Assignment Cover Sheet

Qualification		Module Number and Title
HND in Computing and Software Engineering		CSE5015/ Computing project
Student Name & No.		**Assessor**
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Hand out date		**Submission Date**
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Assessment type	**Duration/Length of Assessment Type**	**Weighting of Assessment**

Learner declaration
I, Pasan Bimsara Lankeshwara certify that the work submitted for this assignment is my own and research sources are fully acknowledged.

Marks Awarded			
First assessor			
IV marks			
Agreed grade			
Signature of the assessor		Date	

FEEDBACK FORM

INTERNATIONAL COLLEGE OF BUSINESS & TECHNOLOGY

Module/Title :

Student :

Assessor :

Assignment :

Strong features of your work:

Areas for improvement:

Marks Awarded:

Pet Record Management System

HD in Computing & Software Engineering

CSE5015 Computing Project Proposal Approval Sheet

Student Use only;

Group Name	**Group 15**	**Attempt No**	**1**
Title of the project	Pet Record Management System to Improve Pet Healthcare		
System platform	■ Web Application ☐ Desktop ☐ bile Application ☐ Application ……		
Technology			
Programming methodology	■ Structured System Analysis and Design Methodology ☐ Object Oriented Analysis and Design Methodology		
SDLC	Agile model		

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Roles & Responsibilities; **QA Engineer**			

System Functionality:

Function	Description
Login	Ability to Login using credentials applicable for Admin, veterinarian and Pet/Users.
Registration	Ability Register Vets/Pet/Users into the system.
Profile View	Ability to view profiles and reset passwords.
Settings	Ability to optimize user accounts.
Dashboard	View Most important data.
Logout	Ability to logout of sessions.
Generate Reports	Ability to generate and view reports for all 3 User-Types
Manage Users and Pets (Admin)	Ability to Create, Read, Update and Delete users.
Managing Vets (Admin)	Ability to Create, Read, Update and Delete Vets.
Deactivate Accounts (Admin)	Ability to Deactivate and Manage accounts.
Manage Medical Records (Vets)	Ability to Create, Read, Update and Delete Medical Records of pets.
Manage Appointments (Vets)	Ability to accept or reschedule appointments made by the pets/user.
Messaging System	Secure messaging system within the vet and the user.

(Vets, Pets)	
View Pet Records	View and Download vaccination records, past diagnoses of the pet.
Reminders	Ability to schedule reminders regarding next vaccinations etc.
Book appointments	Ability to schedule appointments via the website and receive confirmations
Past visits	Ability to view past visits
Confirmations	Ability to receive confirmation messages through email functions
Chat functions	Ability to chat or video call with the respective veterinarian for consultation.
Nearby locations	Ability to view the closest vet for the user within a selected radius.

Official use only;

Status: Approved / Rejected

Date of the status: ……

Approved by:

…… …….. …….

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1. Introduction

In today's fast-paced world of pet care, Vets, and veterinary clinics play an important role in protecting our pet companions' health and enjoyment. From routine check-ups to specialty treatments, these facilities offer a wide range of pet healthcare needs. However, using traditional methods to manage appointments and medical information can be inefficient due to manual activities.

This proposal outlines the comprehensive vision for the project PETTER, a Pet Appointment and Medical Record Management System that is initiated to improve pet healthcare management for both veterinary clinics and pet owners. PETTER maximizes operational efficiency by seamlessly automating important processes such as appointment scheduling and medical record-keeping, while also providing pet owners with easy access to their pets' complete medical histories.

We propose to address the current challenges that are faced with a detailed breakdown of the project scope, the project outline including functional and non-functional requirements of the system along with a clear understanding of the project timeline and task allocated to each member. In addition, we carry out a comprehensive analysis of possible risks that can arise throughout the development stage. We also explore the advanced tools and technologies that will operate our system, the development process methodology, the structure of our team, and their individual roles and duties.

In conclusion, PETTER represents a significant leap forward in pet healthcare management in Sri Lanka, catering to the evolving needs of veterinary clinics and pet owners alike. By harnessing the power of automation and technology, PETTER aims to streamline processes, enhance operational efficiency, and ultimately improve the overall quality of pet care. With a dedicated team, robust methodology, and thorough risk analysis in place, we are confident in our ability to deliver a solution that not only meets but exceeds expectations.

2. Background study

A Pet Record Management System (PRMS) is a platform that is designed to improve the administrative processes involved in pet healthcare. It normally includes features such as appointment scheduling, Electronics Health Record (EHR) to track medical records and vaccination tracking amongst many others.

Similar concepts in where these features are used include human healthcare, which also automates the process of manually going through patient records. A PRMS solution is generally initiated to enhance the efficiency and accuracy in pet healthcare which is meant to ultimately improve the quality of animal care and it is not a common solution.

Most pet care apps are focused only on the pet owner; however, this solution will be beneficial for vets and clinics as well.

Similar systems include:

1. PetVet

PetVet is a veterinary clinic website based in Sri Lanka, offering a range of services for pet owners. While the website provides valuable information about the clinic's services, it lacks interactive features for user engagement capabilities commonly found in modern pet healthcare management systems.

https://www.petvet.lk/

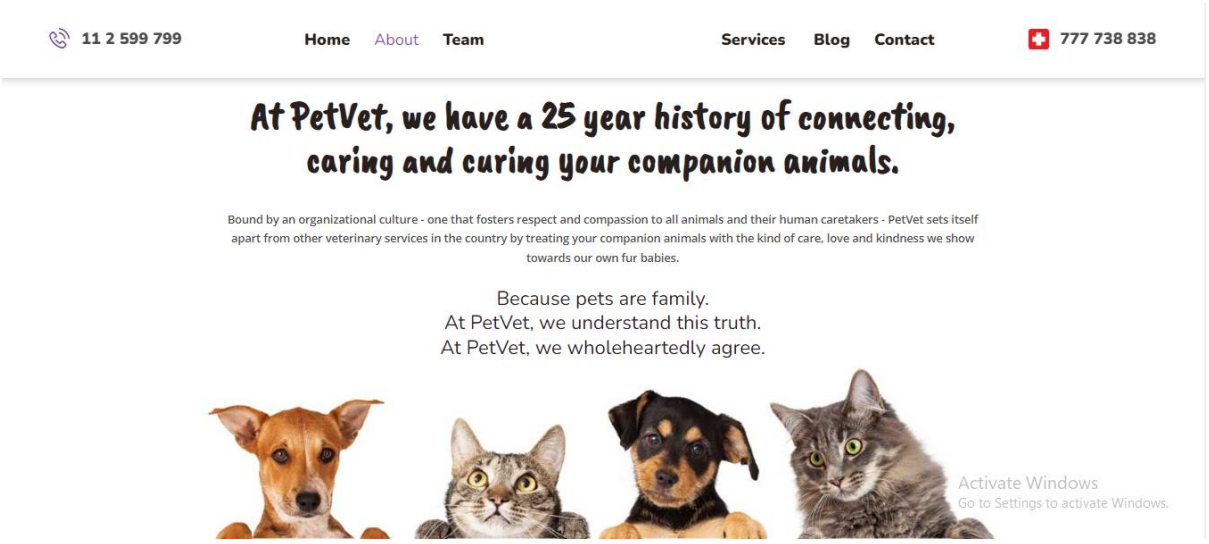


Figure 1 PetVet

2. Digitail

Digitail is a cloud-based practice management software created to improve communication between veterinary clinics and pet owners and speed up the management of pet healthcare. With a variety of features, this innovative system aims to streamline clinic operations, enhance client engagement, and simplify administrative duties. It is a 3rd party software which can be used by the vets to manage their clinics.

https://digitail.com/

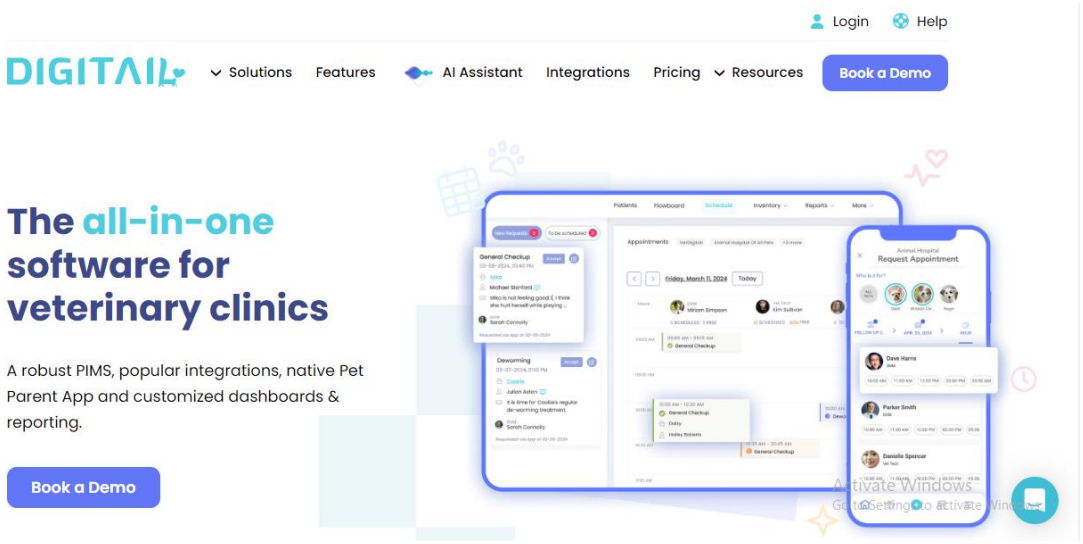


Figure 2 Digitail

3. DogCat app

"DogCat App" is a comprehensive pet care tracker designed to simplify the lives of pet parents and ensure the optimal health and happiness of their furry friends. This comprehensive application offers several features tailored specifically for dogs and cats, as well as a wide range of other pet species, making it a very versatile choice for pet care management.

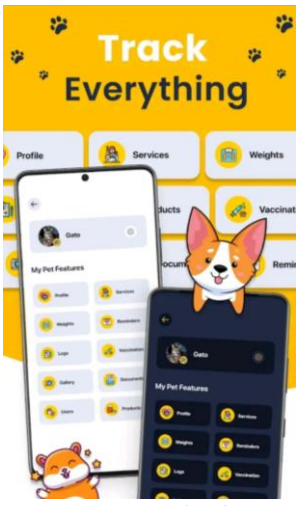


Figure 3 DogCat App

3. Problem Statement

In Sri Lanka vet clinics and owners heavily depend on manual procedures where pet records are kept in physical books and cards which can sometimes lead to the loss and damage of the records due to misplacement amongst other reasons. PETTER aims to address these shortcomings by automating the process of managing records and appointments thereby ensuring the security and accessibility of records. As for appointments, there can be instances where the owners may forget about the specified date and time as appointments are simply noted down in the pet record book.

Moreover, the pet record book is very crucial to both the veterinarians and pet owners which they must bring it along whenever they have an appointment or visit. Thus, it is important the pet record book is kept safe so that the vets and owners can easily refer to information. This will act as an alternative to the physical pet record books used here in Sri Lanka which are handled manually.

Below are the key challenges identified as problems for vet clinics and pet owners.

1. **Excessive documentation:**

   The extensive paperwork increases stress levels for veterinarians, especially when everything must be handled manually. (McNeill & McNeill, 2022)

2. **Inefficiency and Errors:**

   Manual handling of appointments and medical records are inefficient. Vets often rely on handwritten schedules or outdated booking systems, which lead to overlapping appointments, failure to show up to consultations and incomplete records. With these issues being a direct factor on the quality of the service and the level of satisfaction that the clients receive, the customers often find difficult in making bookings and the veterinarians cannot give accurate and clear information on their pets' health.

3. **Record Management Issues:**

   Physical files can be misplaced, damaged, or lost. One of the main difficulties that veterinarians come across is retrieving comprehensive and accurate medical histories. Such

histories are critical for diagnosing conditions and designing treatment strategies. Without maintaining proper records, the vets cannot offer customized guides which may in turn lead to poor health of pets. For example, missing vaccination records can unwittingly put itself at risk for a disease that could have been easily prevented.

4. Pet Owner Involvement:

Pet owners often fail to bring their pets' medical files with them to each veterinary consultation, which has been one of the reasons why doctors end up with missing or incomplete notes. Owners' inconsistencies in recording become a significant problem when trying to narrow down the list of illnesses. As such, the overall quality of health information is compromised, depriving patients of a chance for early diagnosis. In the majority of cases, the owners of animals do not see the necessity of the keeping the required paperwork, resulting in a lack of communication between the vet doctor and the client. (Collins, 2017)

5. Client Education:

Manual systems also limit opportunities for educating pet owners about preventive care and treatment adherence. Without efficient communication tools or platforms that can engage clients with reminders, articles, or videos on best practices, pet owners may struggle to follow through on treatment plans. Consequently, treatment outcomes may be suboptimal, and preventive care practices might not be thoroughly understood or adhered to.

6. Emergency Care:

In emergencies, immediate access to a pet's comprehensive medical history is crucial for making rapid and accurate treatment decisions. Manual record-keeping delays the retrieval of information, potentially compromising critical care. Without accurate information about past treatments or pre-existing conditions, veterinarians might have to make uninformed decisions, affecting the chances of successful intervention.

7. Competitive Disadvantage:

Veterinary clinics in Sri Lanka that continue using manual processes are at a competitive disadvantage compared to those equipped with digital tools. Digital systems offer improved

efficiency, enhanced client engagement, and streamlined workflows. Clinics that lack such systems may lose business to more technologically advanced practices, which can provide a seamless client experience and comprehensive medical management.

8. **User Accessibility:**

The absence of digital systems makes it difficult for clinics to offer clients user-friendly portals. Such tools enable pet owners to schedule appointments, view medical records, and receive reminders for treatments or vaccinations conveniently. Without them, client engagement suffers, and owners often forget appointments or miss important vaccination schedules, leading to lower satisfaction and inconsistent healthcare.

3.1. Aims and objectives.

The PETTER system aims to address these problems by automating appointment scheduling and medical record management, offering veterinarians immediate access to vital patient information, and providing pet owners with streamlined appointment scheduling and reminders.

Objectives

- To develop a comprehensive online platform to manage pet healthcare.
- Efficiently store and manage pet health records.
- Enhance the accessibility of pet records for both pet owners and vets.
- To manage appointment scheduling quick and efficiently.

(Shirole et al., 2021)

4. Literature review

4.1. Overview

Automating manual tasks to online systems is a very common in the world nowadays and in the world of pet's healthcare, it has started to get more important. The main functions and features of a vet clinic is that the medical history of pets will be recorded in a book that is normally safeguarded and kept with the pet owner, while appointments will be scheduled and noted down on a fixed date.

Pet owners and veterinary staff are both subjected to faced numerous issues and inconveniences at some point due to reasons such as misplaced record books, data entry errors where sometimes the vet may write the wrong data or omit records due to forgetfulness. As for appointment scheduling, it can be quite hassle-some due to scheduling conflicts, fractured information and missed appointments which may occur due to the forgetfulness of clients. However, these issues can be solved by automating the pet healthcare process which will streamline the administrative processes and enhance the clinic's efficiency. (AmeriVet, 2023)

4.2. Similar existing platforms and systems

4.2.1. PetVet

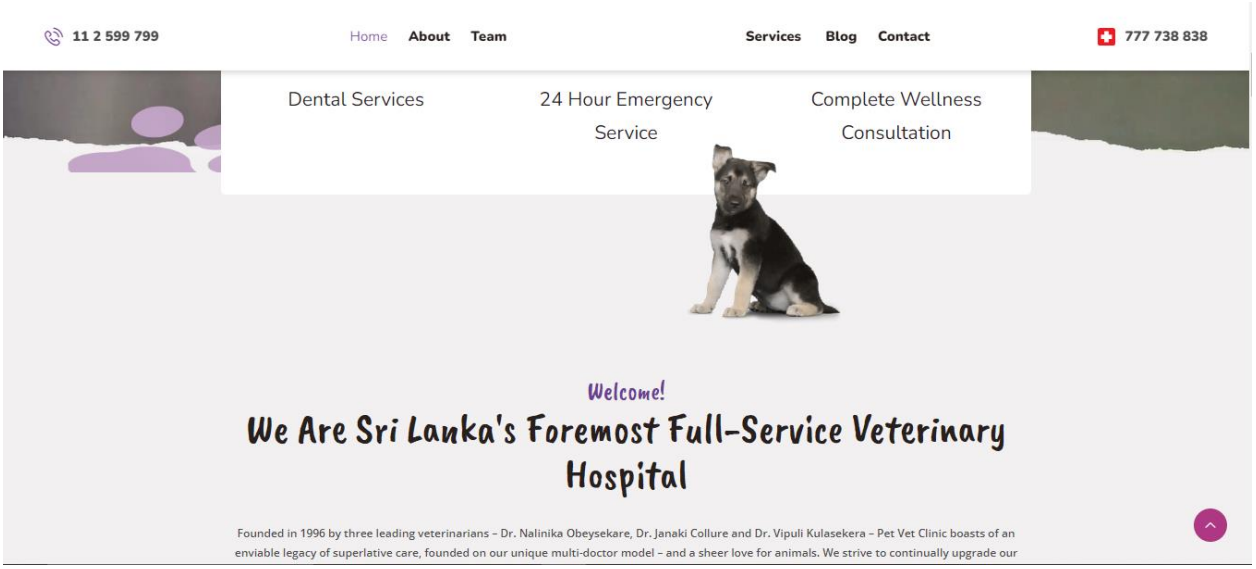


Figure 4 PetVet Home Page

https://www.petvet.lk/

Features

- **Informative Content**

  Pet Vet's website serves as an informative platform for pet owners to learn about the clinic's services and offerings. Users can browse through the website to find information about veterinary services, clinic locations, and contact details.

- **Static website**

  it is a static website, meaning it does not offer any interactive or dynamic features. There are no options for the user to sign up, login or engage with the clinic via online. This limits the user engagement a lot.

- **Appointment booking**

  while the website provides an option to book appointments in the website, it is not efficient as the process is not seamless and the pet owners are required to email or call the clinic to schedule appointments which is basically booking manually.

- **Limited interaction**
  as mentioned earlier, the website lacks interactions amongst the pet owners and clinic staff, and as there are no options to consult the vets online to seek immediate assistance or advice. This can result in delayed responses to the customer.

- **No FAQ column present**
  given that there is no way for the user to interact with the staff, there should be a FAQ column for the staff to clarify small, common doubts they have.

- This website can be easily improved by converting to a dynamic platform which offers more useful functions such as implementing chat options and FAQ sections. They can attract more customers, with a fast and quick service.

Technologies used in this website includes:

WordPress for the CMS and blogs, PHP for the programming language, MySQL for the database and JavaScript libraries like jQuery and swiper have been used.

User interface:

It has a simple, yet attractive user interface with a consistent color theme, however, the content seems to be a little clustered which makes it difficult to navigate.

Performance and security

The loading speed of the website is very poor and there are no worries regarding the security of the website as it does not deal with a database.

4.2.2. Digitail

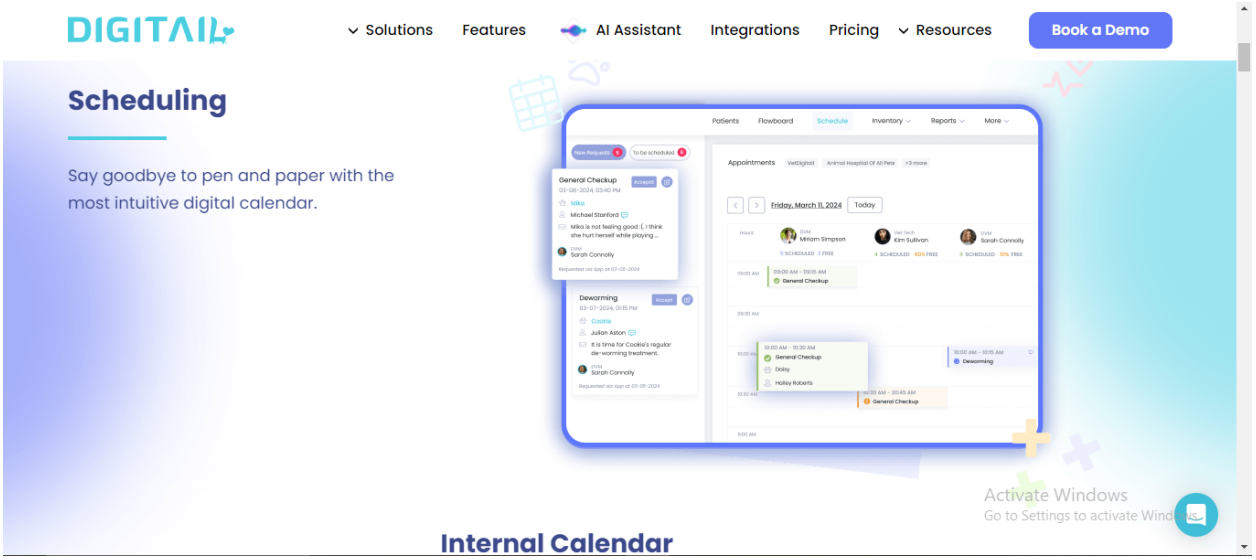


Figure 5 Digitail 2.0

https://digitail.com/

Features

- **Electronic Health Records (EHR)**

  Digitails allows veterinary clinics to automate from maintaining paper records to keeping electronic records, which makes data management and access more efficient. Accuracy and accessibility are guaranteed by the speed with which veterinarians can enter and update pet health data, including vaccination histories, medical histories, and treatment schedules.

- **Appointment scheduling**

  Pet owners can easily schedule appointments with the platform's user-friendly online scheduling functionality. Clinics can streamline their scheduling procedures and cut down on administrative burdens by using Digitails to replace manual appointment scheduling.

- **Client communication along with reminders & alerts**

  Digitails uses email notifications, in-app messaging, and SMS reminders to improve communication between pet owners and veterinary clinics. Stronger client engagement

and satisfaction are encouraged by this, which guarantees prompt communication of crucial updates, appointment reminders, and healthcare instructions.

- **Prescription Management:**
  Veterinary clinics can effectively handle prescription requests and refills with Digitails. The platform automates prescription management procedures, which lowers errors and streamlines medication fulfillment.

Technologies used in Digitails includes:

Amazon Web Services for Cloud and for the programming languages, Laravel Framework (PHP) and JavaScript have been used. Additionally, they also have integrated 3rd party APIs for added functionality.

User Interface

Digitails offers a plain, yet intuitive user interface which could be improved by also organizing the information to make navigation easier. It is also mobile responsive.

Performance and speed

This software is optimized for speed so the loading time will be low, the performance is maintained to avoid lagging or delays to handle large volumes of data.

4.2.3. Dog cat app

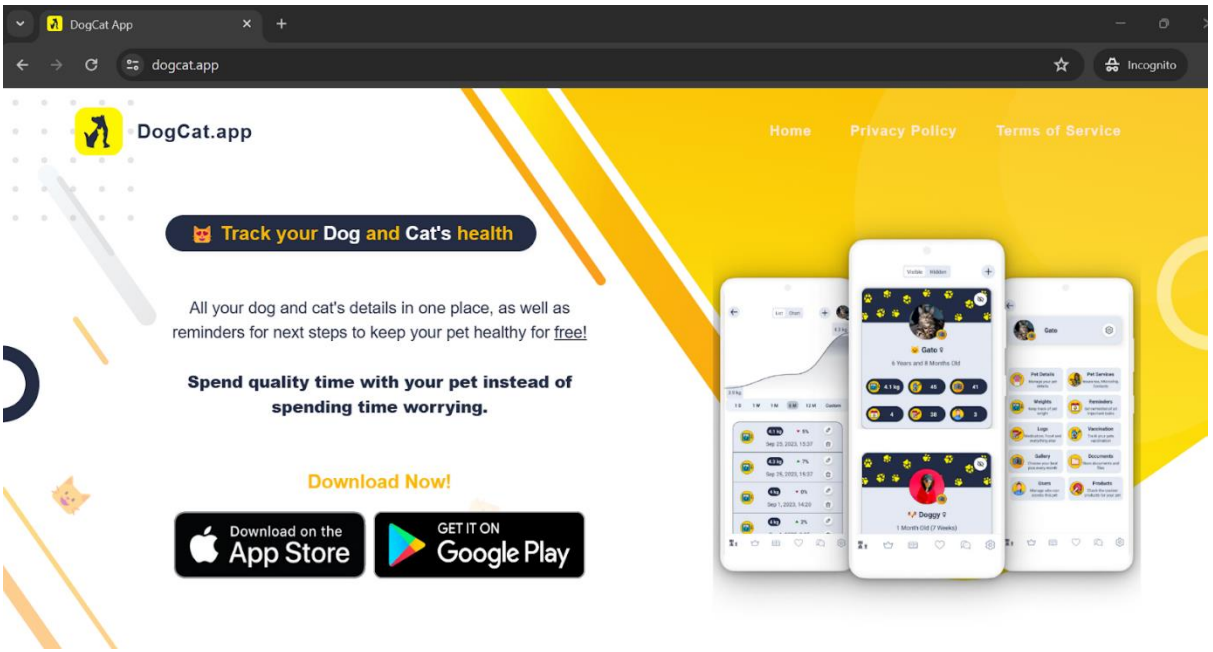


Figure 6 DogCat app website

https://dogcat.app/

Features

Calendar based interface - DogCat App features an intuitive calendar-based interface that allows pet parents to schedule and track various aspects of their pets' lives, including daily activities, health milestones, and important appointments. Personalized schedules and daily reminders will help pet owners to stay organized and be attentive to their pets' needs.

- **Health Management Tools**

  The app offers a wide range of health management tools, such as schedules for medications, symptom logs, and vaccinations trackers. The medical history of their pets can be easily recorded and tracked by pet owners, who can then make sure that vaccinations, checkups, and treatment are given on time.

- **Diet and Weight Monitoring**

  Keeping pets healthy requires keeping them on a balanced diet, and the DogCat App assists pet owners in keeping an eye on their pets' eating habits and weight fluctuations. Pet owners can make educated decisions regarding the nutritional requirements and general health of their pets because of the app's features for tracking diet and weight.

- **Multi-Species Support**

  The DogCat App meets the needs of many pet owners by supporting over 21 different pet species, such as hamsters, rabbits, birds, and reptiles. The app offers features and functionality that are specifically designed to meet your pet care needs.

Technologies used include a 3rd party tool for analytics called "UXCam" and the dog cat app supports both android and iOS platforms which could be developed using java or Kotlin for android and flutter or swift for iOS.

User interface

it has a visually appealing interface and has the options to switch from dark mode to light mode. It has a calendar-based layout and it is quite user friendly.

Speed and performance

The app loads quickly due to performance optimizations, which contributes to a good user experience.

4.3. Comparison on existing systems

Platform	Functionalities	Technologies	Design	Nature
PetVet	• Displays basic, read-only information about pets and the services offered by the clinic.	WordPress PHP MySQL JavaScript jQuery	Has an attractive user interface and consistent color theme. However, it is difficult to navigate which contributes to a poor user experience.	Static website
Digitails	• Electronic health records can be maintained. • Appointment scheduling software • Prescription management • Client can interact with the vet and receive automated alerts and notifications.	Laravel (PHP) AWS JQuery Bootstrap	Provides a very simple user interface. However, it is vey detailed and has a lot of information and features.	Dynamic website
DogCat app	• Diet and weight can be monitored. • Supports multiple pet species. • Health management tools • Has a calendar interface for owners to track pet info.	UXCam is used a 3rd party analytics tool. flutter may be used for iOS and java or Kotlin might be used for android.	Has a good user interface along with user experience. A consistent color theme is used and it is easy to navigate the app.	Dynamic mobile application. Can be run on iOS and android

4.4. Similar Research work

There have been numerous research work and studies done that were similar to a pet record management system. This section reviews a few similar research papers.

4.4.1. Animal Health System: Pet Health Clinic

This is an initiative to develop a comprehensive health management system for pets within veterinary clinics. It aims to have features such as Electronic Health Management diagnostic support, treatment planning, and client communication tools. The Pet Health Clinic system aims to increase the efficiency, accuracy, and effectiveness of veterinary care services to improve client satisfaction and patient outcomes. (Amin, 2011)

4.4.2. Pet Health Care System

This study presents the (PHCS), which aims to simplify veterinary care procedures and organize pet health records. Treatment planning, appointment scheduling, diagnosis support, diagnosis assistance, electronic medical record management, and communication tools between veterinarians and pet owners are probably features of this PHCS. PHCS seeks to raise the standard, accuracy, and efficiency of veterinary care delivery through automating administrative tasks and digitizing pet health records. By making it simple to obtain information about pet health and promoting better decision-making, the system probably helps both pet owners and vets. (Thabit A. Alsaadi, 2020)

4.4.3. Veterinary Work Management Application – MatVet

Veterinarians can manage their practices more effectively by using MatVet, an application for veterinary management that simplifies a variety of manual duties. It mentions that the application will provide functions such as scheduling appointments, managing clients, maintaining medical records. MatVet improves efficiency, coordination, and client communication in veterinary clinics by giving professionals a centralized platform to manage their workflow. Improved service delivery and client satisfaction are likely outcomes of the application's user-friendliness and ability to be adapted to the unique requirements of veterinary practices. (Nurmikar, 2012)

4.4.4. Mobile-based Animal Vaccination System in Sri Lanka

This study focuses on implementing a mobile-based animal vaccination system. By utilizing mobile technology, the system seeks to speed up the vaccination process for pets at home,

especially dogs. It discusses the necessity of effective immunization campaigns to ward off illnesses like rabies, which present serious threats to Sri Lanka's public health. Features like automated follow-up vaccination alerts, real-time vaccination coverage monitoring, and mobile data entry for vaccination records are probably included in the system. it aims to improve the efficiency of animal vaccination programs in Sri Lanka. (Senanayake, Wickramasinghe and Hettiarachchi, n.d.)

4.5. Summary

To sum up, this review addresses problems like lost pet records and scheduling conflicts as it explains how the automation of pet healthcare will be useful for vets and pet owners both. It examines 3 similar platforms: PetVet, DogCat app and Digitails. The 3 systems are compared and assessed while their key features and technologies used are stated.

From the systems, we can include the following features and functionalities for a more enhanced system.

- Staff assistance
- Tracking pet records online
- Consult vets online.
- Include a FAQ column.
- Schedule and track appointments
- Manage prescriptions.

5. Proposed Solution

As mentioned in the problem statement earlier, since majority of the vet clinics in Sri Lanka operate manually, 'PETTER' has been initiated as a comprehensive solution to all the challenges faced by vet clinics and pet owners both. By using the latest technologies along with a good design, this system aims to streamline appointment scheduling, pet's record management and improve the customer experience and improve animal care quality.

5.1. Key features of Petter

1. Automating the process of scheduling appointments

Automated Appointment Scheduling: PETTER will provide pet owners with an easy-to-use web site for scheduling appointments, removing the need for labor-intensive manual booking procedures. Pet owners will be encouraged to show up for appointments on time thanks to automated reminders and notifications, which will decrease missed consultations and increase clinic productivity. Furthermore, the vets will be allowed to accept or reject appointments and they can be given a feature to add any extra notes.

2. Electronic health records (EHR)

PETTER aims to convert to electronic health records from the manual methods used by a lot of vets, ie: physical vaccination cards or pet record books which are normally kept with the pet owner and bought along with for every visit. This will ensure that data is accurate, accessible, and efficient in managing pet medical records. Veterinary clinics will have instant access to detailed pet data, allowing well-informed choices and customized care treatments. The vaccination records and medications prescribed will be recorded here.

3. Reminder and alerts

PETTER will be designed to enable smooth communication between pet owners and veterinary clinics via email notifications. To encourage better adherence to treatment plans and preventive care practices, pet owners will receive timely updates and treatment reminders.

4. Communicate with vets

The pet owners will be able to chat with the vets or their staff via the website if they have any doubts they may need to clarify. They can request assistance from the staff if they face any difficulties as well.

6. Justification For the Proposed Solution

Petter will be a very useful application for both pet owners and vets in Sri Lanka and these are a few reasons.

6.1. Pet owners

Traditionally, animal vaccination in Sri Lanka is recorded on a physical book and it must be maintained by the pet owner incase of an emergency situation where it needs to be proved that the pet has been vaccinated and does not have any harmful diseases such as Rabies as the owner may be subjected to lawsuits and other legal problems if they are unable to prove their pets were vaccinated. According to (epid.gov.lk, n.d.), it has been stated that "it is the responsibility of the pet owner to produce the vaccination records in case of a bite.".

The vaccination book must be safe kept at all times so this can be avoided by automating the vaccination book by converting to Electronic Health Records, where all the vaccination details of the pets will be entered along with the function to view when the next vaccination or checkup has been scheduled for.

Another issue faced by pet owners is the hassle of scheduling appointments as it can take a considerable amount of time to schedule appointments and even then, mistakes maybe made from both the vet and owners' side. For instance, the pet owners may forget to show up to an appointment, which will result in delayed pet care and rescheduling again. However, this can be solved using the reminders and alerts feature provided by the PETTER system. Pet owners will be able to receive reminders and alerts whenever something has been scheduled for their pets.

Communication is a very important feature that will encourage the pet owners to clarify any doubts they have regarding their pets without scheduling appointments. It will be time convenient as well as a good customer experience.

6.2. For vets and clinics

Scheduling appointments manually would be a tedious task to do as staff must be very cautious to not double book appointments, note down correct appointment dates and also scheduling a convenient time for the pet owner. Since they have to go through each and every appointment manually, an online booking system can be implemented so that the staff can easily track

appointments ad revert to pet owners. The pet owners may also be allowed to schedule appointments by themselves; however, it will need to be approved by the staff.

The vets will be able to prepare beforehand if given access to EHR as they can quickly look up pet medical records and prescribe medication, etc. Furthermore, the function of having reminders and alerts will reduce the number of last-minute cancellations due to pet owners not showing up and is likely to improve the clinics work efficiency.

7. Scope of the System

7.1. Functionality and Features of the System

7.1.1. Major/Common functionalities:

- Register
- Login
- One-Time Passcode (OTP) for email verification
- Reset password
- Security Alerts for potentially unauthorized access

Admin

- Multi-User platform.
- Basic system settings such as profile, settings, logout, dashboard.
- Manage Users and Pets.
- Onboarding Vets into the system.
- Manage Vets.
- Availability of information of vets using a single source.
- Centralized information management.
- Generation of Monthly, Daily reports of each vet be it sales based.
- Generation of reports for pet quantity for each vet.
- CRUD Operations for all Entities.
- Deactivate Vets and Pet profiles.
- Subscription plans implementation for a business model.

Vet:

- Multi-User platforms.
- Basic system settings such as profile, settings, logout, dashboard.
- View medical history of each pet in the system and the owner contact details.
- Availability of information of pets using a single source.
- Centralized billing procedures for online appointments.
- Set availability

- pet medical activities being monitored.
- Easy scheduling of appointments to respective veterinarian representatives.
- Secure messaging system for discussing cases with pet owners.
- Record treatments, vaccinations, and procedures of the selected pet into the system.
- Generation of Monthly, Daily reports of the vet based on sales.
- CRUD applications for all Entities
- Reports and Analysis.
- Request withdrawals.

Pets:

- Multi-User platforms.
- Basic system settings such as profile, settings, logout, dashboard.
- Register a pet into the system by addressing its name, image, breed, sex etc.
- View and download vaccination records, past diagnoses, and treatment history
- Schedule Reminders (Vaccination/Medicine/Food/Walk).
- Book appointments via the website and receive a confirmation of the appointment.
- View past appointments.
- Register more than one pet with a unique ID. (the same pet cannot be registered twice)
- Receive a confirmation email of the registered pet.
- Chat or video call with veterinarians for consultations.
- Receive reminders for upcoming appointments.
- Find nearby veterinary hospitals and emergency services.

7.1.2. Non-Functional Requirements

- Response Time (Speed)
- Data Encryption
- Authentication and Authorization
- Security
- Uptime Guarantees
- Device Compatibility
- Documentation
- Data Retention

7.2. Project Scope

- Outputs include a scope management plan
- Requirements management plan
- Product will be delivered and catered to the user's needs.

7.2.1. Requirement Gathering

Collecting Data by tools and techniques gathered from various and trusted sources includes,

- Data gathering, such as interviews, brainstorming sessions.
- Data Science Analysis
- Affinity Diagrams
- Document Analysis
- Mind Mapping
- Context Diagrams, Use case diagrams etc.
- Prototypes developed and past examples of systems integrated.
- Feasibility Study

The desired output will be a requirement. Documentation that caters to the business aspect of Petter will be in the context of stakeholder requirements, business requirements, solution requirements, project requirements, and quality requirements. To proceed with the requirement gathering, a requirement traceability matrix will be issued.

7.3. Define Scope (Output Generated)

The aim of the scope for the "Development and Integration of the Appointment and Medical Record Management System of PETTER" which is to encompass a comprehensive range of activities aimed at enhancing and embracing the medical field for pets in Sri-Lanka in order to bring efficiency and effectiveness into the work force through hand-made and tailored state-of-the-art software implementation. The process begins with an in-depth analysis of the current business and technical of the structure.

The objective of the product is to improve operational and streamline operations, maintain all the databases implemented, maintain global standards of project development, reduce manpower and manual paper work, and maintain the integrity of the data.

Why was the System built?

The data managed in the past was imbued manually which is not efficient in a technologically advanced era, the cost for maintaining manually was huge which costs an exponential amount of workforce-power, and the procedure was error prone as it was not accurate as most of the pet owners lose their Pet medical records and the veterinarians have no idea as to what dosage the animal has been given, which puts the animal's life at risk.

As such the Solution to counter the above stepping stones was to develop and integrate an automation system, an Appointment and Medical Record Management System which maintains data with a limited amount of manpower and with high accuracy, which will reduce man-days and above all increase efficiency in the related Vets.

7.4. Control Scope

The project scope contains management and changes that have been introduced into the current implementation of the scope.

Item	Re-Work	Progress
Change-In Request	Additional functionality	Approved
Re-work	Additional work on progress	Approved
Re-design (UI)	Design Rework on progress	Approved
Optimization	Optimize frameworks	Approved

7.5. Validate Scope

Our Objective is to complete the project within the given time frame and within the expected and estimated budget drawn.

Deliverables

Item	Project Management Plan	Deliveries
1	Scope Management Plan	Completed
2	Project Scope	Completed
3	Requirement Management Plan	Completed
4	Scope Baseline	Completed
5	Control Scope	Completed
6	Survey Questionnaire	Completed

7.6. WBS Brief Summary

Please refer to WBS below for detailed explanation

Project Activity	Impact	Impacted on by	Criticality
Requirement Gathering	Analyzing Requirement	Project Manager, Business Analyst	High
Analyzing Requirement	Planning	Business Analyst	Medium
Planning	Design and coding	Project Manager, Business Analyst	High
Design and coding	Testing	Systems Architect, Developer	High
Testing	Implementation	QA Engineer	Medium

7.6.1. Duration of the Project (WBS)

WBS	Task/ Description	Duration	Dependency
1	**Requirement Gathering**	**5 days**	
1.1	Basic requirements and prepare questionnaires.	1 day	
1.2	Conduct review and surveys	3 days	1.1
1.3	Requirement Review	1 day	
2	**Analyzing Requirement**	**4 days**	

2.1	Research requirement applications	2 days	
2.2	Analyze feature requirements in details	2 days	1.2/1.3
3	**Planning**	**2 days**	
3.1	Making a schedule plan	1 day	2.2
3.2	Planning a feasible project timeline	1 day	3.1
4	**Design and Coding**	**22 days**	
4.1	Develop ER Diagram, Use-Case and Sequence Diagram.	3 days	
4.2	Develop UI	6 days	4.1
4.3	Design Review	1 day	4.2
4.4	Design Changes	2 days	4.3
4.5	Develop Back-end and Database	6 days	
4.6	Develop Functionality	6 days	4.3
4.7	Functionality Review	2 days	4.7
5	**Testing**	**11 days**	

5.1	Develop test plan	1 day	4
5.2	System Testing according to the plan	2 days	5.1
5.3	System Review	3 days	5.2
5.4	Text Documentation	3 days	
5.5	Bug Fixes	3 days	5
6	**Implementation**	**6 days**	5
6.1	Launch Systems	1 days	
6.2	Evaluate the system performance	6 days	6.1

7.7. Data Gathering Using Conducted Surveys

Below Statistics have been conducted and collected using surveys regarding the issues surfaced and the point-of-view of the individuals who own pets.

7.7.1. Statical Analysis

- Percentage of households with different types of pets.

Table 1. Percentage of households with different types of pets by divisional secretariat division.

No	Divisional secretariat division	Total number of households	Percentage (%) of households with a						
			Pet	Dog	Cat	Fish	Bird	Rabbit	Squirrel
1	Galenbidunuwewa	29	28	24	0	7	0	0	0
2	Galnewa	21	67	43	19	10	14	0	0
3	Horowpothana	23	65	35	39	4	13	4	0
4	Ipalogama	24	38	21	8	8	0	0	0
5	Kahatagasdigiliya	25	28	24	8	0	0	0	4
6	Kebithigollewa	14	71	50	7	21	7	0	0
7	Kekirawa	36	64	50	19	8	3	3	0
8	Mahavilachchiya	14	64	57	14	0	7	0	0
9	Medawachchiya	29	41	31	14	3	0	0	0
10	Mihintale	22	73	64	18	0	0	0	0
11	Nachchaduwa	16	56	38	25	0	0	0	0
12	Nochchiyagama	31	52	42	23	0	0	0	0
13	Nuwaragam Palatha Central	38	63	29	13	13	18	3	0
14	Nuwaragam Palatha East	43	72	40	21	5	12	2	2
15	Padaviya	14	100	93	36	0	0	0	0
16	Palagala	21	71	48	14	5	10	0	0
17	Palugaswewa	10	30	10	20	0	0	0	0
18	Rajanganaya	21	62	48	24	0	0	0	0
19	Rambewa	23	48	30	17	0	0	0	0
20	Thalawa	35	69	66	9	11	9	6	0
21	Thambuththegama	26	35	27	8	0	8	4	0
22	Thirappane	17	76	65	24	0	0	0	0
	Total	**532**							

https://doi.org/10.1371/journal.pone.0277108.t001

Figure 7 Percentage of houses with different types of pets

- Democracy of Vet visits.

Table 3. Demography of veterinary visits.

Variables	Dog	Cat	Bird	Fish	Rabbit	Squirrel
A. Owners (n)	***220***	***88***	***28***	***26***	***7***	***2***
B. Number of veterinary visits within the last year (%)						
None	72 (33)	53 (60)	26 (93)	26 (100)	6 (86)	2 (100)
1	118 (54)	31 (35)	2 (7)	0	0	0
>1 to ≤ 3	18 (8)	4 (5)	0	0	1 (14)	0
>3	12 (5)	0	0	0	0	0
C. Reasons for veterinary visits (%) * ^						
Annual check	18 (12)	2 (6)	0	0	1 (100)	0
Desexing	8 (5)	2 (6)	0	0	0	0
Emergency	1 (1)	0	0	0	0	0
Health issue	31 (21)	4 (11)	2 (100)	0	1 (100)	0
Vaccination	144 (97)	32 (91)	0	0	1 (100)	0
D. Reason not taken to a veterinary visit (%) * #						
Accessibility	10 (14)	4 (8)	0	0	0	0
Cost	2 (3)	1 (2)	0	0	0	0
Forgot to give the vaccination	0	1 (2)	0	0	0	0
Not necessary	57 (79)	48 (91)	26 (100)	26 (100)	6 (100)	2 (100)
No vet facility nearby	3 (4)	2 (4)	0	0	0	0
Vaccination at temple	3 (4)	0	0	0	0	0

* Participants were allowed to select multiple options

^ Among owners reporting ≥ 1 visit to a veterinarian

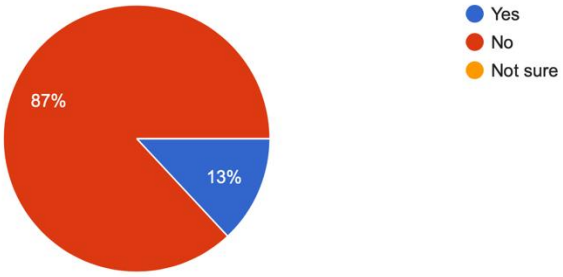
Among owners who did not take their pet to a veterinarian

Figure 8 Democrazy of Vet Visit

7.7.2. Survey Conducted

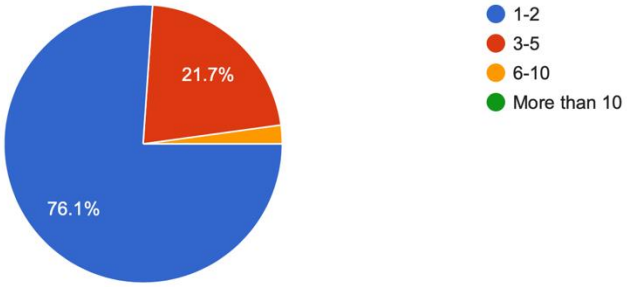
Do you currently use any form of pet record management system?

46 responses



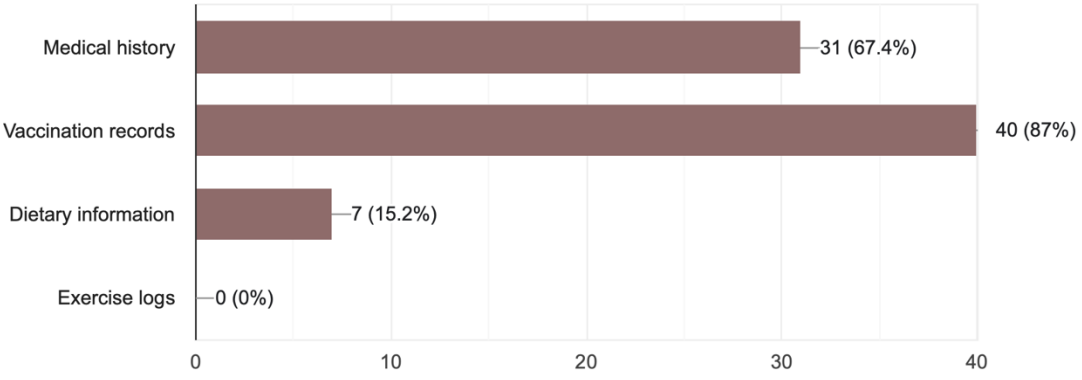
How many pets do you currently own or manage?

46 responses



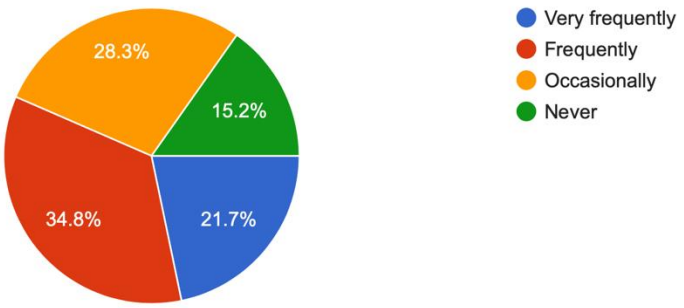
What types of records do you frequently maintain for your pets? (Select all that apply)

46 responses



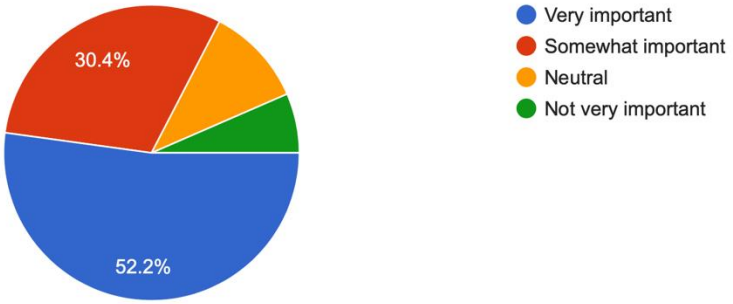
How often do you experience difficulties due to forgetting or misplacing your pet's record book?

46 responses



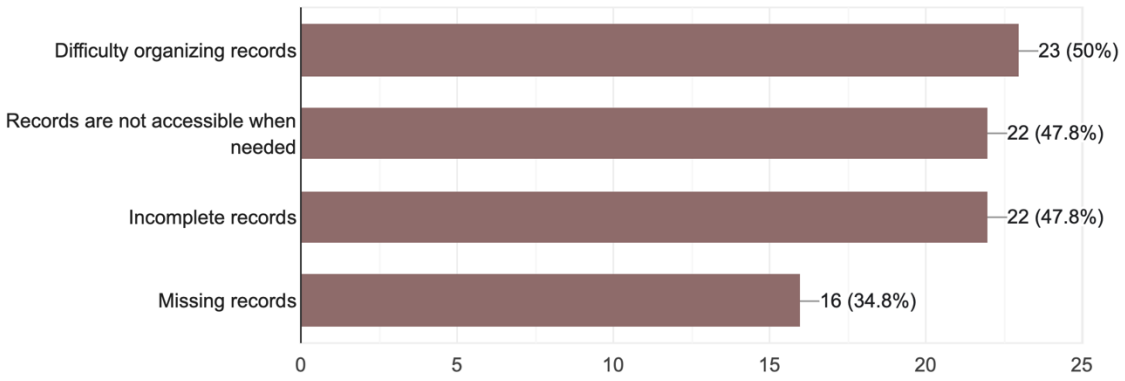
How important is it for you to have online access to your pet's records?

46 responses



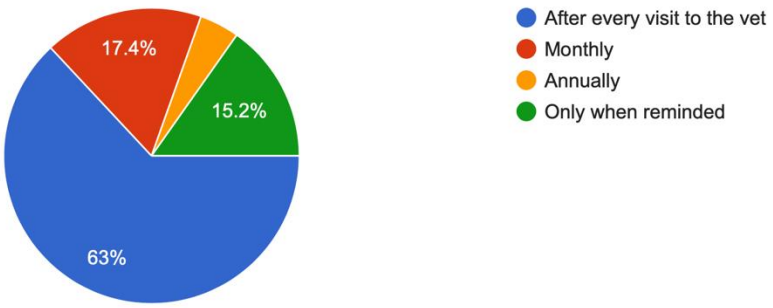
What difficulties do you encounter when managing your pet's records? (Select all that apply)

46 responses



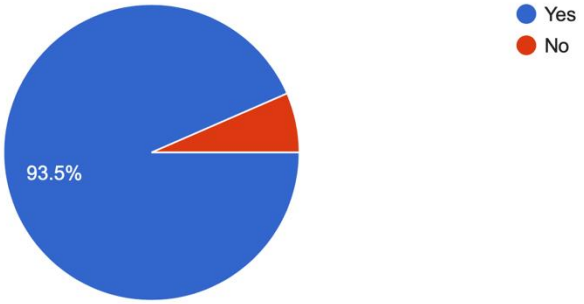
How often do you update your pet's medical records?

46 responses



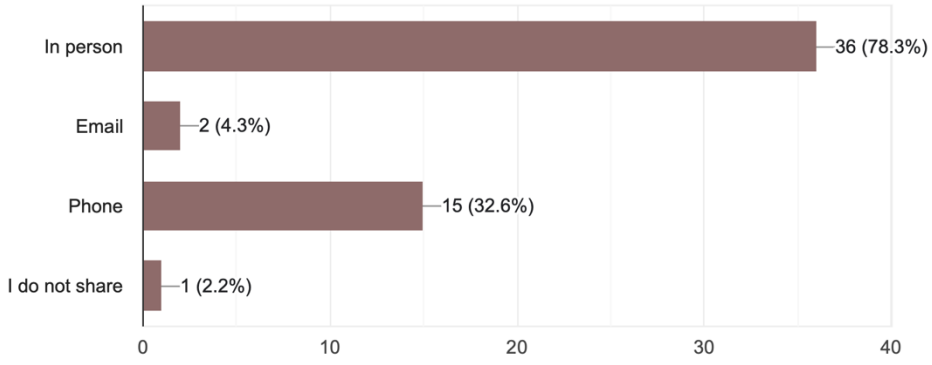
Would you be interested in a web version of the pet record management system?

46 responses



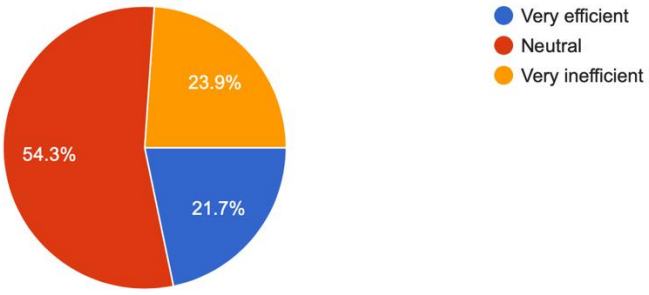
How do you currently share your pet's medical information with your veterinarian?

46 responses



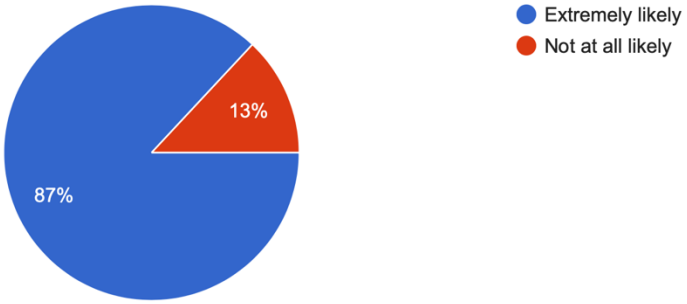
How would you rate your current method of managing pet records in terms of efficiency?

46 responses



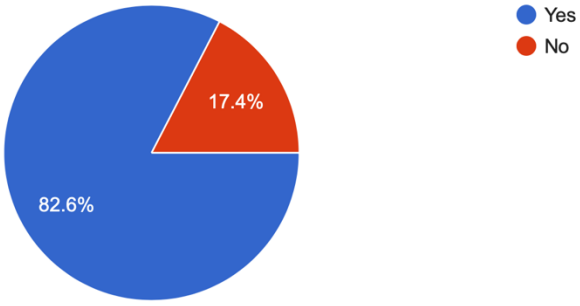
How likely are you to recommend a well-functioning pet record management system to other pet owners ?

46 responses



Would you use features that provide personalized health tips based on your pet's records?

46 responses



8. Methodology & Technology

8.1. Agile Methodology

Due to its flexibility and iterative nature, the agile methodology is perfect for developing this project (Petter). This methodology enables the project to effectively incorporate feedback and adapt to changing requirements, ensuring that the final product closely complies with industry standards and user expectations. Continuous improvement and frequent assessments are emphasized by agile, which is essential in a project with lots of changing requirements.

Agile Methodology Overview

Key Principles

The core principles of Agile include continuous improvement, flexibility in response to changes, and regular stakeholder involvement. These principles ensure that the project remains aligned with user needs and business goals, facilitating adaptive planning, evolutionary development, and delivery, and encouraging a rapid and flexible response to change.

Implementation Strategy (Iterative Development)

The project will be structured into sprints, usually lasting 2-4 weeks, allowing for regular assessment and adaptation. This approach enables the team to make adjustments in a controlled manner and deliver functional increments at the end of each cycle.

Planning and Execution

1. **Backlog Creation and Maintenance**:
   The product backlog will be developed to include all necessary tasks, features, and requirements, prioritized based on ongoing feedback and business needs. This backlog serves as the foundational tool for sprint planning.

2. **Sprint Planning**:
   Detailed planning at the start of each sprint ensures that the team selects tasks from the backlog that align with the project goals and stakeholder expectations.

3. **Daily Stand-Ups**:

Short daily meetings help the team to update on progress, discuss any issues, and plan the day's work, thereby maintaining transparency and addressing challenges promptly.

Sprint Reviews and Retrospectives

1. **Sprint Reviews**: At the end of each sprint, the team reviews the completed work with stakeholders, gathering feedback that will influence future sprints.

2. **Retrospectives**: The team reflects on the past sprint to identify what was successful and what could be improved, enhancing their processes continuously.

8.2. Resource allocation

8.2.1. Team structure

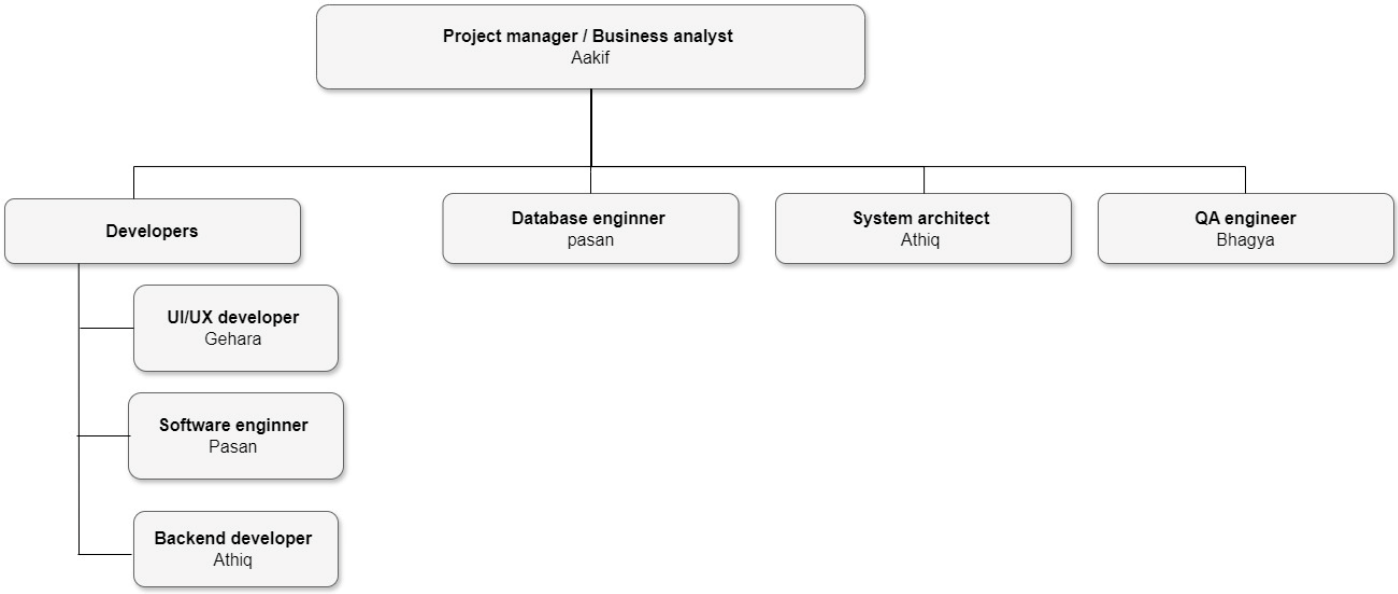


Figure 9 Team Structure

8.2.2. Roles and responsibilities of the team

Team members	Roles	Responsibilities
Abdullah Aakif	Project Manager & Business Analyst	• As the Project Manager, Aakif will oversee the entire project and make sure the project is on working on schedule within the budget and meet the project objectives. He will be responsible for creating project goals, scope, and deliverables, as well as managing project plans, schedules, and budgets. • As the Business Analyst, Aakif will gather and analyze requirements from stakeholders, translate business needs into technical requirements, and ensure that the business objectives meet the project outcomes.
Gehara Samarawickrema	UI/UX Engineer	• Gehara will be responsible for designing the user interface (UI) and user experience (UX) of the Petter application.

		• She will create wireframes and mockups to visualize and work on design concepts, for a user-friendly and intuitive interface. And she will collaborate closely with the developers, and QA engineer to make sure that the UI/UX design aligns with project goals and user requirements.
Pasan Bimsara	Software Engineer & Database Engineer	• Pasan will be responsible for developing the software components of the Petter application, including front-end and back-end systems. • As the Software Engineer, Pasan will write code, implement features, and handle the functionality and performance of the application. • As the Database Engineer, Pasan will design, implement, and maintain the database architecture of the Petter application, which will ensure data integrity, security, and scalability.
Athiq Ahmeer	Backend developer & System Architect	• Athiq will be responsible for developing the backend infrastructure and architecture. • Athiq will design and implement the server-side logic, APIs, and databases necessary for the application to function. • As a System Architect, Athiq will design the overall system architecture, ensuring that it meets the necessary requirements.
Bhagya Rathnayake	QA Engineer	• Bhagya will be responsible for quality assurance (QA) and testing. • Bhagya will develop test plans, test cases, and test scripts to ensure that the application meets functional and non-functional requirements. • Bhagya will perform various types of testing and conduct a system review to identify and report bugs and issues.

8.2.3. Cost

9. Category	Description	Cost (LKR)
Server	Hostinger Shared Server	20,000
Hardware	Computers and Laptops	160,000
Software Costs		
- Operating Systems	Windows License	24,000
- Third-Party Services	Google Map & Meet API	18,000
Development Costs		
- Development Team	Salaries for 4 team members	380,000
- Project Management	Salary for Project Manager	90,000
Operational Costs		
- System Maintenance	Ongoing updates and fixes	80,000
Miscellaneous		
-Training and Documentation	Creation and sessions	60,000
- Contingency Fund	Unforeseen expenses	50,000
Total Cost		**882,000/=**

9.1.1. Hardware/Software Specifications

Server

- LightSpeed Shared IP Linux Server with 100GB NVME Storage

Hardware

For Development:

- MacBook M1 air with 256gb Hard Drive
- Intel i5 7th generation, windows 11 Desktop with 1TB SSD Hard Drive

For User Interface Design:

- Intel i3 5th generation, windows 10 Pro Desktop with 500TB SSD Hard Drive
- MSI MP243X 24inch Monitor

Development and Deployment Tools

Integrated Development Environments (IDEs):

- Visual Studio Code(VS Code)
- Sublime Text

Wireframe Design (UI)

- Figma

Version Control System:

- GitHub backed by GIT

Project Management Software

- MS Word
- MS Project

9.2. Technologies in Petter

Petter combines a variety of technologies to create a user-friendly and secure pet management system. Each technology has been chosen carefully to make sure that Petter is not only easy to use but also powerful and reliable. Here's a closer look at how each technology contributes to the platform: Frontend Technologies

Frontend Technologies

1. **HTML/CSS:** These are the fundamental building blocks of the web interface. HTML provides the structure, while CSS is utilised to build visually appealing designs and layouts that are responsive and intuitive for users across all devices.

2. **JavaScript (jQuery):** jQuery simplifies complex JavaScript operations like AJAX calls to the backend for seamless content updates, event handling, and animations which improves interactivity without requiring page refreshes.

3. **Bootstrap**: A comprehensive library for creating responsive designs. Bootstrap's grid system and pre-designed components make it ideal for developing a flexible and accessible user interface.

4. **Select2**: A flexible jQuery plugin that replaces standard select boxes with enhanced versions, supporting features like search, multi-selection, and remote data integration, thereby improving user interaction.

5. **Chart.js**: This library helps in drawing responsive charts and graphs that are essential for visual data representation, such as pet health trends, appointment statistics, and daily, weekly stats to the admins, allowing users to quickly grasp complex data at the first sight

6. **Font Awesome and Feather Icons**: Provides a wide array of icons that help in creating a more engaging and intuitive navigation experience. These icons visually represent different actions and features in the app, making it user friendly.

7. **iziToast**: A versatile plugin for displaying notifications and alerts. It uses lightweight, customizable toast messages to inform users about updates, reminders, and other important notifications, enhancing the interaction without being intrusive.

8. **DataTables**: Enhances HTML tables with features like pagination, sorting, and searching, making it easier to handle and view large datasets such as pet medical records and user information efficiently. Backend Technologies

Backend Technologies

1. **PHP**: A powerful server-side scripting language that handles all server-side logic, from user authentication to data processing, ensuring the backend of Petter is strong and efficient.

2. **MySQL**: Used for storing and managing application data like pet records, user profiles, and appointment details. It supports complex queries, which are essential for retrieving, updating, and managing large datasets efficiently.

3. **LiteSpeed (via Hostinger):** A high-speed web server that enhances the performance of the website by reducing load times and improving the handling of concurrent user requests, ensuring a smooth user experience. APIs and Plugins

APIs and Plugins

1. **Google Maps API**: An essential component for enhancing Petter's location capabilities, it allows users to identify nearby veterinarian services by providing address autofill upon registration and retrieving their location coordinates, including longitude and latitude.

2. **Google Meet API**: Allows the integration of live video communications directly in the app and browser, facilitating online consultations and meetings without needing external software, which is crucial for user convenience, especially in remote consultations.

3. **GeoPlugin API**: Provides geolocation services to enhance user experience and security. It determines the user's current location for localising content and services, and importantly, it tracks login locations to inform via email alerts about potentially unauthorised access from new or unusual locations.

4. **Stripe Sandbox**: A crucial tool for testing payment functionalities within Petter. Before rolling out the Petter Premium plan, Stripe Sandbox is used to simulate transactions, ensuring that payment processes are reliable, secure, and user-friendly. This testing environment allows to catch and resolve issues prior to live deployment, safeguarding both user data and transaction integrity.

Additional Tools

1. **Git (GitHub):** Provides version control for managing the development process across multiple developers. GitHub's infrastructure supports continuous integration and automatic deployment on the server through webhooks, ensuring that updates are seamlessly pushed to the production server without downtime.

2. **Cron**: Automates regular tasks such as data backups, sending out reminders to users where they can get in touch with the upcoming pet’s activities. This not only ensures high operational reliability but also improves the efficiency of maintaining the system's health and user satisfaction.

Through the integration of these technologies, Petter aims to deliver a superior platform that efficiently manages all aspects of pet care, enhancing both the pet owner's experience and the operational capabilities of pet service providers including veterinarians

9. Gantt Chart and Risks

9.1. Gantt chart

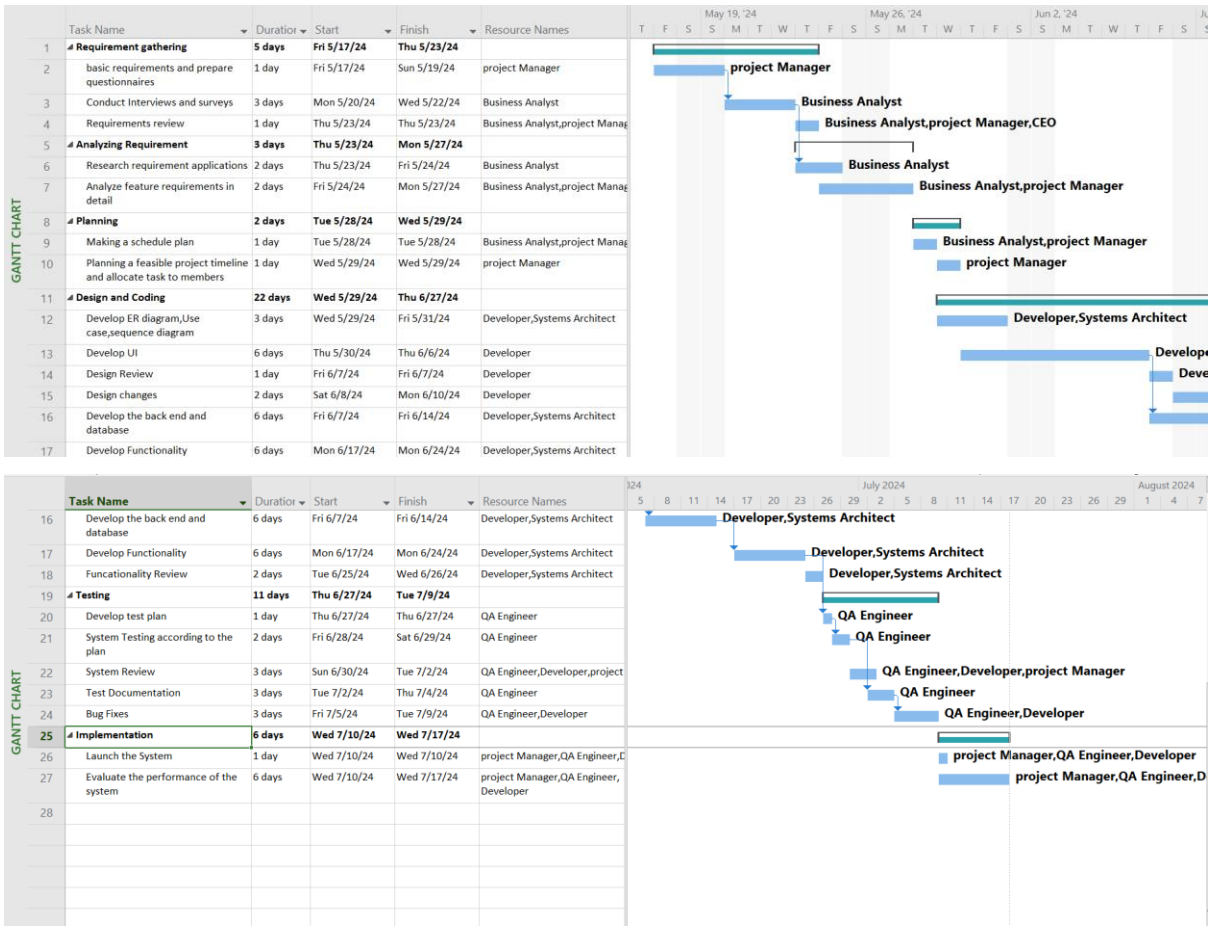


Figure 10 Gantt chart

The Gantt chart illustrated above provides a graphical representation of the project's timeline, delineated into six distinct phases:

Phase 1: Requirement Gathering

Phase 2: Analyzing Requirements

Phase 3: Planning

Phase 4: Design and Coding Development

Phase 5: Testing

Phase 6: Implementation

Each phase comprises various tasks, with allocated durations specified by both date ranges and the number of days. The Gantt bars on the right side of the image visually depict the segmentation of each task within the respective phases

9.2. Risk Analysis

Vendor Dependencies:

Reliance on external vendors for support services introduces risks such as service disruptions, or dependency on third-party roadmaps, affecting PETTER's stability and long-term viability.

Integration Challenges:

Integrating PETTER with existing systems or third-party applications may pose compatibility issues, resulting in delays or functional discrepancies that hinder the system's effectiveness.

Resource Constraints:

Insufficient manpower, or technological resources could impede the timely development and deployment of PETTER, limiting its ability to meet project objectives within the designated timeframe.

Data Security Breaches:

Unauthorized access to sensitive data could compromise the confidentiality and integrity of information stored within the PETTER system, potentially leading to legal and reputational consequences.

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