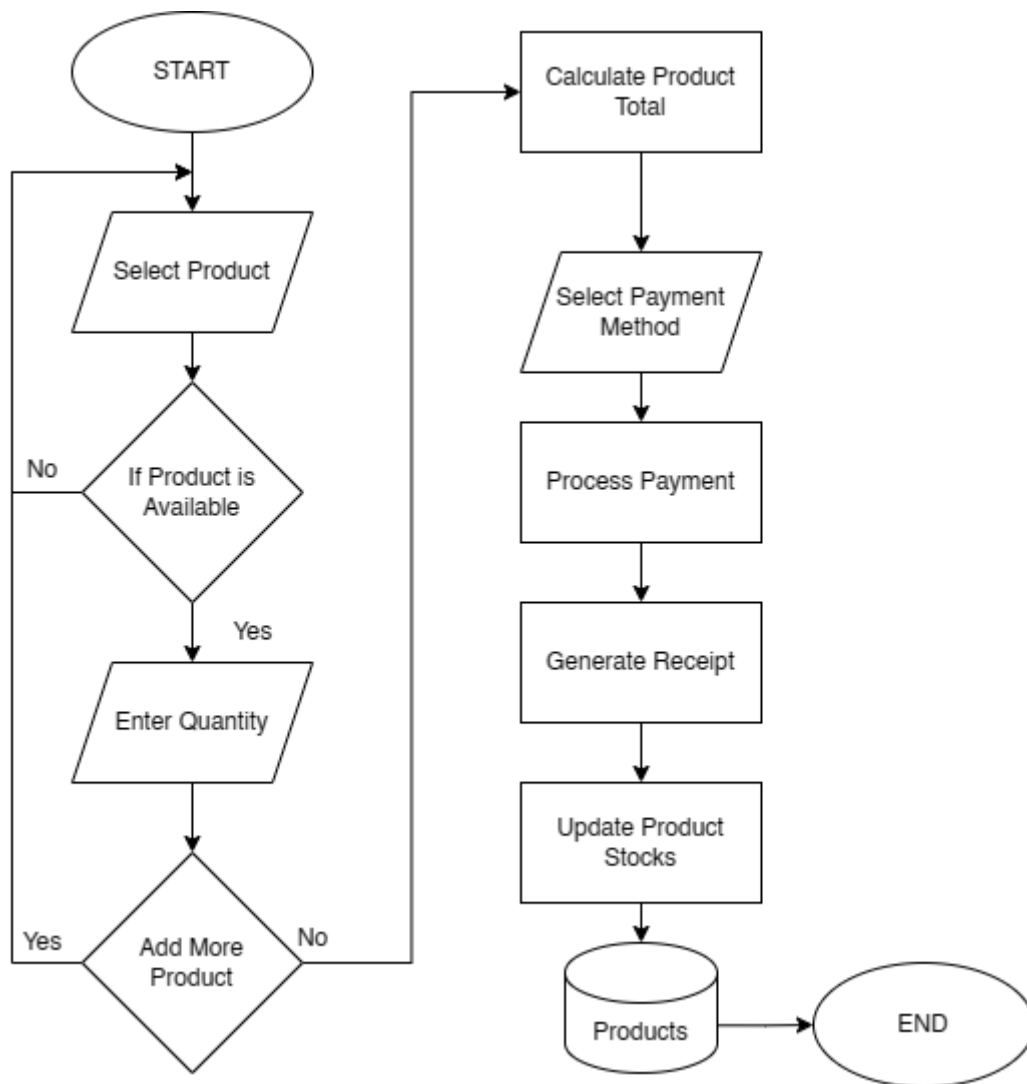


Figure 17. Point of Sales Flowchart

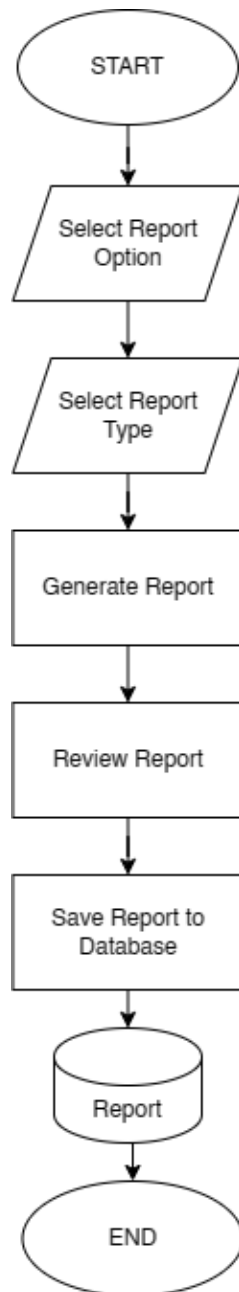


Figure 18. Generating of Reports Flowchart

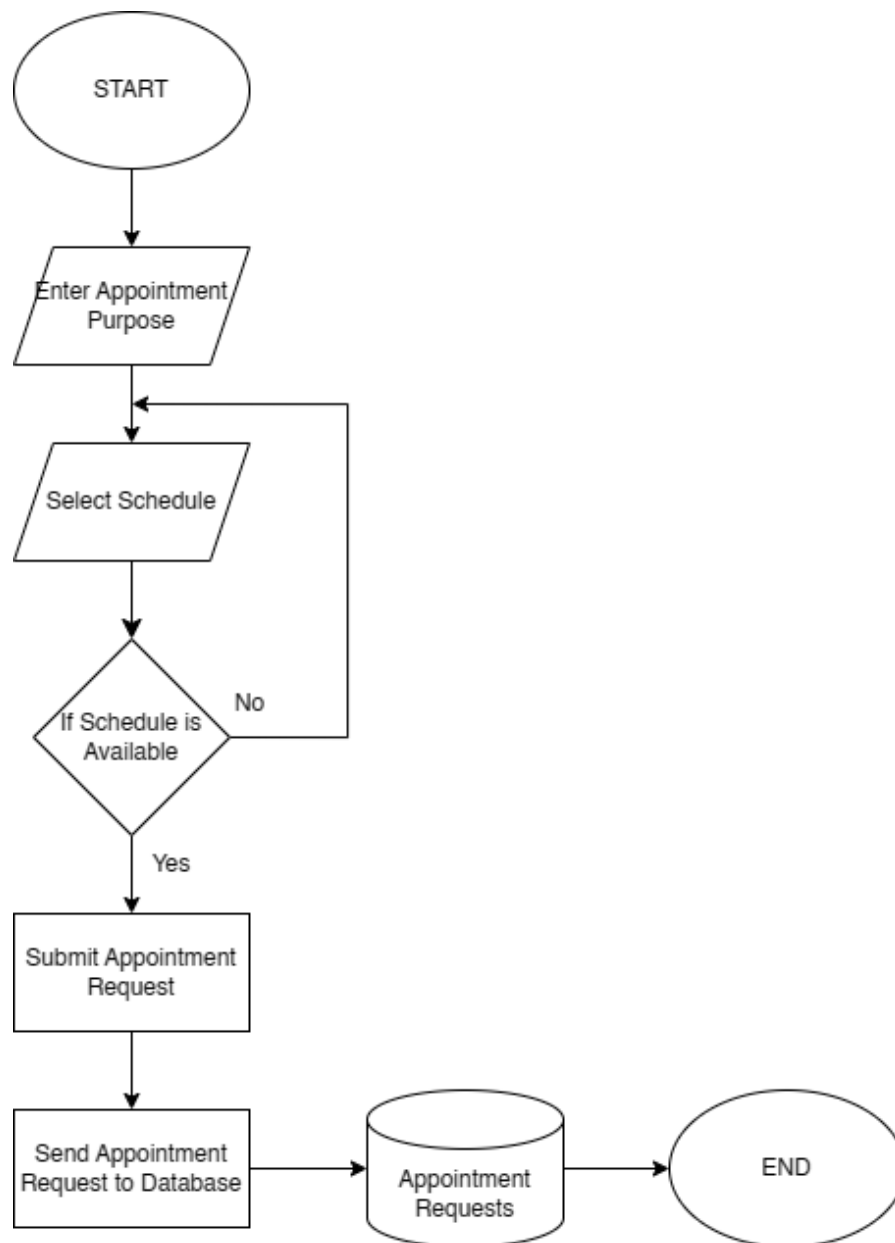


Figure 19. Requesting of Appointments in Client Side Flowchart

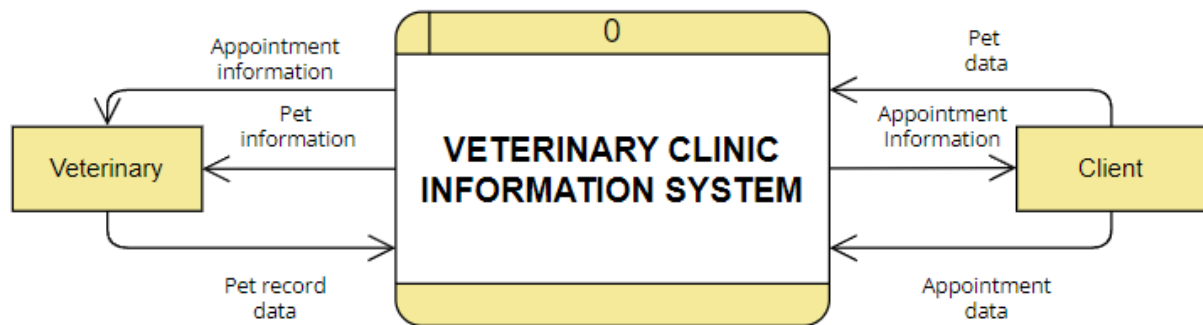


Figure 20. Context Level Data Flow Diagram

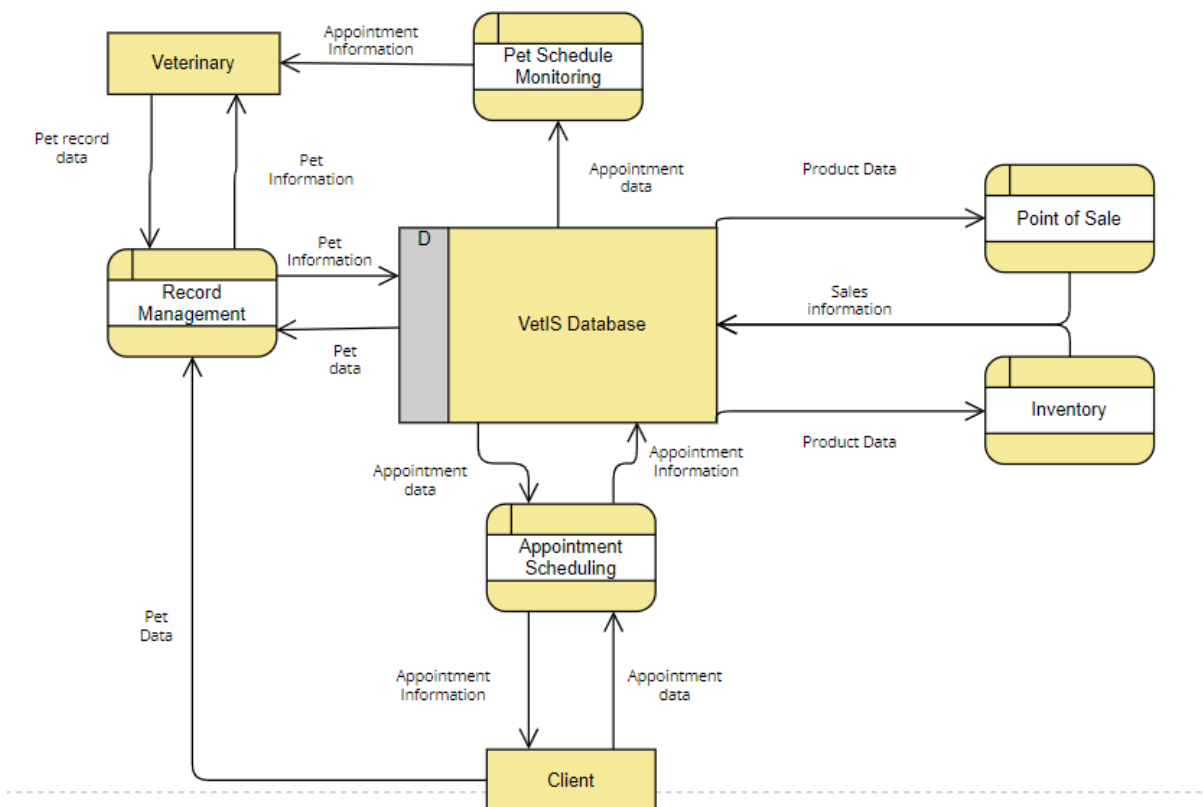


Figure 21. Level 0 Data Flow Diagram.

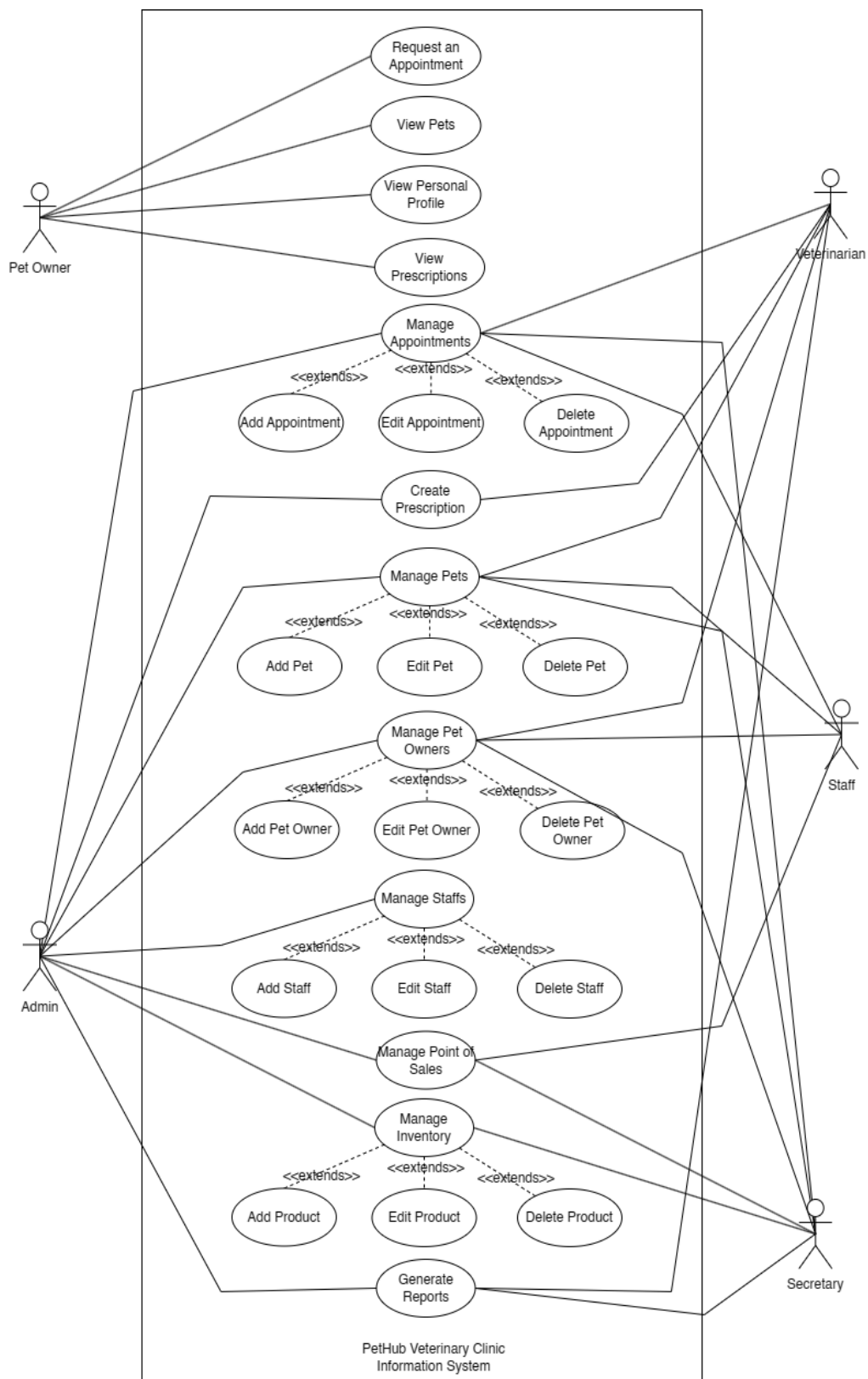


Figure 22. Organizational Owner Use Case Diagram and General Use Case Diagram.

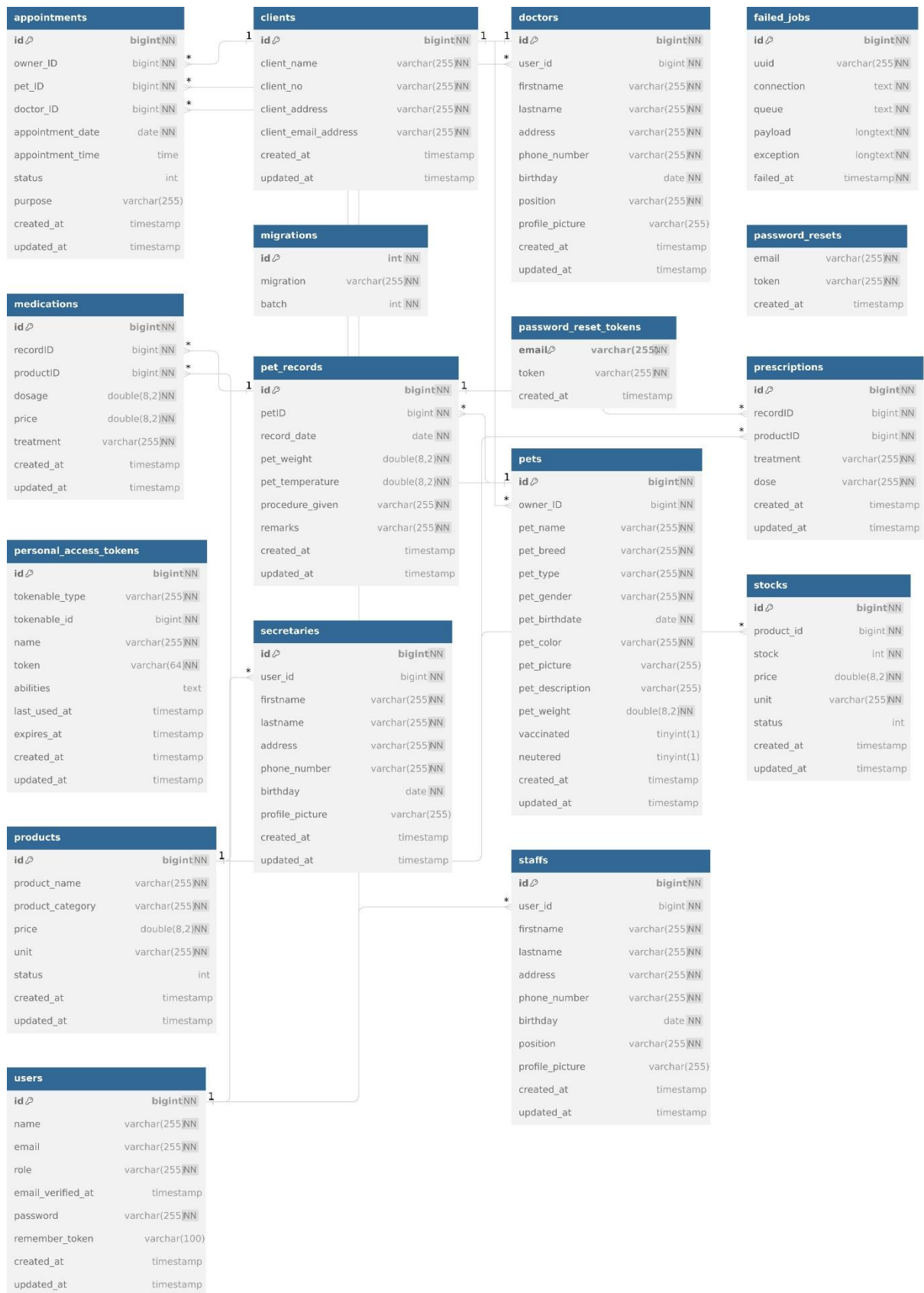


Figure 23. Database Schema for Veterinary Clinic Information System

Table 1. Data Dictionary for Users

Field Name	Field type	Description
name	varchar	Name of the user
email	varchar	Email of the user
role	varchar	User's role or privilege type
password	varchar	User's password

Table 2. Data Dictionary for Staffs

Field Name	Field type	Description
firstname	varchar	Firstname of the staff
lastname	varchar	Lastname of the staff
address	varchar	Address of the staff
Phone_number	varchar	Phone Number of the staff
birthday	varchar	Birthdate of the staff
position	varchar	Position of the staff
profile_picture	blob	Profile picture of the staff

Table 3. Data Dictionary for Secretaries

Field Name	Field type	Description
firstname	varchar	Firstname of the secretary
lastname	varchar	Lastname of the secretary
address	varchar	Address of the secretary
Phone_number	varchar	Phone Number of the secretary
birthday	varchar	Birthdate of the secretary
position	varchar	Position of the secretary
profile_picture	blob	Profile picture of the secretary

Table 4. Data Dictionary for Doctors

Field Name	Field type	Description
firstname	varchar	Firstname of the doctor
lastname	varchar	Lastname of the doctor
address	varchar	Address of the doctor
Phone_number	varchar	Phone Number of the doctor
birthday	varchar	Birthdate of the doctor
position	varchar	Position of the doctor
profile_picture	blob	Profile picture of the doctor

Table 5. Data Dictionary for Clients

Field Name	Field Type	Description
client_name	varchar	Client's name
client_no	varchar	Client's phone number
client_address	varchar	Client's home address
client_email_address	varchar	Client's email address

Table 6. Data Dictionary for Pets

Field Name	Field Type	Description
pet_name	varchar	Pet's name
pet_breed	varchar	Pet's Breed
pet_type	varchar	Pet's type refers to it being a mammal, reptile, amphibian etc.
pet_gender	varchar	Pet's gender
pet_birthdate	varchar	Pet's birthdate
pet_color	varchar	Pet's color
pet_picture	varchar	Pet's picture
pet_description	varchar	Additional information for the pet
pet_weight	Double	Pet's weight in kilograms
vaccinated	Bit	Determines if the pet is vaccinated
neutered	Bit	Determines if the pet is neutered

Table 7. Data Dictionary for Products

Field Name	Field Type	Description
product_name	Varchar	Name of product
product_category	Varchar	Category of product
price	Double	Price of product
unit	Varchar	Unit of sale for product
status	bit	Stocks status of product

Table 8. Data Dictionary for Pet records

Field Name	Field Type	Description
record_date	Date	Date of record
pet_weight	Double	Weight of pet on the day of recording
pet_temperature	Double	Body temperature of pet on recording
procedure_given	Longtext	The procedure given to the pet
remarks	Longtext	Remarks from the doctor

Table 9. Data Dictionary for Medications

Field Name	Field Type	Description
productID	bigInt	Id of the product given for medication
dosage	Double	Dosage of the product to be taken
Price	Double	Price of the product
treatment	varchar	Treatment using the product

Table 10. Data Dictionary for Stocks

Field Name	Field Type	Description
product_id	BigInt	Id of the product that is in stock
stock	Integer	Number of items or stocks
price	Double	Price of purchasing the item
unit	Varchar	Unit of item
status	bit	Status of item whether all the stocks are all sold

Table 11. Data Dictionary for Appointments

Field Name	Field Type	Description
appointment_date	Date	Date of appointment
appointment_time	Time	Time of appointment
status	int	Status of appointment whether approved, denied, pending, or cancelled
purpose	longtext	Purpose of appointment

Table 12. Login Requirement Specification

Requirement No. 1	Login
Priority	High
Purpose	Implement user authentication to validate users and clients who access the system, and redirect them to the dashboard after successful verification.
Input	Users can input Email and Password.
Operations	The user inputs their email and password. The system checks the entered email address and password against the database. If the verification is successful, the system results the user to the dashboard. If verification fails, the system displays an error message indicating wrong credentials, giving the user the option to try again or reset their password.
Output	After successful authentication, the system redirects users to the dashboard, granting access to system functionalities. In contrast, if verification fails, an error notice informs users to erroneous credentials, allowing them to update them or seek more assistance if necessary.

Table 13. Registration Requirement Specification

Requirement No. 2	Registration
Priority	High
Purpose	To allow clients to register for access to the system by providing basic information.
Input	Users can input Name, Birth Date and Contact Information (e.g., email, phone number)
Operations	The system will provide a registration page available to clients. Gather the following necessary data from clients. Validate the entered information to guarantee its accuracy. The system will save the registration details to the database for future authentication and reference.
Output	After successful authentication, the system redirects users to the dashboard, granting access to system functionalities. In contrast, if verification is unsuccessful, an error notice informs users to incorrect credentials, enabling them to update them or seek more assistance if necessary.

Table 14. Adding Pet and Pet Record Requirement Specification

Requirement No. 3 Adding of Pet and Pet Record	
Priority	High
Purpose	To allow the secretary/assistant to input basic information about pets and their medical history into the system, creating new pet records and updating medical information as needed.
Input	Secretary/Assistant can input Pet basic Information (Name, Breed, Sex, Birth Date, and Owner) and Pet Medical Information (Vital Signs, Medications, Procedures performed)
Operations	The system will provide a form where the secretary/assistant can enter basic information about the pet. Gather the following basic information about the pet. Validate the entered information to guarantee its accuracy and completeness. Enter the basic pet information into the database as a new pet record. Provide a form where the secretary/assistant can enter basic medical information about the pet. Collect the following medical information about the pet then the system will validate the medical information you entered. Lastly, the system will store the medical information in a database linked to the pet's record.
Output	The system allows the secretary/assistant to create new pet records by entering basic pet information such as name, breed, and other details, as well as updating medical information such as vital signs and prescriptions. A confirmation message is given following the successful creation or change. When inaccurate or incomplete information is entered, an error message urges the user to update or complete the required fields.

Table 15. Adding User Requirement Specification

Requirement No. 4 Adding User	
Priority	High
Purpose	To allow admins to establish new user accounts by entering basic information, assigning user types, and creating default passwords for initial access.
Input	Admin can input the user's email and input the user type.
Operations	The system allows admins to enter user information via a form, such as email address and user type. Following submission, it generates a default

	password for the new account and securely stores this information in the database. Upon successful account creation, the system sends an email to the user confirming the creation and offering instructions for changing the default password upon first login.
Output	After successfully creating a new user account, the system displays a confirmation message and the default password for the user's information. The system also sends a notification to the user's email address. This message informs the user about their newly established account and provides information on how to change the default password when checking in for the first time.

Table 16. Adding Products Requirements Specification

Requirement No. 5	Adding Products
Priority	High
Purpose	To enable an admin to add new products to the system, include basic product information such as name, price, and unit of sale.
Input	Admin can input the product name, price and unit sale.
Operations	The system provides an exclusive form for administrators to enter product information, such as name, price, and unit of sale. Following submission, the system validates the submitted information to ensure its accuracy and completeness. Following successful validation, the system securely stores the product information as a new item in the database.
Output	The system offers a simpler approach for introducing new goods. After successful addition, it displays a confirmation message indicating that the work was completed successfully. However, if the information entered is wrong or incomplete, the system displays an error message and directs users to update or complete the required forms.

Table 17. Adding Appointments Requirement Specification

Requirement No. 6	Adding Appointment
Priority	High
Purpose	To facilitate the scheduling of appointments by allowing staff or clients to submit appointment requests, which the admin can then review and approve.
Input	Staff/Client can input the Appointment date and time.
Operations	The system enables staff and clients to schedule appointments using a simple form. When the request is submitted, it captures appointment information such as the day and time, and the request is marked as pending. The system then notifies the admin of the new request for evaluation. The admin then approves or rejects the appointment. If authorized, the appointment status is updated to confirm; if rejected, the staff or customer is alerted appropriately.
Output	Following the successful submission of the appointment request, the system sends a confirmation message. When an appointment is pending approval, it notifies the administrator for review. Once approved, the system confirms the appointment. The system tells the staff or client of the refusal.

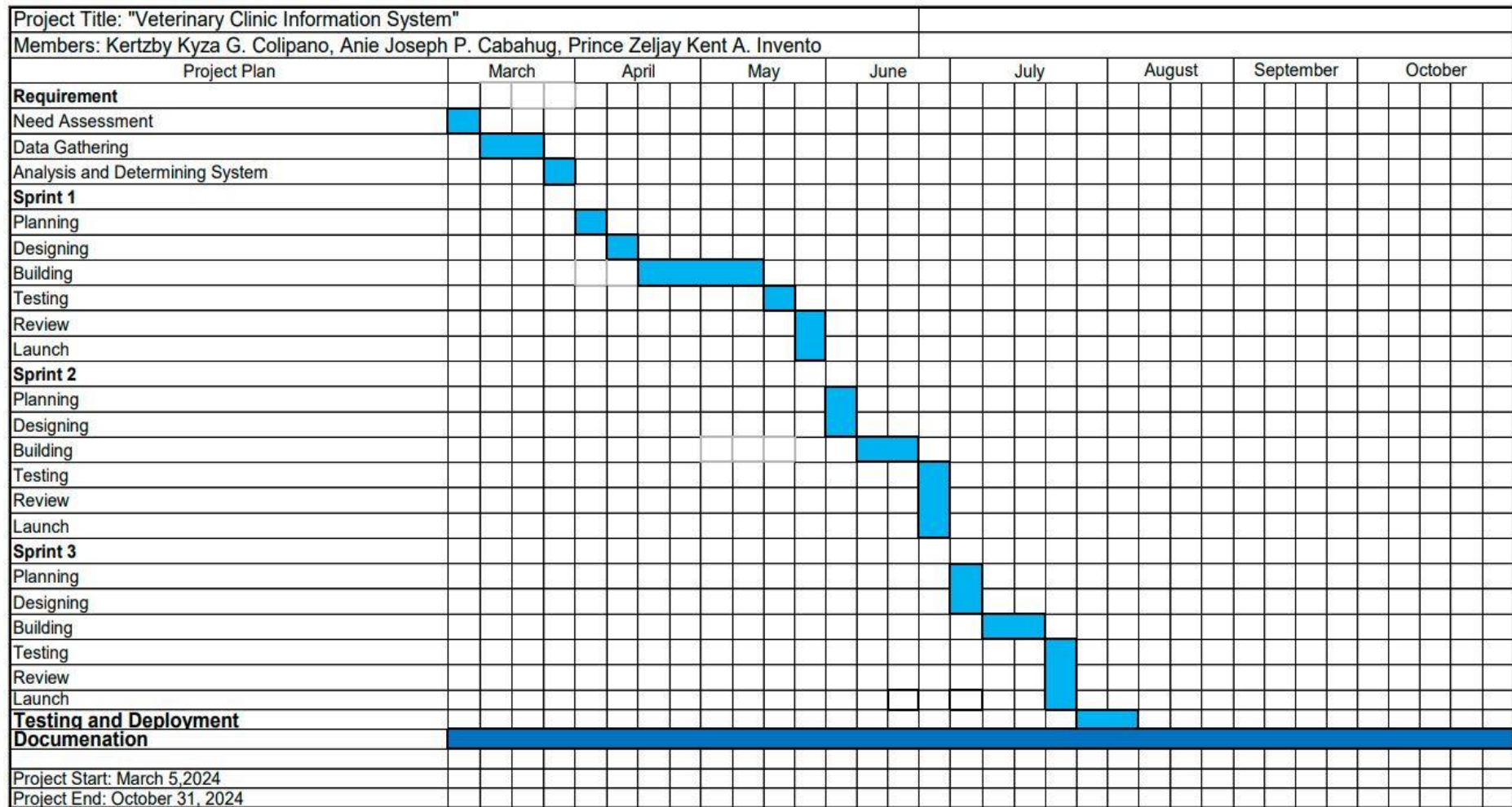


Figure 24. Project Gantt Chart.

Table 18. UAT Questionnaire

No.	Test Scenarios	Expected Result	Actual Result	Pass/Fail
1	The system can store and access pet records as well as client profiles.	Pet records are stored in the database for access.		
2	Users can schedule appointments for different services.	Users can schedule and track their appointments through the system.		
3	Email notifications are sent to the users	Users are sent notifications about their appointment through email		
4	The system handles point of sale transactions	Yes		
5	The system handles inventory checking and management	Yes		
6	The system tracks expiry dates of products.	Yes		

No.	Acceptance Requirements	Test Result (Number of People)	
		Accept	Reject
1	The system stores pet records and client profiles.		
2	The system can schedule appointments for different services.		
3	The system notifies clients of their appointment schedules through email.		
4	The system handles point-of-sale transactions.		
5	The system handle inventory checking and management.		
6	The system tracks expiry dates of products.		