Final Report:
"Dogtor" - An Integrated Online Solution for Canine Health Management and Well-being.

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Abstract

The "Dogtor" project introduces a groundbreaking approach to addressing the complexities of managing canine health care. Currently, dog owners face the challenge of dealing with a range of services and products that operate in isolation, creating a disjointed experience. This lack of coordination is particularly problematic during emergencies when immediate access to detailed health records and veterinary advice is critical. Moreover, routine tasks like vaccination tracking and wellness monitoring become prone to errors without a unified system.

The "Dogtor" platform revolutionises this scenario by creating a single, integrated hub for all facets of canine health care. This centralised system simplifies the process of health monitoring, managing veterinary records, and purchasing pet supplies. The platform enhances communication between pet owners and health care providers and supports efficient data management through a robust and scalable infrastructure, while prioritising data security and a user-friendly interface.

Through this integration, "Dogtor" seeks to improve the efficiency of canine health management, alleviate the stress associated with pet ownership, and elevate the standard of care pets receive. This project is not just a step forward in pet care technology; it sets a benchmark for future innovations in integrated pet health management systems.

Acknowledgements

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1. Introduction

"Innovation is not about saying yes to everything. It's about saying NO to all but the most crucial features."

— Steve Jobs

Approximately one-third of households worldwide include a dog, demonstrating the global and cultural significance of canine companionship across diverse regions (GFK, 2022). This widespread affinity for dogs not only reflects a universal cultural appreciation but also emphasises the significant roles dogs play as family members in many lives. The 'Dogtor' project, inspired by this deep, global bond between humans and their canine companions, is designed to address the critical void in comprehensive canine health management. By introducing an integrated health management platform, 'Dogtor' aims to transform the way pet health is managed worldwide, enhancing the quality of life for dogs and their owners.

1.1 Overview

For many people, dogs are more than just pets - they are beloved family members. In fact, one-third of households around the world have a dog (Dog, facts and photos 2021), making canine companionship a global phenomenon. This deep bond between humans and dogs is rooted in a shared love and appreciation for each other's company.

However, managing a dog's health can be a daunting task. With various services and products scattered across different platforms, it's easy to get overwhelmed and lose track of important information. This can lead to delayed or missed appointments, unnecessary stress, and even compromise on the health of the dog.

The "Dogtor" project aims to change this by providing a comprehensive and user-friendly platform for managing a dog's health. By integrating essential aspects of canine care - such as health monitoring, veterinary records management, and shopping for pet supplies – we can make it easier for owners to make informed decisions and take better care of their pets.

With "Dogtor," owners can access all the necessary information and tools in one place, making it easier to stay on top of their dog's health and well-being. This means fewer missed appointments, reduced stress, and more opportunities for proactive care.

But "Dogtor" is about more than just improving the organisation of pet care. It is also about strengthening the bond between dogs and their owners. By providing easier access to resources and management tools, owners can be more responsive to their pets' needs, leading to a higher standard of care and potentially improving the quality of life for their canine companions.

Ultimately, the "Dogtor" project is about setting a new standard in pet care, where technology and compassion come together to enhance the well-being of dogs worldwide. By providing a streamlined, efficient, and user-centric platform, we can make a real difference in the lives of dogs and their owners.

1.2 Problem Statement

The current state of canine health care management is characterised by a lack of integration and coordination among various services and systems. This disjointed approach can lead to inefficiencies, delays, and errors, which can have serious consequences for the health and well-being of dogs.

The current system is fragmented, with multiple platforms and services responsible for different aspects of canine health care, such as health monitoring, veterinary record keeping, and pet supply shopping. This lack of integration and coordination can lead to difficulties in accessing comprehensive health records, tracking vaccination schedules, and making informed decisions about a dog's care (O’Neill et al. 2014).

In emergency situations, this lack of integration can be particularly problematic. Pet owners may need to access multiple systems to retrieve critical health information, which can delay treatment and potentially compromise the health of the dog.

Furthermore, the current system can also make it difficult for pet owners to maintain an accurate and up-to-date overview of their dog's health status. This can lead to missed preventive care opportunities, allowing preventable illnesses to become serious issues.

The "Dogtor" project aims to address these issues by developing a comprehensive and integrated platform that combines all the essential aspects of canine health care into a single cohesive system. This platform will provide pet owners with a centralised and user-friendly interface for managing their dog's health, including access to comprehensive health records, vaccination schedules, and pet supply shopping.

By integrating these various aspects of canine health care into a single platform, "Dogtor" aims to improve the overall efficiency and effectiveness of canine health care management. This will enable pet owners to make more informed decisions about their dog's care, reduce the risk of delays and errors, and improve the overall well-being of dogs.

In conclusion, the current state of canine health care management is characterised by a lack of integration and coordination among various services and systems. The "Dogtor" project aims to address these issues by developing a comprehensive and integrated platform that combines all the essential aspects of canine health care into a single cohesive system. By improving the efficiency and effectiveness of canine health care management, "Dogtor" aims to enhance the overall well-being of dogs and improve the quality of life for pet owners.

1.3 Motivation

The inspiration for the "Dogtor" project stems from a profound understanding of the challenges faced by dog owners in managing their pets' health. A personal experience with navigating the fragmented and cumbersome systems available for health management served as a catalyst for this initiative. This journey revealed the frequent struggles and uncertainties inherent in such a disjointed approach, highlighting the urgent need for an integrated solution.

The personal experiences of dog owners, including the founder's own journey, underscored the common theme of feeling overwhelmed and under-equipped due to the piecemeal structure of available resources. The emotional and practical burdens of ensuring a pet's health, compounded by the anxiety of emergency situations where crucial health data was inaccessible, emphasised the need for a comprehensive solution.

The vision for "Dogtor" is not just to provide a tool, but to transform the landscape of canine healthcare. This project is driven by a passion to enhance the well-being of dogs by simplifying and streamlining the management of their health. It addresses the full spectrum of needs, from handling emergency health crises to daily wellness monitoring, thereby reducing stress and uncertainty.

Furthermore, "Dogtor" aims to enrich the overall experience of dog ownership by easing logistical burdens and providing reliable, intuitive tools for health management and supply procurement. This initiative seeks to allow owners to focus more on the joys of companionship and less on the anxieties of caregiving, thus enhancing the quality of the relationship between dogs and their owners.

Ultimately, the motivation behind "Dogtor" is rooted in a commitment to making a tangible difference in the lives of dogs and their owners. This project seeks to empower owners to provide the best possible care for their pets, enhancing not only their health and longevity but also the quality of their bond.

1.4 Project Scope

The "Dogtor" project is a custom-made application aimed at tackling the intricate needs of canine health management through modern computer science technologies. Central to the project is the use of the Flask web framework for server-side development and SQLite for robust database management, laying a solid technological groundwork for the platform.

The development of the "Dogtor" web application revolves around Flask, known for its simplicity and adaptability, making it perfect for small to medium web applications. Its efficiency in handling requests with minimal overhead is ideal for this project, enabling real-time interactions and updates crucial for monitoring pet health and managing veterinary records effectively.

In terms of data management, SQLite, an Object-Relational Mapping (ORM) framework, streamlines database transactions and boosts performance. This choice allows for the implementation of strong data schemas and reliable transaction support, crucial for managing complex data structures like veterinary records, user profiles, and transaction histories. SQLite's capability to manage complex queries and generate detailed reports greatly enhances the analytical aspects of health monitoring.

"Dogtor" also utilises advanced real-time data analytics to track various health parameters of pets using IoT devices. Data on heart rate and activity levels is collected and processed in real-time, ensuring efficient storage and handling in the database. This information is then used to create real-time alerts and health reports, accessible to pet owners via the web application, offering immediate insights into their pets' well-being.

To safeguard sensitive data, "Dogtor" tries to incorporate some cybersecurity measures, including data encryption and strict access control mechanisms based on user roles and permissions within the SQLite database, ensuring secure data transactions and preserving data privacy and integrity.

Additionally, the project includes an integrated e-commerce platform for pet supplies and virtual vet consultations, enhancing the application's service offerings. These features utilize Flask's real-time data processing capabilities and SQLite's sturdy data management to provide a seamless and unified user experience.

A key focus in designing "Dogtor's" web interface is user experience and accessibility, crafted to be intuitive and user-friendly. The use of Flask enables the creation of responsive interfaces that guarantee smooth user interactions and optimal performance.

Lastly, "Dogtor" is designed with scalability in mind, equipped to handle a growing user base and data volume. This scalable architecture ensures the application can grow without sacrificing performance, with upcoming enhancements such as the integration of machine learning for predictive analytics and expanding IoT device support, cementing "Dogtor's" status as a forward-thinking leader in canine health management.

1.5 Aims and Objectives

The "Dogtor" project is driven by the primary goal of creating a comprehensive and integrated online platform that simplifies canine health management. This innovative web application, aptly named "Dogtor," is designed to provide dog owners with a user-friendly, efficient, and reliable solution that encompasses all aspects of dog care management. By centralising health monitoring, veterinary record management, and pet supply shopping into one accessible platform, "Dogtor" aims to enhance the overall experience and simplify the responsibilities of dog ownership.

At the core of the project's objectives is the development of a cutting-edge technology that enables seamless communication between dog owners and veterinarians. This technology will provide dog owners with immediate access to their pets' health data, enabling them to detect potential health issues early and respond swiftly to emergencies. The inclusion of IoT devices will ensure a continuous stream of health data, allowing for early detection of potential health issues, improving preventative care, and ensuring better preparedness for emergency situations.

Another crucial objective involves designing a secure veterinary records repository with automated reminders. This central repository will store all veterinary records, including vaccination histories, medical treatments, and regular health check-ups, securely. The system is designed to safeguard sensitive medical information while also making it readily accessible to both pet owners and veterinarians. Automated reminders for upcoming vaccinations and check-ups will ensure that pets receive timely medical attention, thereby increasing compliance with vaccination schedules and regular health checks, which are critical for the overall health and well-being of pets.

The project also aims to create a user-friendly online marketplace for pet supplies. This integrated e-commerce platform will enable pet owners to purchase pet supplies—such as food, toys, and medications—based on the specific health needs and preferences of their pets. The marketplace is designed to offer convenience and personalization, making it easier for owners to find and purchase the best products for their pets' health and well-being, thus encouraging better care through appropriate product choices.

Furthermore, the incorporation of virtual vet consultation features is a key objective. This feature will enable virtual consultations with veterinarians directly through the "Dogtor" platform, providing pet owners with quick access to professional medical advice. This is particularly valuable in remote areas or situations where immediate in-person consultation is not feasible, thus increasing accessibility to veterinary care, reducing delays in receiving medical advice, and enhancing convenience for pet owners.

Throughout this report, we will delve deeper into the methodologies, technical approaches, and practical implementations that have been employed to realise these objectives. The development process of "Dogtor" involves rigorous planning, design, and testing to ensure that each feature not only meets technical standards but also enhances the user experience and efficacy of pet care management. Ultimately, "Dogtor" aims to transcend its technological framework by fundamentally improving the lives of dogs and their caregivers. By integrating essential services into a single platform, "Dogtor" seeks to alleviate the stress of pet care and enrich the relationship between dogs and their owners.

2. Background

"Until one has loved an animal, a part of one's soul remains unawakened."

— Anatole France

2.1 Context of Canine Health Management

In today's world, dogs are more than just pets - they are beloved members of our families. They bring us joy, companionship, and a sense of belonging. Research has shown that simply having a dog around can reduce stress, anxiety, and depression, and even improve our physical health. For instance, interacting with dogs has been shown to lower cortisol levels, a stress hormone, and blood pressure (UK and Pugh 2023). Dogs also have a way of reducing loneliness, increasing feelings of social support, and boosting our mood (Robinson 2024).

As our canine friends become more integral to our daily lives, the responsibilities of pet ownership have also evolved. Modern dog owners are not only caregivers but also stewards of their pet's health and well-being. This means keeping track of their health, providing regular veterinary care, and ensuring they receive the necessary supplies.

Canine health management today is about much more than just providing food and shelter. It is a comprehensive approach that ensures dogs receive the care they need to thrive. This includes regular health check-ups, vaccinations, dental care, nutritional management, and behavioural training. With advances in veterinary medicine and technology, there are now more sophisticated treatments and wellness plans available than ever before (Gyles 2016).

Technology has also transformed the way we manage our dogs' health. Wearable devices can now monitor their vital signs, activity levels, and sleep patterns, providing valuable insights into their health (Endra 2024). Digital platforms make it easy to keep track of veterinary appointments, manage vaccination schedules, and store medical records securely online.

Access to quality veterinary care and essential supplies is crucial for effective canine health management (Pasteur et al. 2024). As dogs age and their health needs become more complex, pet owners must navigate a range of options to find the right care and support for their pets. However, despite these advancements, there are still significant challenges in ensuring all aspects of canine health are managed efficiently.

As seen from the project survey, many pet owners face difficulties in synchronising various elements of care, dealing with fragmented service provisions that can lead to gaps in healthcare coverage. For instance, the disconnect between data collected from health monitors and the health records maintained by veterinarians can create inconsistencies in understanding a pet's health status (Paynter et al. 2021). Additionally, geographical, and economic accessibility of veterinary care can still be a significant barrier for many pet owners.

In this evolving landscape, the need for a unified solution that can integrate these disparate elements into a cohesive management system is clear. The "Dogtor" project aims to address these needs by providing a platform that simplifies and enhances the management of canine health through innovative technology and user-friendly design. By doing so, the developer hopes to contribute to the ongoing evolution of pet care in modern society.

2.2 Need for Integrated Health Management Systems

The pet care landscape is a complex and fragmented one, making it challenging for pet owners to manage their furry friend's health effectively. Traditional services often operate in isolation, leaving pet owners to navigate a maze of different health monitoring systems, veterinary records, and pet supply shopping (McDonald 2023). This disjointed approach can be particularly problematic in emergency situations where quick access to comprehensive health records is crucial.

Current digital solutions have made some progress in incorporating features like vaccination tracking and wellness monitoring, but they often lack a holistic approach to pet care (HealthforAnimalsDigital Revolution in Animal Health | 2021). This leads to inefficiencies and stress for pet owners, particularly in emergency situations where rapid access to comprehensive health data is essential.

Innovations in veterinary medicine have made significant strides in recent years, but the integration of these advancements with traditional veterinary practices is still lacking (Veterinary Technology - Evolution or Revolution? :: Veterinary Jobs Marketplace 2023). This is where "Dogtor" comes in - a platform that links health data directly with vet records, offering a solution to the inefficiencies caused by current practices.

Veterinary record management is often manual or semi-automated, which can lead to errors and make it difficult to access critical health data when it is needed most (Wallis et al. 2019). "Dogtor" addresses this issue by providing a secure, centralised database for veterinary records, allowing for streamlined access to pet health data and informed veterinary decisions.

The integrated marketplace within "Dogtor" takes pet care to the next level by not only facilitating the purchasing of pet supplies but also aligning these purchases with the pet's specific health needs. This improves compliance with prescribed treatments and diets, ensuring that pets receive the best possible care.

The literature suggests that while there are advancements in individual areas of pet health management, a comprehensive, integrated platform like "Dogtor" could significantly enhance the efficiency and effectiveness of these services (CVPM 2021). By consolidating health monitoring, veterinary records, and supply management into a single platform, "Dogtor" addresses significant gaps in the current market and offers a streamlined, user-friendly solution that could set new standards in the industry.

Ultimately, "Dogtor" represents a significant advancement in canine healthcare, setting a new standard for integrated pet health management solutions. By simplifying and streamlining care processes, "Dogtor" promises to enhance the overall relationship between pets and their owners, making it easier for them to provide the best possible care for their furry friends.

2.2 Current Challenges in Canine Health Care

Despite the bond between humans and their canine companions is strong, but there are still many challenges in the world of canine health care that make it difficult to provide the best possible care for our furry friends. One of the biggest challenges is the lack of integration between different health care services and resources (Hawes et al. 2021). For example, when a veterinarian sees a dog, they may have to provide a separate list of medications and supplements they are taking, rather than having all of this information easily accessible in one place. This can lead to mistakes and omissions, which can have serious consequences for the dog's health.

Another challenge is the difficulty of accessing pet supplies, particularly those that are health related. Pet owners may have to visit multiple stores or websites to find what they need, which can be time-consuming and frustrating. This can be particularly challenging for pet owners who have pets with specific dietary needs or chronic conditions, where consistency and timeliness in obtaining supplies are essential.

Economic and geographical factors also play a role in the challenges of canine health care (McDowall et al. 2023). Not all pet owners have equal access to veterinary services or pet health products. For example, pet owners who live in rural areas may have limited access to veterinary services or may have to travel long distances to get to a vet. Similarly, pet owners who live in low-income areas may have limited access to pet health products or may not be able to afford the best care for their pets (Hawes et al. 2021).

In addition, there are many different types of health care services and resources that are available to pet owners, but these services often do not communicate with each other. For example, a pet owner may take their dog to a veterinarian for regular check-ups and vaccinations, but then may also take their dog to a specialist for treatment of a specific condition. These different services may not have access to the same information about the dog's health history, which can lead to errors and omissions.

To address these challenges, we need a comprehensive solution that can bring all these different components together into a single, user-friendly platform. This platform would not only simplify the complexities of canine health care but would also ensure that all pets receive the best possible care, regardless of their geographical or economic status.

Some key features of this platform could include:

- A centralised database that stores all of a pet's health information, including medical history, vaccination records, and medication lists.
- A secure online portal where pet owners can access their pet's health information and communicate with their veterinarians.

- A marketplace where pet owners can purchase pet supplies and products, including health-related products such as medication and supplements.
- Integration with wearable devices and other technologies that can track a pet's health and provide real-time data to veterinarians.
- Automated reminders and alerts to help pet owners stay on top of their pet's health care needs.

By bringing all of these different components together into a single platform, the developer hopes to make it easier for pet owners to provide the best possible care for their pets, while also reducing costs and improving outcomes.

2.3 The Inspiration Behind "Dogtor"

The idea for "Dogtor" was born out of a deeply personal and impactful experience that highlighted the significant gaps in the existing canine health care system. It was a moment that would forever change the perspective on the importance of pet health care.

About five years ago, an 11-year-old Labrador Retriever named Magic, a cherished member of the family, suddenly became paralyzed in his hind legs. The sudden and distressing situation was a wake-up call that made it clear that a more integrated and accessible healthcare solution for pets was urgently needed.

Amid that chaotic moment, it became apparent that the existing pet health resources were fragmented and disorganised. Access to Magic's comprehensive medical history was crucial, but it was difficult to consolidate quickly. The need to consult with a veterinarian immediately became a stressful endeavour as existing platforms did not support swift and seamless communication. This ordeal underscored how the disconnection of vital health resources could complicate and delay essential care.

Fortunately, through the determined efforts of Magic's family and the eventual support of veterinary professionals, Magic recovered and adapted well to his condition. However, this incident left a lasting impression on the importance of pet healthcare. It sparked a resolve to ensure that no other pet owner should have to undergo similar difficulties when managing their pet's health emergencies or routine care.

This experience motivated the development of a unified platform that would serve as a holistic solution for canine health management. The concept of "Dogtor" was conceived, driven by the ambition to create an all-encompassing platform that integrates comprehensive veterinary records, real-time health monitoring, and direct communication with veterinarians.

The goal is to transform how pet healthcare is managed by making it more cohesive, proactive, and responsive. By integrating these essential services, "Dogtor" aims to alleviate the stress associated with pet healthcare and enhance the overall experience of dog ownership. Owners will have peace of mind knowing that comprehensive care tools are readily accessible, which empowers them to take prompt and informed actions regarding their pet's health.

This initiative reflects a commitment to leveraging technology to solve real-world problems, inspired by Magic's story and the shared experiences of countless other pet owners facing similar challenges. "Dogtor" seeks to set a new standard in pet health management, ensuring that pets receive the best possible care through an integrated, streamlined approach.

2.4 The Role of Computer Science in Canine Health Management

The "Dogtor" project exemplifies how computer science and technology can profoundly enhance the field of canine health management. This initiative is grounded in a multitude of computer science principles and methodologies, each serving a pivotal role in transforming traditional pet care into a comprehensive, technologically advanced system. Through the integration of cutting-edge technologies, "Dogtor" aims to streamline and optimise various aspects of pet health management, from routine care to emergency responses.

Web Application Development:

At the heart of the "Dogtor" platform is a sophisticated web application built using modern programming languages such as JavaScript, HTML, and CSS. The platform's frontend is designed to be user-friendly and responsive, utilising clean and intuitive design principles to ensure ease of use. The backend is built using Flask, a lightweight and flexible web framework that provides a robust and scalable foundation for the platform.

Database Management and Security:

A fundamental aspect of "Dogtor" involves the secure storage and efficient management of veterinary records and pet health data. Utilising SQL databases, the platform ensures data integrity and security through structured data storage solutions that facilitate fast and reliable access to data. This is crucial not only for day-to-day management but also in emergency situations where quick access to a pet’s medical history can be lifesaving. Moreover, the database architecture is designed with security at its core, implementing measures such as encryption, secure access protocols, and regular audits to protect sensitive information against unauthorised access and data breaches.

User Interface Design:

The success of any application heavily relies on its usability, and "Dogtor" is designed with a focus on creating an intuitive and accessible user interface. Principles of human-computer interaction are applied to ensure that the platform is easy to navigate and use, even for users who are not technically savvy. This includes the implementation of a clean, appealing design, logical navigation pathways, and interactive elements that enhance user engagement and satisfaction.

Through these diverse applications of computer science, the "Dogtor" project not only addresses specific needs within canine health management but also sets a new standard for how technology can be utilised to enhance and revolutionise pet care. This comprehensive approach ensures that both the functionality and security of the platform are maintained at the highest levels, providing a reliable, efficient, and secure system for managing the health of beloved canine companions.

2.5 Aligning with Computer Science Principles

The "Dogtor" project is a testament to the application of computer science principles to solve real-world challenges, specifically in the domain of canine health management. By leveraging a holistic approach that integrates diverse tools, technologies, and methodologies, this project not only addresses complex problems but also serves as an educational model that aligns with several fundamental principles of computer science.

Application of Systems Thinking:

"Dogtor" exemplifies systems thinking in computer science, where the focus is on the integration and interaction of various components within a larger system. This approach is crucial in ensuring that different functionalities—such as real-time health monitoring, secure data management, and user interface design—work harmoniously to deliver a seamless experience to users. By viewing the platform as a cohesive system, "Dogtor" demonstrates how individual technological solutions can be integrated to address broader healthcare management issues effectively.

Utilisation of Algorithmic Thinking:

At the core of "Dogtor" are algorithms that process vast amounts of data generated by health monitoring devices. These algorithms are designed to identify patterns, predict health trends, and make recommendations based on the data. The application of algorithmic thinking enables the platform to perform complex analyses and support decision-making processes, which are essential for proactive health management. This demonstrates the practical application of computer science in automating and enhancing data-driven decisions in a real-world context.

Adherence to Software Engineering Best Practices:

The development of "Dogtor" adheres to best practices in software engineering, including modular design, version control, and continuous integration/continuous deployment (CI/CD) practices. These methodologies ensure that the software is reliable, maintainable, and scalable. Moreover, adherence to these practices helps in managing the complexity of the software development process, facilitating collaboration among developers, and improving the quality and security of the software product.

Emphasis on Human-Computer Interaction (HCI):

A significant principle within "Dogtor" is the focus on human-computer interaction, ensuring that the technology is accessible and user-friendly. The application of HCI principles guides the design of the user interface, making it intuitive and engaging for all types of users, regardless of their technical expertise. This includes considerations for usability, accessibility, and aesthetics, which are critical for ensuring that the platform is effective and pleasant to use.

Future-Ready and Scalable Architecture:

Lastly, "Dogtor" incorporates a scalable architecture that is prepared to adapt to future advancements and increased demand. This aligns with computer science principles of creating flexible and extendable systems that can evolve as technology advances and user needs change (UK Government 2023). The use of cloud services, microservices architecture, and APIs exemplifies how "Dogtor" is built with a vision for future growth and integration possibilities.

In subsequent sections of this report, we will delve deeper into how these computer science principles are specifically applied in the "Dogtor" project. This exploration will highlight the methodologies, technologies, and outcomes of the project, providing a comprehensive overview of how computer science contributes significantly to the advancement of canine health care.

2.6 Advantages and Challenges of a One-Stop Shop Model in Canine Health Care

Managing a pet's health can be a daunting task, with multiple responsibilities and services to control. That is why the one-stop shop model, like "Dogtor", is a game-changer. By integrating all the necessary services and products into a single platform, pet owners can streamline their experience and enjoy more quality time with their furry friends. The biggest advantage of this approach is its convenience. With all services and products in one place, pet owners can save time and effort, reducing the stress and hassle of navigating multiple systems.

This convenience also enables better coordination of care, as veterinarians can access complete health histories from one platform, leading to more informed decisions and personalised care plans. Moreover, the one-stop shop model can potentially provide cost savings through bundled services and reduced operational costs. By offering a comprehensive range of services and products, "Dogtor" can help pet owners save money while still receiving top-notch care.

However, there are also challenges to consider. Integrating diverse services into a single platform can be complex and technically demanding. Additionally, there is a risk of overdependence on a single platform, which could lead to disruptions if the platform experiences downtime or technical issues. Furthermore, there is a concern about data security. With sensitive data centralised in one place, there is a higher risk of data breaches. Therefore, it is essential to have robust cybersecurity measures in place to protect user data.

To make "Dogtor" effective, it should offer comprehensive health tracking, including real-time monitoring of vitals and activity levels through wearable technology and IoT devices. The platform should also include integrated veterinary services, such as online scheduling for check-ups, vaccination reminders, and telehealth consultations. An e-commerce component that provides a tailored marketplace for pet supplies based on individual health needs and preferences would add significant value. The platform should also have a user-friendly interface that is accessible to all users, regardless of their technical skills.

By incorporating discussions on these aspects throughout the dissertation, the developer highlights the transformative potential of "Dogtor". By thoroughly exploring the one-stop shop model, we not only justify the development of "Dogtor" but also underscore its anticipated impact on the market and the quality of life for both pets and their owners. With its comprehensive range of services and products, robust cybersecurity measures, and user-friendly interface, "Dogtor" has the potential to revolutionise the way pet owners manage their pets' health.

3. Methodology / Approach / Specification, Design, and Implementation

"For a successful technology, reality must take precedence over public relations, for nature cannot be fooled."

— Richard P Feynman

3.1 Methodology

As the "Dogtor" project began, it was clear that the methodology employed would play a crucial role in shaping the outcome of the endeavour. The team adopted a systematic and iterative approach, dividing the project into three key phases: specification, design, and implementation. This approach allowed the team to break down the project into manageable chunks, ensuring that each stage was thoroughly completed before moving on to the next.

3.1.1 Specification Phase

The specification phase was a pivotal moment in the project's development. It was here that the team laid the foundation for the entire project, meticulously examining every aspect of the initial requirements and objectives to ensure that they aligned with the overarching goals of the application. The team began by conducting a thorough review of the initial project plan, which outlined the intended features and functionalities of the application.

Next, they held extensive discussions with stakeholders, potential users, and veterinary professionals to gather valuable insights and feedback. These interactions were instrumental in helping the team understand the practical needs and industry expertise that would be essential in creating a product that truly resonates with its end-users.

At the heart of the specification phase was the team's objective refinement process. Here, they took each goal from the initial plan and scrutinised it for its relevance and potential impact. This step involved transforming broad goals into specific, measurable, achievable, relevant, and time-bound (SMART) objectives. For example, they took a general goal to enhance pet healthcare management and distilled it into specific objectives like developing a real-time health monitoring system, integrating a secure veterinary records system, and creating an intuitive user interface.

Each objective was carefully crafted to ensure that it contributed effectively toward building a comprehensive platform that simplifies and enhances the management of canine health. The team also defined both the technical and functional specifications needed to realise these goals. This involved drafting detailed documents that outlined the technical architecture and the tools and platforms to be used.

Decisions, such as employing SQLite for its lightweight nature and ease of use, were made to support the application's need for efficient data handling. Additionally, functional specifications were laid out to detail the application's processes and interactions. These specifications included user flow diagrams, wireframes, and system models, providing both visual and textual representations of how the application would operate from both backend and frontend perspectives.

Once these specifications were complete, they underwent multiple rounds of internal and external reviews. This iterative process ensured that all specifications were thorough and left no stone unturned. Stakeholder feedback during this phase was particularly valuable, ensuring that the final specifications not only met but also exceeded the functional and technical expectations.

The specification phase concluded with the formal approval of these meticulously refined objectives and detailed specifications. This approval marked a significant milestone in the project, setting a robust foundation for the subsequent phases of design and implementation. The thoroughness of this phase ensured that the project moved forward with a clear, well-defined roadmap, poised for success in developing a cutting-edge application tailored to meet the needs of dog owners and significantly improve the management of canine health.

3.1.2 Design Phase

The design phase of the "Dogtor" project was a crucial step in shaping the final architecture and user interface of the application. It was during this phase that various diagrams played a vital role in translating conceptual specifications into detailed, actionable design blueprints that would guide the subsequent phases of development.

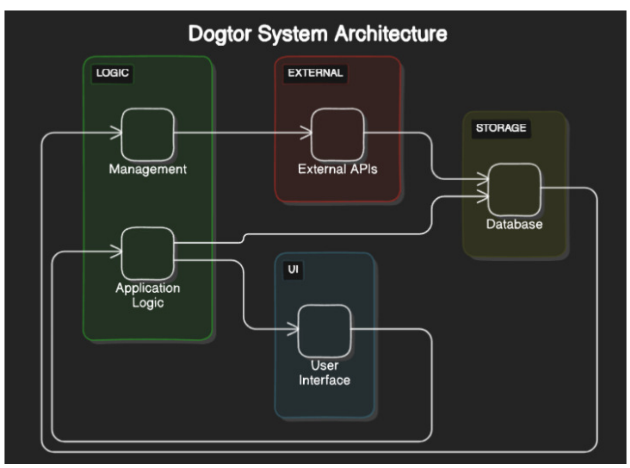

Figure 1

One of the most important diagrams created during this phase was the System Architecture Diagram as shown in Figure 1. This diagram provided a high-level view of the application's architecture, showing how different components such as the frontend, backend, database, and external services interact with one another. It detailed the interactions and data flows between components, making it easier to identify potential bottlenecks or security risks. This visual representation was crucial for planning out the infrastructure needed to support complex data interactions and user management requirements. By outlining the structure and dependencies of the system components, the System Architecture Diagram helped ensure that all parts of the application could work together seamlessly and efficiently.

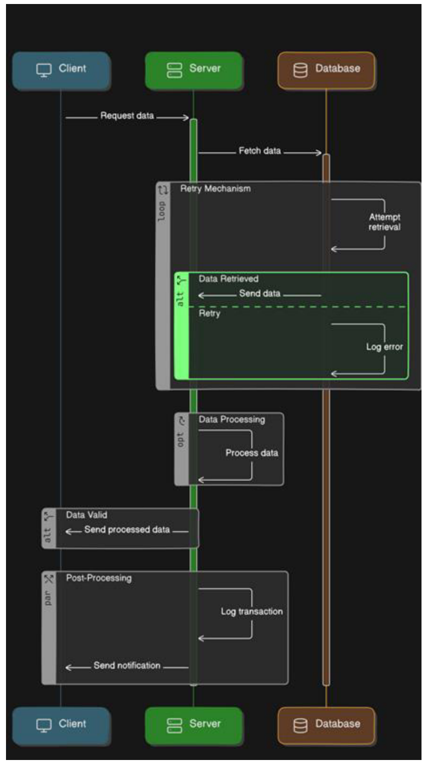

Figure 2

Another vital tool during this phase was the Use Case Diagram depicted in Figure 2 above. These diagrams mapped out all the possible interactions users could have with the application, from logging in to accessing and managing pet health records. Each use case diagram defined the roles of different users and the actions they could perform, providing a clear blueprint of required features and functionalities. These diagrams were essential for ensuring that the development efforts were aligned with user needs and that the application's functionality would comprehensively address all user requirements.

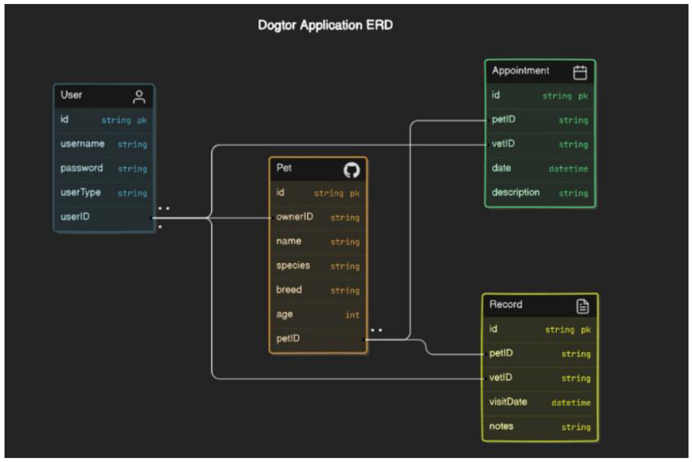

Figure 3

The Class Diagram (Figure 3) was also an essential tool during this phase. These diagrams provided an in-depth view of the application's backend structure, depicting the classes, their attributes, methods, and the relationships between classes. This detailed blueprint was instrumental in coding the application, as it defined the data structure and the behaviour that the software needed to implement. Class diagrams helped maintain object-oriented design principles, promoting reusability and scalability in the application's codebase.

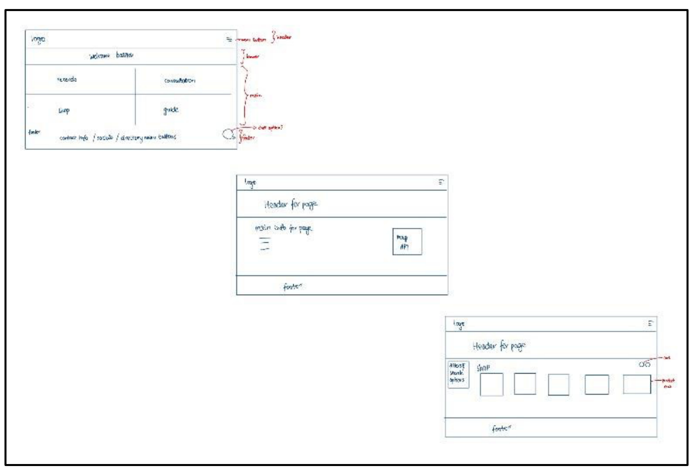

Figure 4

Wireframe Diagrams played a crucial role in the design of the user interface. These diagrams presented a skeletal version of the application's UI, outlining the placement of different elements such as buttons, text fields, and navigation menus. Wireframes were critical for visualising the user experience early in the design process, allowing for adjustments based on user feedback before high-fidelity designs were developed. The iterative process of creating and refining wireframes ensured that the user interface was not only aesthetically pleasing but also intuitive and user-friendly.

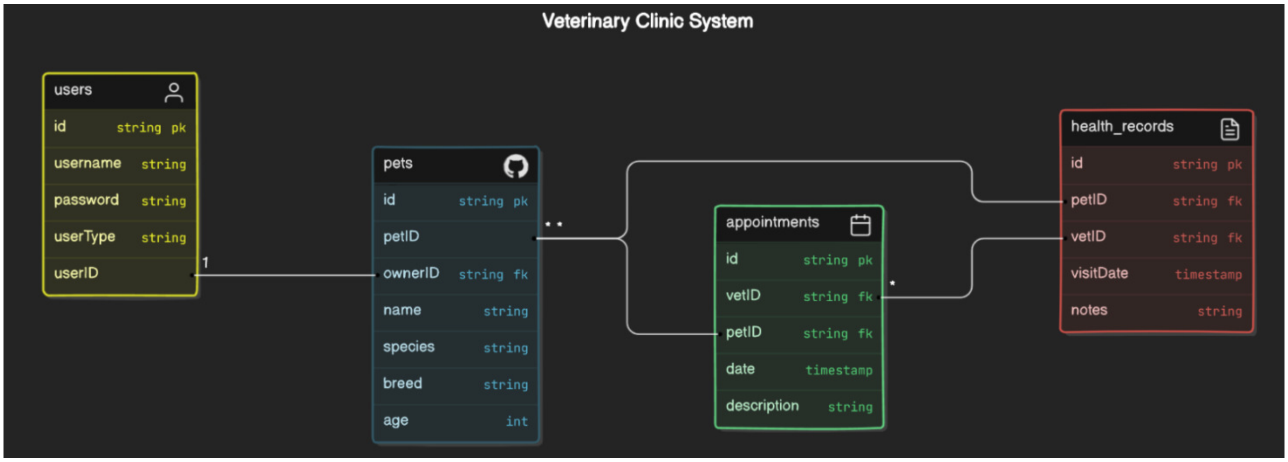

Figure 5

Figure 5, the Database Schema Diagram was meticulously crafted to illustrate how data would be organised within the database. This diagram showed the tables, fields, relationships, and constraints that would be used to store and manage data such as user accounts, pet health records, and appointment schedules. Having a well-planned database schema was vital for ensuring efficient data retrieval and storage, and for maintaining data integrity and security. The Database Schema Diagram helped developers understand the relationships between different data entities and facilitated the implementation of robust data management systems within the application.

Each of these diagrams contributed significantly to the design phase, helping to align the application with technical specifications and user expectations. By providing clear visual representations of different aspects of the application, these diagrams facilitated communication among stakeholders, ensured that all design elements were thoroughly considered, and helped prevent costly redesigns. The concerted effort to integrate user feedback into these designs further ensured that the "Dogtor" application would meet the high usability standards and functional requirements of its intended users. This comprehensive and meticulous approach laid a solid foundation for the successful implementation of the application in subsequent phases.

In conclusion, the design phase of the "Dogtor" project was a critical step in shaping the final architecture and user interface of the application. The various diagrams created during this phase played a vital role in translating conceptual specifications into detailed design blueprints that would guide subsequent phases of development. By providing clear visual representations of different aspects of the application, these diagrams facilitated communication among stakeholders, ensured that all design elements were thoroughly considered, and helped prevent costly redesigns. The concerted effort to integrate user feedback into these designs further ensured that the "Dogtor" application would meet high usability standards and functional requirements.

3.1.3 Implementation Phase

The implementation phase of the "Dogtor" project was a critical step in bringing the application to life. This phase marked a significant transition from concept to a functional application, and it was during this phase that the intricate designs and specifications developed earlier were brought to fruition.

The development process began with the coding of frontend and backend components, which were designed to align with the approved designs. The Flask web framework was used to manage server-side logic, facilitate dynamic endpoint creation, and handle routing and controller logic. Concurrently, HTML structured the web pages, CSS enhanced visual appeal through styling, and JavaScript added interactivity, combining to shape a user-friendly interface.

To ensure seamless integration between the frontend and backend, the team leveraged Flask's templating capabilities and its ability to manage HTTP requests and static files. This allowed for the creation of a cohesive and efficient application that was both responsive and scalable.

In parallel with the software development, the SQLite database was meticulously configured to align with the application's data handling requirements. This involved setting up database schemas that reflected the class diagrams crafted during the design phase, creating tables, and establishing relational links between them. SQLite's lightweight nature facilitated efficient data management with minimal setup.

Quality assurance was a critical component of this phase, involving rigorous testing to ensure that the application functioned correctly and met performance standards. This included unit testing to verify individual components, integration testing to ensure seamless component interaction, and system testing to evaluate the application against comprehensive requirements. The use of Flask's development server in this context mimicked the production environment, allowing for reliable test results.

As the development phase neared completion, preparations for deployment commenced, focusing on configuring the production environment and ensuring all components were optimised for operation. The developer implemented continuous integration and deployment (CI/CD) practices using tools like GitLab, or GitHub Actions, which automated testing and backup.

The culmination of the implementation phase was a significant milestone, marking the moment when the "Dogtor" application was ready for deployment to a production environment. The team had successfully transformed their initial designs into a working system, ensuring that it was robust, user-friendly, and ready for real-world use. Through detailed planning, rigorous testing, and continuous integration, the "Dogtor" application emerged as a reliable and high-quality solution that met the demands of its users effectively.

This implementation phase was a crucial step in bringing the "Dogtor" application to life, demonstrating the importance of careful planning, rigorous testing, and continuous integration in software development. The outcome of this phase was a functional application that met the design requirements and user expectations, setting the stage for its successful deployment and operation.

3.2 Specifications

The "Dogtor" application is a comprehensive suite of services that revolutionises the way canine health management is approached. At its core is the Vet Records Repository, a secure and centralised database that stores all critical veterinary health records, including vaccination records, medical histories, and appointment schedules. This repository is designed to ensure that health documents and details are stored in a single, easily accessible location, making it easy for pet owners to keep track of their pet's health history.

The repository is equipped with advanced encryption standards to guarantee the security of stored data. Access to the repository is strictly controlled through role-based access controls, ensuring that only authorised personnel can view or modify sensitive information. This feature also integrates seamlessly with notification systems to alert pet owners of upcoming vaccinations and appointments, ensuring that crucial health check-ups or treatments are never overlooked.

In addition to health record management, the "Dogtor" application hosts an Online Marketplace, a user-friendly platform that simplifies the purchasing of pet-related products such as food, medications, toys, and other supplies. The marketplace offers detailed product descriptions, user reviews, and ratings to aid in making informed purchasing decisions. A key feature of this marketplace is its ability to leverage data analytics to recommend products tailored to the pet's specific health needs based on the pet's health profile and past purchases.

This customization ensures that all recommended products are suited to the pet's particular requirements. The marketplace is equipped with secure payment gateways that support a variety of payment methods, providing a smooth and secure transaction process for users. The integration of the marketplace with the Vet Records Repository allows for seamless tracking of purchases and product recommendations, providing a more personalised experience for pet owners.

Another significant specification of the "Dogtor" application is the Virtual Vet Consultation feature, which facilitates remote consultations by connecting pet owners with licensed veterinarians via high-definition video calls. This feature allows for the scheduling of appointments, receiving reminders, and conducting consultations within the app. The consultation feature is designed for flexibility, offering users the option for immediate consultations based on veterinarian availability or pre-scheduled sessions.

The Virtual Vet Consultation feature is also integrated with the Vet Records Repository, allowing veterinarians to access the pet's medical history during the consultation. This access is crucial for providing accurate diagnosis and advice. The consultation feature is designed to ensure that service quality is maintained and monitored through a user rating system post-consultation.

Each feature of the "Dogtor" application is interconnected, providing a seamless and user-friendly experience that enhances the management of pet health. By integrating these essential services within one platform, "Dogtor" not only addresses the diverse needs of modern pet owners but also promotes proactive pet care management, setting a new standard in the field of pet health technology.

In conclusion, the "Dogtor" application is a comprehensive suite of services that revolutionises the way canine health management is approached. By providing a secure and centralised database for storing health records, an online marketplace for purchasing pet-related products, and virtual vet consultations for remote consultations, "Dogtor" sets a new standard in pet health technology.

3.3 Design and Implementation Considerations

In developing the "Dogtor" project, the design and implementation phases were crucial in ensuring that the platform would not only meet the immediate needs of its users but also be robust enough to accommodate future growth and evolution. From the outset, the project team recognized the importance of scalability and usability, and these foundational considerations were woven into the very fabric of the project.

Scalability was a critical consideration, as it was anticipated that "Dogtor" would need to grow alongside its user base and the continual addition of new functionalities. The decision to use Flask as the backend framework was a pivotal one, as it enabled the platform to efficiently handle large volumes of data and user interactions. This choice allowed the platform to scale effortlessly without compromising performance, ensuring that users could continue to access the platform seamlessly as the user base grew.

In conjunction with Flask, SQLite was implemented for its flexibility and light resource demands. The database was designed with a modular schema that could be easily adapted as the influx of data grew, ensuring that the application could handle more complex datasets and user profiles without difficulty. This modular design allowed for greater flexibility and adaptability, enabling the platform to evolve in response to changing user needs.

Parallel to the focus on scalability was a deep commitment to usability, guided by a user-centred design philosophy. It was recognized early on that for the platform to succeed, it must not only be functional but also provide a seamless and intuitive user experience. To achieve this, the UI and UX were iteratively developed, refined through multiple revisions informed by user feedback. This feedback loop was crucial in streamlining the user interface and simplifying interactions, ensuring that critical functionalities such as health tracking for pets, scheduling appointments, and managing marketplace transactions were straightforward and user-friendly.

The iterative process of design not only focused on enhancing aesthetic appeal but also emphasised making the application's navigation intuitive, which significantly boosted user engagement and satisfaction. By prioritising ease of use and accessibility, the project team ensured that each aspect of the application was polished and aligned with the users' needs.

The focus on usability was not limited to aesthetic appeal or functionality alone; rather, it was deeply rooted in an understanding of human behaviour and psychology. The design team drew upon insights from cognitive psychology to inform the development of the application's interface, ensuring that users could navigate the platform with ease and confidence.

These strategic choices in design and implementation have resulted in a platform that is not just robust at its launch but also capable of adapting to future technological shifts and user expectations. As "Dogtor" moves into the subsequent phases of testing, results, and evaluation, these foundational elements will be critical in ensuring that the application achieves its goal of revolutionising canine health management through technology.

The focus remains on maintaining a reliable and functional platform that meets high standards and adapts to ongoing changes, thereby embodying a solution that is both forward-thinking and transformative in the field of pet health management. The "Dogtor" project is a testament to what can be achieved when scalability and usability are prioritised from the outset, resulting in a platform that is poised to make a lasting impact on the lives of pet owners and their beloved companions.

3.4 Deployment on OpenShift

The deployment of the "Dogtor" web application on the university's OpenShift Container Platform was a complex and challenging process, one that revealed the intricate and often unpredictable nature of modern software deployment. Despite the promise of robust scalability and manageability offered by OpenShift, the developer encountered a series of obstacles that tested their expertise and perseverance.

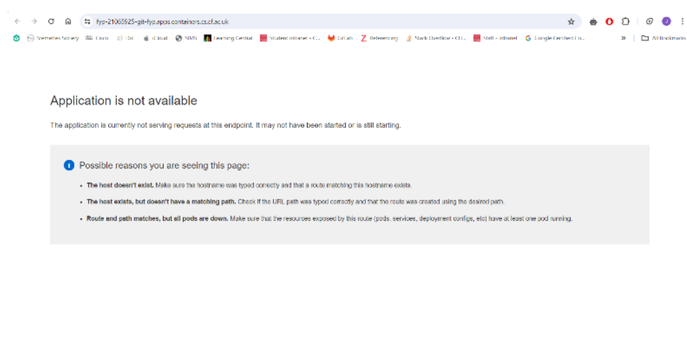

Figure 6

The deployment process began with a sense of optimism, as the developer carefully containerised the application using Docker and pushed it to the OpenShift registry. They meticulously set configurations for routes, services, and deployments through the platform's web console, hoping to avoid any potential pitfalls. However, as they awaited the deployment's completion, their excitement was short-lived. The application, although reportedly running according to the OpenShift console, remained inaccessible from the outside, with browsers consistently showing an "Application is not available" error as seen in Figure 6

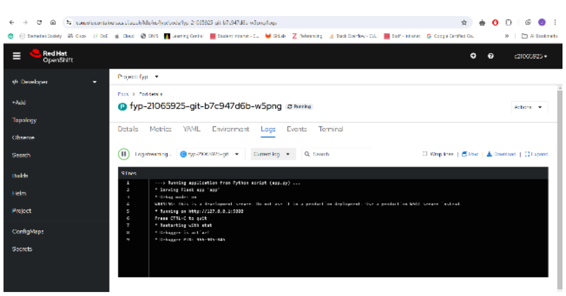

Figure 7

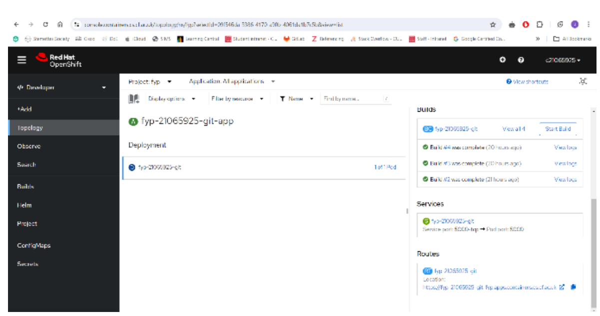

Figure 8

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This issue was a significant roadblock, as it suggested that something was amiss with the network exposure or routing configurations – critical elements in OpenShift that control how external traffic is routed to internal services. Their initial log analysis from the running pods suggested a healthy application (Figure 7 &8), contradicting the inaccessible status observed from external points of access. This prompted a deeper investigation into the OpenShift configurations, including a detailed verification of the YAML files and a rigorous examination of the network policies and route mappings.

Each step was double-checked for adherence to best practices, yet no conclusive errors were uncovered. The frustration was palpable as the developer encountered multiple dead ends, with each attempt to resolve the issue yielding little progress. The situation was further complicated by tests in local and development environments showing the application functioning as expected, indicating that the issues were specific to the OpenShift deployment environment.

The collective expertise of the developer, supervisor, and IT support, grounded in extensive review and validation of the deployment steps, could not rectify the issues. The decision to seek external expertise was a humbling acknowledgment of the developers' limitations and a testament to the complexities often hidden beneath the surface of modern software deployment. The developer's engagement with an external OpenShift advisor underscored the importance of comprehensive expertise in both the platform and the application's architecture to navigate such complexities.

The deployment saga of the "Dogtor" application on OpenShift serves as a candid illustration of the potential hurdles in software deployment. It emphasises the importance of resilience and the need for an expansive troubleshooting approach that might sometimes extend beyond the immediate technical team. The ongoing consultation with their external advisor holds the promise of uncovering the elusive issues, aiming to pave the way for a successful deployment.

This experience offers profound insights into the deployment phase, integral to the methodology of their project. It highlights the importance of overcoming real-world obstacles, thereby ensuring the robustness and reliability of the "Dogtor" application in a live environment. As Richard P. Feynman so aptly put it, "reality must take precedence over public relations, for nature cannot be fooled." The practical challenges the developer encountered here underscore their commitment to overcoming real-world obstacles, thereby ensuring the reliability and robustness of the "Dogtor" application in a live environment.

4. Results and Evaluation

"Not everything that can be counted counts, and not everything that counts can be counted."

— William Bruce Cameron

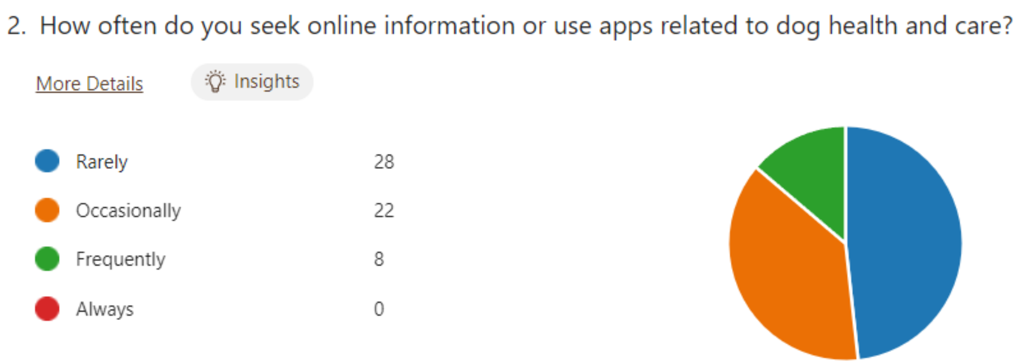


Figure 9

The pre-development survey analysis for the "Dogtor" project provides critical insights into user behaviours and preferences, which are pivotal in tailoring the development of the Dogtor application. A significant portion of survey participants reported that they rarely (48%) or occasionally (38%) seek online information or use apps related to dog health and care as can be seen in Figure 9. This moderate engagement with digital solutions hints at potential gaps in the market, likely stemming from a lack of compelling features or perceived inadequacies in existing tools.

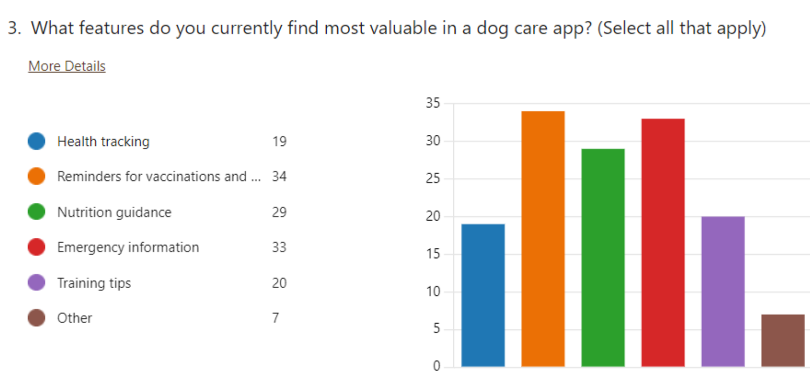


Figure 10

The survey also shed light on the features users deem most valuable in dog care apps. Notably, reminders for vaccinations and appointments are highly valued by 59% of respondents as shown in Figure 10, emphasising the need for reliable scheduling tools within the Dogtor app. Furthermore, 50% of users appreciate nutrition guidance, and 57% seek emergency information, underscoring the demand for comprehensive, trustworthy content that supports both routine and critical pet care needs. These findings dictate the essential functionalities that should be seamlessly integrated into the Dogtor app to meet and exceed user expectations.

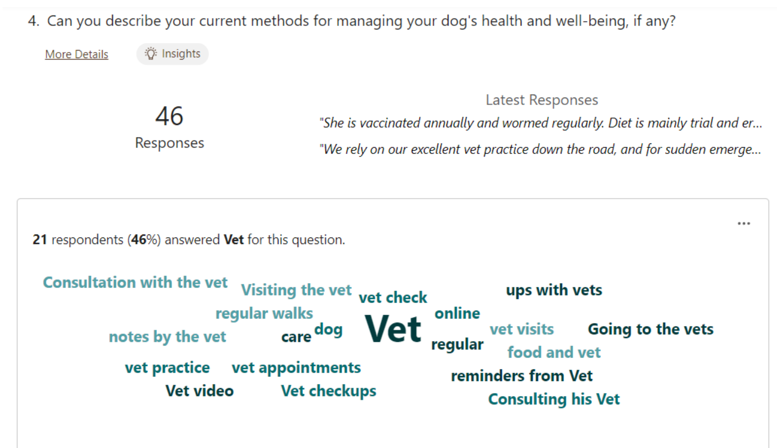


Figure 11

Regarding typical methods for managing pet health, according to Figure 11 about 45% of dog owners rely on regular veterinary consultations, indicating the importance of incorporating robust veterinary support features within the app. Such features could streamline health management practices, significantly benefiting users who prioritise professional health oversight for their pets.

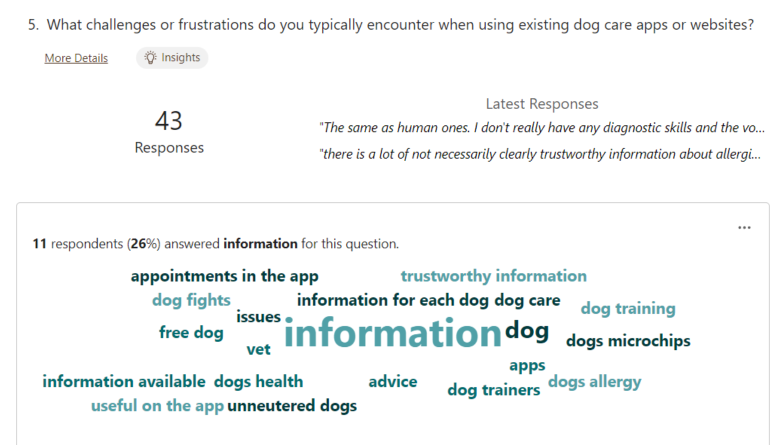


Figure 12

Additionally, the survey highlighted that 25% of respondents are dissatisfied with the reliability of information available through existing platforms which can also be seen in Figure 12 above.

This feedback presents a unique opportunity for the Dogtor app to distinguish itself by providing vetted, reliable information and functionalities, potentially increasing user trust and satisfaction.

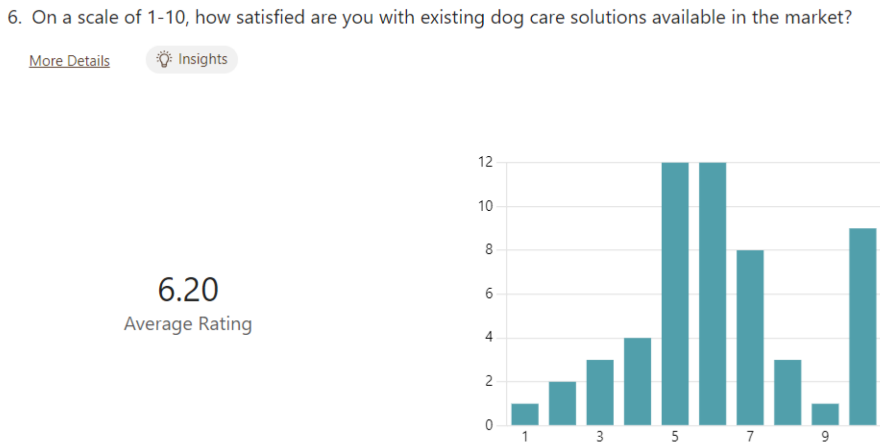


Figure 13

Lastly, as shown in Figure 13 the overall satisfaction with current dog care solutions is relatively low, with an average rating of 6.2 out of 10. This moderate satisfaction level reveals a substantial market opportunity for a more refined and user-centric solution. By addressing specific needs identified in the survey, such as improving the accuracy of health information, simplifying vaccination schedule management, and ensuring easy access to emergency guides and nutritional advice, the Dogtor app can significantly enhance its market position.

In summary, the survey provides crucial directives for the development of the Dogtor app, emphasising the need for trusted information, integrated health management tools, and user-friendly features that streamline the care process. By aligning the app's development with these identified user requirements, the potential for its success in the competitive market is markedly enhanced.

5. Conclusions and Future Work

"The best way to predict your future is to create it."

— Abraham Lincoln

As the first stage development of the "Dogtor" project ends, the developer reflects on the significant strides made in transforming canine health management through digital solutions. The successful launch of the "Dogtor" platform serves as a testament to the commitment to enhancing pet care, offering a suite of intuitive features that empower dog owners to proactively manage their pets' health and well-being. This achievement marks merely the starting point for an ambitious journey of continuous improvement and expansion in response to the dynamic digital landscape and evolving needs of pet owners.

As the "Dogtor" platform continues to evolve, its potential for expansion extends beyond canine health management. The foundation laid by this project can be leveraged to create a comprehensive platform for pet care, catering to a wide range of animal species. By adapting the platform's features and functionalities to serve other animal species, such as cats, horses, and small animals, "Dogtor" can become a go-to destination for pet owners worldwide, providing a seamless and comprehensive experience for pet care. This vision of expansion not only underscores the potential for growth but also underscores the importance of creating a platform that is adaptable, scalable, and committed to the well-being of all pets, regardless of their species.

At the heart of the "Dogtor" ethos is a commitment to continuous innovation. A primary focus for upcoming enhancements is the refinement of the platform's user interface, designed to provide an intuitive and seamless experience for dog owners. Plans include integrating sophisticated algorithms that do more than track health metrics; they will predict potential health issues before they become critical, allowing users to take proactive steps to prevent or mitigate them. This proactive approach to health management will be coupled with a customised alert system that considers each pet's unique health history and breed-specific characteristics, providing a tailored experience for users.

The vision for expansion extends to the "Dogtor" marketplace, where plans are set to enrich the selection of high-quality pet products through strategic partnerships with top-tier suppliers. This initiative will not only broaden the product offerings but also incorporate cutting-edge e-commerce functionalities, such as artificial intelligence-driven recommendations tailored to the specific health and lifestyle needs of each pet. The platform's e-commerce capabilities will be designed to provide users with a seamless and secure shopping experience, ensuring that they can easily access the products and services they need to care for their pets.

The ambition for growth is global in scope, with efforts underway to make the platform accessible to international users by translating and localising content to suit various cultural and linguistic preferences. This internationalisation effort will ensure that "Dogtor" serves as a global hub for pet owners, providing consistent and reliable pet care information and services worldwide. The platform's global reach will be facilitated by a robust infrastructure designed to handle diverse user needs and preferences, ensuring that users can access the information and resources they need regardless of their location.

A groundbreaking innovation in the realm of canine health management is the integration of real-time health tracking for microchipped dogs. This feature will enable dog owners to monitor their pets' vital signs and health metrics in real-time, providing an unprecedented level of transparency and control over their pets' health. The platform will utilize advanced sensors and algorithms to track vital signs such as heart rate, temperature, and blood pressure, as well as other health metrics such as activity levels and sleep patterns. This information will be transmitted directly to the owner's device, providing a constant stream of data that can be used to identify potential health issues early on.

Collaboration is another cornerstone of the future strategy, as plans are in place to form partnerships with veterinary associations across the globe to expand the virtual consultation services. This will not only broaden the network of veterinary professionals but also enhance the community features, allowing pet owners to share insights and learn from a collective pool of veterinary knowledge. The platform's community features will be designed to facilitate meaningful connections between users, providing a safe and supportive environment for pet owners to share their experiences and advice.

Looking beyond the immediate scope of this student-led project, several advanced features were envisioned but could not be implemented in the current phase due to time constraints and resource limitations:

- Automated Password Reset Functionality: An automated system for password resets was planned to enhance user security and convenience through secure email verification and temporary codes. However, the complexities of setting up and maintaining such a system required more resources than were available at this stage.
- Geolocation Features: Implementing mapping technology to help users locate nearby veterinary services, dog parks, and pet-friendly locations was considered. However, this was deferred due to the need for a robust framework to handle privacy compliance and secure user consent.
- Enhanced E-commerce Capabilities: Expanding the "Dogtor" shop to include a comprehensive payment portal was envisioned to transform the platform into a self-sustaining business. This feature requires significant investment in secure payment infrastructure and was beyond the current capabilities.

- Community Engagement Tools: Development of a community section within the app for users to engage in discussions, share advice, and connect with other dog owners was planned. The implementation of such a feature demands substantial moderation and regulatory oversight to ensure a safe and supportive environment, which was unfeasible in this project phase.

In conclusion, while the "Dogtor" project has successfully laid a strong foundation, it harbours the potential for much greater advancements. Each future iteration of "Dogtor" will be shaped by ongoing user feedback and technological progress. The commitment to enhancing the platform ensures that "Dogtor" will continue to evolve, aspiring to become an indispensable, globally recognized tool for dog care that perfectly marries technology with compassion.

6. Reflection on Learning

"Pets are humanising. They remind us we have an obligation and responsibility to preserve and nurture and care for all life."

— James Cromwell

Reflecting on the journey of developing the "Dogtor" project, a profound understanding of the intricacies involved in building a complex digital solution was gained. The process began with a dive into the selection and mastery of specific technologies essential for creating a robust platform. The choice of Flask for the backend was driven by its flexibility and lightweight architecture, which proved instrumental in allowing for seamless integration of complex functionalities.

The frontend development was handled with HTML, CSS, and Flask, which together provided a solid foundation for creating a responsive and visually appealing user interface. The challenge was not only to ensure functional performance but also to create an engaging user experience that could adapt to the varying needs of different users. Each line of code was written with the end-user in mind, striving to create intuitive navigation and interaction that would make the application straightforward and pleasant to use.

On the data management front, SQLite was chosen for its simplicity and effectiveness in handling relational databases. This involved designing database schemas that were not only efficient in data retrieval but also scalable as the user base grew. Understanding and implementing the best practices in database security and integrity became a crucial aspect of this process, ensuring that user data was handled securely and with respect.

Throughout the project, there were numerous technical challenges that required innovative solutions. Optimising data processing to handle large volumes of data without lagging was particularly demanding, requiring experimentation with different data storage solutions and caching techniques. Developing a personalised alert system also required innovative algorithmic solutions that could process user preferences and behavioural data.

In addition to technical skills, the developer had to learn how to manage their time and prioritise tasks effectively as a solo project. The use of project management tools and techniques helped her set clear milestones and deadlines, which were crucial in keeping the project on track amidst the complexity of tasks. Learning to balance independence with the need for occasional external input was a delicate endeavour that improved over time through continuous reflection and adjustment.

Ethical considerations were also a major part of this project. When working with sensitive data like geolocation and health information, it was crucial to prioritise user privacy and security. This involved not only implementing technical measures to secure data but also creating clear and transparent user agreements to ensure users were informed about how their data would be used.

Looking ahead, there are several areas where the developer plans to continue learning and developing their skills. Advancing knowledge in fields like artificial intelligence and machine learning is a priority, aiming to enhance the app's capability to provide predictive insights into pet health. This will require not only technical skills but also ethical considerations in AI, ensuring that the use of such technology is responsible and beneficial to users. Furthermore, further development in cybersecurity measures is critical to safeguarding the growing amounts of sensitive user data the platform handles.

```python
@app.route('/signup', methods=['GET', 'POST'])
def signup():
    if request.method == 'POST':
        # Collecting form data
        full_name = request.form['full_name']
        phone_number = request.form['phone_number']
        email = request.form['email']
        address = request.form['address']
        pet_name = request.form['pet_name']
        breed = request.form['breed']
        dob = datetime.strptime(request.form['dob'], '%Y-%m-%d')
        primary_vet = request.form['primary_vet']
        username = request.form['username']
        password = request.form['password']
        confirm_password = request.form['confirm_password']

        if password != confirm_password:
            flash('Passwords do not match')
            return redirect(url_for('signup'))

        # Creating new records
        owner = Owner(full_name=full_name, phone_number=phone_number, email=email, address=address)
        pet = Pet(name=pet_name, breed=breed, dob=dob, primary_vet=primary_vet, owner=owner)
        user_credentials = UserCredentials(username=username, password=password, owner=owner)

        db.session.add_all([owner, pet, user_credentials])
        db.session.commit()
        flash('Account created successfully, please log in.')
        return redirect(url_for('login'))
    return render_template('signup.html')
```

Figure 14

The code snippet showcased In Figure 14 is a significant component of the "Dogtor" project, specifically handling the signup functionality for the web application. This segment of code defines a Flask route associated with the /signup URL, which accepts both GET and POST requests. When a user submits the signup form, the code processes this data to create new user accounts.

The process starts when the form is submitted (via POST). The code retrieves various pieces of data from the form, such as the user's full name, phone number, email, and other details pertinent to both the user and their pet, including the pet's name, breed, and date of birth. One critical feature in this code is the way it handles the user's password; it checks that the confirmed password matches the initially entered password, enhancing security by preventing typing mistakes during account creation.

Upon successful validation of the form data and matching passwords, the code creates new database entries for the owner, pet, and user credentials, showcasing the developer's ability to integrate multiple models within a single transaction. This involves handling relational data, as seen with the linkage between the owner and the pet and their corresponding credentials. Once the records are successfully added and committed to the database, the user is informed of the successful account creation through a flash message and is then redirected to the login page.

The developer is particularly proud of this functionality for several reasons. First, it demonstrates their ability to handle complex form processing within a Flask application effectively. The integration of user input validation and the creation of related database records in a single function required a deep understanding of Flask's request handling and SQLite’s ORM capabilities.

Secondly, the code exemplifies good security practices, such as password confirmation checks and the proper management of relational data entries, which are crucial for maintaining the integrity and security of the application.

Finally, figuring out how to seamlessly integrate these elements within the Flask framework was a significant learning experience. They faced challenges such as ensuring data integrity between linked database entries and implementing effective user feedback mechanisms. Through persistence and dedicated problem-solving, they were able to create a robust signup system that not only meets the functional requirements but also adheres to best practices in web development.

This piece of functionality is a testament to the developer's growing proficiency in web development and their commitment to creating secure, efficient, and user-friendly applications. It stands as a notable achievement in their developmental journey, illustrating both the technical skills and the analytical thinking required to develop such a system.

```python
# Store reminders in a dictionary for simplicity
reminders = {}

# Function to send reminder notifications (replace this with your actual notification mechanism)
def send_notification(reminder_id, reminder_type, reminder_notes):
    print(f"Reminder: {reminder_type} - {reminder_notes}")

# Route to render the HTML page with the reminder form
@app.route('/set-reminder', methods=['GET'])
def set_reminder():
    return render_template('reminder.html')

# Route to handle the reminder form submission
@app.route('/set-reminder', methods=['POST'])
def handle_reminder():
    reminder_type = request.form['reminder-type']
    reminder_date_time = request.form['reminder-date-time']
    reminder_notes = request.form['reminder-notes']

    # Store reminder data
    reminder_id = len(reminders) + 1
    reminders[reminder_id] = {
        'type': reminder_type,
        'date_time': reminder_date_time,
        'notes': reminder_notes
    }

    # Schedule the reminder
    schedule_reminder(reminder_id, reminder_date_time, reminder_type, reminder_notes)

    return "Reminder set successfully!"

# Function to schedule the reminder
def schedule_reminder(reminder_id, reminder_date_time, reminder_type, reminder_notes):
    def job():
        send_notification(reminder_id, reminder_type, reminder_notes)

    # Parse the reminder date and time
    reminder_time = time.strptime(reminder_date_time, "%Y-%m-%dT%H:%M")

    # Schedule the reminder using schedule library
    schedule.every().day.at(time.strftime("%H:%M", reminder_time)).do(job)

# Function to run the scheduler
def run_scheduler():
    while True:
        schedule.run_pending()
        time.sleep(1)

if __name__ == '__main__':
    # Start the scheduler in a separate thread
    import threading
    scheduler_thread = threading.Thread(target=run_scheduler)
    scheduler_thread.start()

    # Create database tables
    with app.app_context():
        db.create_all()
```

Figure 15

In the development of the "Dogtor" project, the implementation of a reminder system was a crucial feature designed to foster user engagement and ensure timely management of pet care activities. This component was specifically engineered to capture user inputs through an HTML form, process this data on the server-side, and schedule reminders for future activities (as shown in Figure 15 above).

To facilitate data storage and retrieval, the system employs a straightforward dictionary-based approach, which simplifies the development and testing phases. When users submit their reminder details via the form, the handle_reminder() function collects this information, assigns a unique identifier to each entry, and stores it in memory. This process demonstrates my proficiency in managing data flow and storage effectively within a web application.

For reminder scheduling, the schedule_reminder() function utilises the 'schedule' library to activate the send_notification() function at specified times. Initially, this function is configured to print the reminder details to the console, serving as a placeholder for potentially more complex notification mechanisms, such as email or SMS alerts, which could be considered for future integration.

During the development process, significant challenges were encountered, particularly regarding the integration of reminders with users' personal calendars. The initial plan was to enable seamless synchronisationwith users' devices, enhancing functionality and user experience. However, integrating such features would have involved accessing and managing personal calendar data, posing potential ethical and privacy concerns.

In light of these ethical considerations, the decision was made not to pursue calendar integration. This decision reflects a commitment to ethical guidelines and user privacy, prioritising confidentiality, and data security over expanded functionality. Despite these limitations, I am proud of the reminder system's development, as it showcases my ability to implement core functionalities within a web application and underscores my commitment to ethical software development practices.

This experience has been invaluable, reinforcing the importance of ethical considerations in the design and implementation of technology solutions, especially those that handle sensitive user data. It has prepared me for future challenges in the tech industry, equipping me with a robust foundation in both technical skills and ethical decision-making.

In retrospect, the decision to use Flask as the primary technology stack for the "Dogtor" project may have limited its potential for future growth and scalability. While Flask proved to be a suitable starting point, it may not have been equipped to handle the complex demands of real-time functionality, intricate database operations, and robust security requirements.

The lack of a unified ecosystem for front-end and back-end development, as seen in Node.js with Express.js, may have resulted in increased development time and complexity. Similarly, the absence of Django's built-in features for handling complex data-driven websites may have led to more time-consuming development and integration of custom components.

Ruby on Rails' convention-over-configuration philosophy could have accelerated development timelines, but its absence may have hindered the project's ability to respond quickly to changing business requirements. ASP.NET Core's benefits in terms of scalability, performance, and integration with Microsoft's ecosystem were also not utilised, which may have limited the project's potential for growth.

Furthermore, separating the front-end and back-end using modern JavaScript frameworks like Vue.js or React.js could have enhanced the application's responsiveness and user experience. However, this architecture was not implemented, which may have resulted in a less flexible and scalable solution.

In hindsight, exploring and potentially integrating these alternative technologies could have prepared the "Dogtor" project for future expansion and challenges, ensuring a more robust platform that can adapt to the evolving needs of its users. This reflection highlights the importance of continual assessment and adaptation in technology choices, particularly in dynamic fields such as web development.

Overall, the "Dogtor" project was a comprehensive developmental experience that required a blend of technical skills, ethical consideration, and project management acumen. The insights gained from this project are invaluable, and the developer is confident that they will serve as a foundation for future endeavours in the tech industry.

7. Appendices

"Research is to see what everybody else has seen, and to think what nobody else has thought."

— Albert Szent-Györgyi

Online Additional Documents - [OneDrive Link]

7.1 Ethics Documentation

CARDIFF UNIVERSITY PRIFYSGOL CAERDYDD

School of Computer Science and Informatics
CM3203 - One Semester Individual Project
Ethics Framework – 2023/2024 Academic Year

This Framework has been reviewed and approved by the School Research Ethics Committee (SREC).

1. Purpose of this Framework

To confirm:

- the general principles and ethical standards that apply to your project.
- what form of ethical review (approval) is required prior to commencing your project.
- your responsibilities as a student, and the responsibilities of your Supervisor(s), module leader(s) and the SREC in relation to ensuring the ethical conduct of your dissertation project.

2. General principles

- Your dissertation project must be conducted to the highest ethical standards.
- You are expected to be aware of the University's Ethics Policy for Human Research, Research Integrity and Governance Code of Practice, and the Academic Integrity Policy and to abide by the principles contained in these documents.
- You, alongside your Supervisor, must have undertaken appropriate ethics training, i.e. Research Integrity Online Training Programme (Students) or Research Integrity Online Training Programme (Staff) as appropriate.
- Ensuring your safety, alongside the health and safety of staff and research participants is paramount. Health and Safety must underpin the planning of your project.
- Equality, diversity and inclusion considerations must underpin your project.
- Failure to meet ethical standards may constitute Academic Misconduct.

3. Key Responsibilities

Your key responsibilities as a student under this Framework, together with the responsibilities of your Supervisor(s), Module Leader(s) and the SREC are set out in **Annex 1**.

4. Ethical review process for your dissertation project

Projects will fall into one of three categories:

A. **Projects that do not require ethical approval.** See **Section 5** of this framework.
B. **Projects eligible for supervisor-only ethical approval.** The SREC has endorsed a proportionate, risk-based, approach to ethical review which enables supervisors to provide ethical approval of projects falling within specific parameters. These parameters are set out in **Section 6** of this Framework.
C. **Projects that require full ethical approval from the SREC.** If the project doesn't fall within the parameters specified in either Section 5 or Section 6, then you need to apply for full ethical approval from the COMSC SREC using the standard forms available here: https://www.cs.cf.ac.uk/ethics/

5. Projects that do not require ethical approval

If your project involves using pre-existing datasets and you are not planning to test your final product with individuals from outside your group, **you do not need to apply for ethical approval**. Please notify the supervisor, e.g. by emailing "I understand that my project doesn't require ethical approval". You **must** still abide by the general principles set out in Section 2, including undertaking ethics training.

6. Determining if a project is eligible for Supervisor-only ethical approval

If your project requires ethical approval, you **must** complete the "**Dissertation Ethics Form**" (**Annex 2**) to assess and document whether your project:

- is eligible for Supervisor-only ethical approval
- **or** whether you are required to apply for ethical approval from the COMSC SREC using the standard forms available here: https://www.cs.cf.ac.uk/ethics/.

If your project is eligible for Supervisor-only ethical approval, your Supervisor **must** countersign your Dissertation Ethics Form and review all project-specific documents prior to data collection.

Where relevant to the project, you **must** utilise the template Participant-facing documents contained in **Annex 3** of this Framework.

You **must** also follow all requirements contained in **Section 7** and **Section 8** of this Framework.

Your project is eligible for Supervisor-only ethical approval if:

A. You are only using one or more of the "Approved Research Methods" below; **AND**

B. Your project **does not** meet any of the "SREC review criteria" below.

A. Approved Research Methods

- Usability evaluation study focused on evaluation of a developed system (e.g. website, app), including questionnaires, interviews, or think-aloud sessions

- Anonymous survey to gather requirements for the system

If your project involves methods not listed above, you must complete and submit the SREC's "Application Form for Ethical Review". Your project is **NOT** eligible for Supervisor-only ethical review and you cannot utilise the "Dissertation Ethics Form". Instead, you are required to apply for ethical approval from the COMSC SREC using the standard forms available here: https://www.cs.cf.ac.uk/ethics/.

B. SREC review criteria

a) Activity within, or involving, the NHS or health and social care systems (e.g. patients, service users, staff, resources or data).

b)	The collection or use of Human Tissue, as defined by the Human Tissue Act 2004.
c)	The use or involvement of animals.
d)	The subject areas of terrorism, extremism or radicalisation. *Note: these terms are defined in the University's* Security Sensitive Research Policy.
e)	Primary data collection without the prior consent of participants* *The following are specifically excluded from this criteria: (1) observation of people in a public space where no identifiable information is being captured; (2) use of publicly available information or secondary data where no identifiable information is being captured."
f)	An element of deception, including covert activity.
g)	Children under the age of 18 or 'at risk' (vulnerable) adults or groups.
h)	Topic areas likely to be considered highly sensitive for participants. Note: examples include sexual behaviour, illegal activities, political, religious or spiritual beliefs, race or ethnicity, experience of violence, abuse or exploitation, and mental health.
i)	Access to records of a sensitive or confidential nature, including 'Special Category Data' or criminal offence data.
j)	Intrusive or invasive procedures Note: examples include the administration of substances, vigorous exercise, procedures which may involve pain or more than mild discomfort to participants (including the risk of psychological distress or anxiety – more than the risks encountered in everyday life).
k)	More than a minimum risk of harm to the safety and wellbeing of participants **and/or** the student conducting the project.
l)	Any other activity which clearly falls outside of the parameters of the **Module Ethics Framework** or raises other material ethical concerns.

If your project meets any of the criteria listed above, your project is **NOT** eligible for Supervisor-only ethical review, and you cannot utilise the "Dissertation Ethics Form". Instead, you are required to apply for ethical approval from the COMSC SREC using the standard forms available here: https://www.cs.cf.ac.uk/ethics/.

7. Specific Ethical considerations and requirements

Projects involving audio and/or visual recording of human participants.

If your project involves audio and/or visual recording of human participants, you must meet **all** requirements of the University' Standard Operating Procedure (SOP) on this subject, available here. If you are not able to meet all requirements of the SOP, you must report this in section 1e) of your Dissertation Ethics Form so that your Supervisor can assess risk in this area and seek advice from the SREC on whether your project may warrant an individual application for ethical review and fall outside of this Module Ethics Framework.

8. Data Protection and Records Management

You are expected to review the University's *"Managing research data tutorial'*, in addition to adhering to the expectations below:

Data Protection

If your project involves collecting identifiable information from or about humans, you must ensure that:

- You only collect the minimum information required i.e., only what is absolutely necessary.

- You have provided participants with clear information about why you are collecting their data and how it will be used and managed (note that this requirement should be met if utilising the template participant-facing documents in Annex 3)
- All data and records containing identifiable information are securely stored within the University's system (separately to any de-identified data or records)
- Access to data and records containing identifiable information is restricted to only those that need it (usually you and your Supervisor)
- Identifiable data and records are securely destroyed at the end of the relevant retention period (set out below)

General Data and Records Management

- All data and records relating to your project must be securely stored
- Data and records should be clearly named, with a version number and date
- If your project is not contributing to a publication or wider research project, data and records relating to your project must be retained for a minimum of 1 year after submission of your assessment. If your project is contributing to a publication or is part of a wider research project, data and records must be retained for a longer period of 1 year from the end of the project.

The group **must** submit the following to their designated OneDrive folder:

A. Signed **Dissertation Project Ethics Form (Annex 2)**
B. Final version of participant-facing documents
C. Data collection tools (e.g. survey questions, evaluation tasks)
D. Research Integrity Training Certificate with assessment.

9. Audit and Governance

The Module Leader, SREC or central University governance colleagues may conduct random spot-checks of project-specific documents for audit and governance purposes. It is imperative that you adhere to the records management requirements above to enable this.

Annex 1
Key Responsibilities

You (The Student)

1. To review and adhere to the Module Ethics Framework.
2. To discuss ethical approval requirements for the project with the Supervisor during the project selection process.
3. To complete the **Dissertation Ethics Form** (if required).
4. To undertake required ethics training: Research Integrity Online Training Programme (Students).
5. Gain ethical approval for your project prior to commencing data collection.
6. To inform your approver (Supervisor or SREC) of:
   - any changes to your project following ethical approval; and/or
   - any ethical issues that arise during your project (especially any risk of harm/emotional distress that emerges as your project progresses).
7. Engage with the module and complete all tasks and assessments, including any additional ethics-specific requirements identified through the ethical approval process.
8. Please note that the student is responsible for their actions, whether Supervisor or SREC approval has been obtained or not.

Your Supervisor

1. To review the Module Ethics Framework and to support you to adhere to its requirements.
1. To undertake required ethics training, appropriate to their role as: Research Integrity Online Training Programme (Staff).
2. For projects eligible for Supervisor-only ethical approval - to review and countersign your **Dissertation Ethics Form** and to review your project-specific documents, prior to the commencement of data collection.
   - Please note that the Supervisor can decline to sign off the application. If that is the case, the Student needs to address all issues or may decide together with Supervisor to submit a regular application instead to the SREC.
3. For projects requiring SREC review – to review and countersign your “Application Form for Ethical Review”, together with supporting documents, prior to submission to the SREC.
4. To provide appropriate supervision as the project progresses, this includes helping to ensure that your project stays within the permissible parameters, reviewing any project amendments and working with you (and SREC where required) to address any ethical issues that arise during your project, including those relating to your own wellbeing/risk.

The Module Leader

1. To oversee the preparation of a Module Ethics Framework and supporting annexes.
2. To obtain SREC approval of the Module Ethics Framework, by submitting the framework and an “Ethics Framework Coversheet” to the SREC.
3. To undertake required ethics training, appropriate to their role as Module Leader: Research Integrity Online Training Programme (Staff).
4. To ensure ethics is integrated into the module and that students and Supervisors are familiar with the ethics approval process applicable to the module. This must include, as a minimum, including the Module Ethics Framework and supporting annexes in the Module Pack (or equivalent, i.e. the material given to students that includes a description of what is going to be taught in a module, the assessment and the references).

5. General oversight responsibility including keeping the Module Ethics Framework under review and to report to the SREC any matters of ethical concern arising from a dissertation project.

<u>The SREC</u>
In relation to dissertation projects undertaken in this module, the responsibility of the SREC is to:

1. Review and approve the Module Ethics Framework (inclusive of annexes and Ethics Framework Coversheet) submitted by the Module Leader.
2. Review and approve any projects falling outside of the Module Ethics Framework (those not eligible for Supervisor-only ethical approval) and to set any monitoring conditions for such projects.
3. Ensure any SREC-specific guidance or Standard Operating Procedures (SOP) are reflected in the Module Ethics Framework.
4. Provide advice and guidance to the Module Leader and Supervisors on any ethical issues escalated to the SREC that arise during the planning or conduct of module dissertation projects.
5. Set minimum standards for ethics training and/or competency of those involved in the ethical approval process for dissertation module projects (module leaders, supervisors and students)
6. Implement monitoring/audit requirements where this is considered necessary and to conduct random spot checks/audit of individual dissertation project documents where there is capacity to do so.

Annex 2 – Dissertation Project Ethics Form
[see next section]

Annex 3 – Templates or Exemplars for adoption by Students (with project specific modifications)
[available on the PATS project management site with the overall project guidance]

(a) Recruitment Adverts/Invitation Letters
(b) Participant Information Sheets
(c) Consent Forms

Annex 2 – Dissertation Project Ethics Form

School of Computer Science and Informatics – CM3203 One Semester Individual Project

Dissertation Project Ethics Form

1. PROJECT SUMMARY					
Project Title:	An integrated online solution for canine health management and well-being.				
Student Name:	JANA JHAVERI				
a) Approved methods to be used:	[Anonymous survey to gather requirements for the system ✓☐] [Usability evaluation ✓ ☐] If usability evaluation, please specify what it will include: [Questionnaire ✓ ☐] [Interview ✓ ☐] [Think-aloud session ☐]				
b) Please provide a summary of your project, including its aims and the methods you will be using:					
The "Dogtor" project aims to develop a user-friendly website application that serves as a one-stop solution for the diverse needs of dog owners. The website will integrate health monitoring, vet records management and a convenient shopping platform for pet supplies. This initiative is inspired by the absence of a comprehensive solution in the market, leaving dog owners grappling with fragmented resources. The aim is to provide a centralised platform that not only simplifies but enhances the overall management of dogs' health.					
c) Do you have any potential conflicts of interest to declare? Information and guidance on conflicts of interest is contained in the Research Integrity Online Training Programme and the Research Integrity and Governance Code of Practice.				Yes: ☐	No: ✓
d) If you have *answered* '**yes**' to b, please confirm the action you propose to take to address such conflicts:					
N/A					
e) What do you consider to be the ethical issues or considerations specific to your project? How do you intend to address these?					
The primary ethical consideration for this project is ensuring user privacy and data security, obtaining informed consent from participants and handling sensitive data responsibility.					
f) Are you planning to collect data from any users from outside of your group? This includes collecting data from social media. If No, skip to Section 2.				Yes: ✓	No: ☐
g) If working with human subjects, please confirm your participant group and how you will identify and recruit such participants:					
The participant group includes dog owners, and recruitment will be conducted through online platforms, social media groups and pet-related communities. The aim is to recruit approximately 50 survey responses.					
h) How many participants are you aiming to recruit?		10 or less ☐	11-20 ☐	21-49 ☐	50+ ✓ ☒
i) Please describe the consent procedures/arrangements for the project – will informed consent be obtained from participants, and if so how? (If informed consent will not be obtained, then your project is **NOT** eligible for supervisor sign off.)					
Informed consent will be obtained from the participants through an online consent form, clearly outlining the purpose of the study, data usage, and privacy measures. Participants will have the option to withdraw their consent at any stage.					

Annex 2 – Dissertation Project Ethics Form

2. IS YOUR PROJECT ELIGIBLE FOR SUPERVISOR-ONLY REVIEW?		
Does your project involve any of the following:	Yes	No
a) Activity within, or involving, the NHS or health and social care systems (e.g. patients, service users, staff, resources or data).	☐	✓
b) The collection or use of Human Tissue, as defined by the Human Tissue Act 2004	☐	✓
c) The use or involvement of animals.	☐	✓
d) The subject areas of terrorism, extremism or radicalisation. *Note: these terms are defined in the University's* Security Sensitive Research Policy.	☐	✓
e) Primary data collection without the prior consent of participants* *The following are specifically excluded from this criteria: (1) observation of people in a public space where no identifiable information is being captured; (2) use of publicly available information or secondary data where no identifiable information is being captured.	☐	✓
f) An element of deception, including covert activity.	☐	✓
g) Children under the age of 18 or 'at risk' (vulnerable) adults or groups.	☐	✓
h) Topic areas likely to be considered highly sensitive for participants. Note: examples include sexual behaviour, illegal activities, political, religious or spiritual beliefs, race or ethnicity, experience of violence, abuse or exploitation, and mental health.	☐	✓
i) Access to records of a sensitive or confidential nature, including 'Special Category Data' or criminal offence data.	☐	✓
j) Intrusive or invasive procedures Note: examples include the administration of substances, vigorous exercise, procedures which may involve pain or more than mild discomfort to participants (including the risk of psychological distress or anxiety – more than the risks encountered in everyday life).	☐	✓
k) More than a minimum risk of harm to the safety and wellbeing of participants **and/or** the student conducting the project	☐	✓
l) Detailed demographics or background information collected beyond age or gender. Age question asks for a specific age (as opposed to using age ranges).	☐	✓
m) Any other activity which clearly falls outside of the parameters of the **Module Ethics Framework** or raises other material ethical concerns?	☐	✓
If you have selected **"Yes"** to any of the above, your project is **NOT** eligible for Supervisor sign-off and must be reviewed by the SREC. **Please do not continue with this form.** You must instead complete the SREC's '**Application Form for Ethical Review**'. See COMSC Ethics website for details. If you have selected **"No"** to all of the above, your project **is eligible for Supervisor sign-off** and you must complete the rest of this form. Your project does not require a SREC application.		

3. DECLARATIONS – For use where project IS eligible for Supervisor sign-off.	
STUDENT DECLARATIONS	
a. The information in this form is accurate to the best of my belief. I take full responsibility for it.	✓
b. I have read, and will adhere to, the Module Ethics Framework.	✓
c. I have completed the University's Research Integrity Training and believe we have the necessary skills and knowledge to conduct the project as proposed.	✓
d. I am familiar with the Ethics Policy for Human Research, Research Integrity and Governance Code of Practice and Academic Integrity Policy and will abide by all standards relevant to our project.	✓
e. [If collecting user data] I have submitted all final version participant-facing documents and data collection tools to our supervisor or the module leader for approval prior to commencing data collection.	✓

f. [If collecting user data] I will notify our supervisor or the module leader of any amendments to our project and seek approval of any substantial changes to participant-facing documents or data collection tools.	✓
g. I will notify our supervisor or the module leader of any ethical issues that arise during the project.	✓
Signed:	
Print names: JANA JHAVERI	
Date: 19th February 2024	
SUPERVISOR DECLARATIONS	
a. I have reviewed this form and I am satisfied that the project, as proposed, meets ethical standards.	☐
b. I have reviewed all participant-facing documents and data collection tools prepared by the group to ensure they meet ethical standards and the Module Ethics Framework.	☐
c. I have completed the University's Research Integrity Training within the last three (3) years and believe I have the necessary skills and knowledge to review the documents referenced above and to offer appropriate supervision in matters of ethics.	☐
d. I am familiar with the Ethics Policy for Human Research, Research Integrity and Governance Code of Practice and Academic Integrity Policy and I will provide support to the group in following all standards relevant to their project.	☐
e. I will encourage the group to discuss with me, and reflect on, any ethical issues that arise during the project and, where relevant, I will ensure such issues are notified to the Module Leader.	☐
Signed: Dr Daniel J. Finnegan	
Print name: Dr Daniel J. Finnegan	
Date: 19/Feb/2024	

CARDIFF UNIVERSITY
PRIFYSGOL CAERDYDD

PARTICIPANT INFORMATION SHEET

An Integrated Online Solution for Canine Health Management and Well-being.

You are being invited to take part in a research project. Before you decide whether or not to take part, it is important for you to understand why the research is being undertaken and what it will involve. Please take time to read the following information carefully and discuss it with others, if you wish.

Thank you for reading this.

1. What is the purpose of this research project?

You are being invited to take part in a research project titled "An integrated online solution for canine health management and well-being." This project aims to develop a user-friendly website application that serves as a one-stop solution for the diverse needs of dog owners. The website will integrate health monitoring, vet records management, and a convenient shopping platform for pet supplies. This initiative is inspired by the absence of a comprehensive solution in the market, leaving dog owners grappling with fragmented resources.

2. Why have I been invited to take part?

You have been invited because you are a dog owner. Your insights and experiences in managing your dog's health are valuable to the study. The goal is to understand the challenges faced by dog owners and gather input to enhance the proposed solution.

3. Do I have to take part?

No, your participation in this research project is entirely voluntary and it is up to you to decide whether or not to take part. If you decide to take part, we will ask you to sign a consent form. If you decide not to take part, you do not have to explain your reasons and it will not affect your legal rights.

You are free to withdraw your consent to participate in the research project at any time, without giving a reason, even after signing the consent form.

4. What will taking part involve?

Your involvement in this research project will include participating in an anonymous survey to gather requirements for the system. The survey will inquire about your experiences in managing your dog's health and your preferences for an integrated online solution. The survey is expected to take approximately 5 minutes. Your participation is voluntary, and you can withdraw at any stage.

5. Will I be paid for taking part?

No.

6. What are the possible benefits of taking part?

By participating in this survey, you contribute to the development of a solution that aims to simplify and enhance the overall management of dogs' health. While there are no direct advantages or benefits to you, your input will play a crucial role in shaping a user-friendly platform for dog owners.

7. What are the possible risks of taking part?
There are no risks.

8. Will my taking part in this research project be kept confidential?
All information collected from (or about) you during the research project will be kept confidential and any personal information you provide will be managed in accordance with data protection legislation. Please see 'What will happen to my Personal Data?' (below) for further information.

9. What will happen to my Personal Data?
No personal data will be collected.

10. What happens to the data at the end of the research project?
The data collected as part of this study will be used only for the purposes of One Semester Individual Project (CM3203) and will not be shared. Any data will be deleted at the end of the academic year.

11. What will happen to the results of the research project?
The results will be published as part of the coursework.

12. What if there is a problem?
If you wish to complain, or have grounds for concerns about any aspect of the manner in which you have been approached or treated during the course of this research, please contact Dr Frank Langbein at langbeinfc@cardiff.ac.uk. If your complaint is not managed to your satisfaction, please contact the School of Computer Science and Informatics Research Ethics Committee: comsc-ethics@cardiff.ac.uk

13. Who is organising and funding this research project?
This research is part of One Semester Individual Project (CM3203) which is part of Computer Science BSc at Cardiff University and is not funded.

14. Who has reviewed this research project?
This research project has been reviewed and approved by Dr Frank Langbein (langbeinfc@cardiff.ac.uk) who is a Module Leader for One Semester Individual Project (CM3203).

15. Further information and contact details
Should you have any questions relating to this research project, you may contact us during normal working hours:

Jana Jhaveri
Jhaverij1@cardiff.ac.uk

Abacws
Senghennydd Road
Cardiff, CF24 4AG

Thank you for considering to take part in this research project. If you decide to participate, you will be given a copy of the Participant Information Sheet and a signed consent form to keep for your records.

Hi everyone,

I am Jana and as part of One Semester Individual Project (CM3203). I am doing a research project titled "An integrated online solution for canine health management and well-being." This project aims to develop a user-friendly website application that serves as a one-stop solution for the diverse needs of dog owners. The website will integrate health monitoring, vet records management, and a convenient shopping platform for pet supplies. This initiative is inspired by the absence of a comprehensive solution in the market, leaving dog owners grappling with fragmented resources.

I am looking for participants aged 18 or over to complete a survey to understand the user requirements dog owners look for in an application for their pet care.

The survey will take 5 minutes to complete and covers questions about what you would look for in an app dedicated to the health management and well-being of your pet. The link to the survey: https://forms.microsoft.com/e/Gr7FKcYpMV

If you're interested or have any questions, please get in touch.

Best,
Jana Jhaveri
Jhaverij1@cardiff.ac.uk

7.2 Pre-Development Survey - Dogtor

FYP Pre Development Survey - Dogtor

This survey aims to gather insights to inform the development of the "Dogtor" app, enhancing its effectiveness in meeting your dog care needs. Thank you for considering participating in our survey! Your input is crucial in shaping the development of the "Dogtor" app, a comprehensive dog care solution. Before we embark on creating the app, I'd like to learn more about your current practices and expectations regarding dog health and well-being.

Participation is voluntary, involving a questionnaire. No personally identifiable data will be collected, and all information remains confidential. While no direct benefits or risks are associated, your input is invaluable to creating this app. This research is part of CM3203 One Semester Individual Project at Cardiff University Computer Science BSc, and results will be used for my final year project. Thank you for considering participation.

You can view the complete Ethics PIS information sheet here - https://cf-my.sharepoint.com/:b:/g/personal/jhaverij1_cardiff_ac_uk/EVcpywdmjdJNmfWw6KMrqa8BxduiNB4TEUk3zCj6sRwR6A?e=FOZCGO

If you have any questions, please contact me at jhaverij1@cardiff.ac.uk

Participant Information and Consent

CONSENT FORM

1. I confirm that I have read the information sheet for the above research project.
2. I confirm that I have understood the information sheet and that I have had the opportunity to ask questions and that these have been answered satisfactorily.
3. I understand that my participation is voluntary and I am free to withdraw at any time without giving a reason.
4. I understand that this study is part of a module and anonymised data I provide may be included as part of coursework.
5. I understand that anonymised excerpts and/or verbatim quotes from my questionnaire may be used as part of the research publication.
6. I agree to take part in this research project.

*

○ Yes

○ No

Dogtor Questionnaire

How often do you seek online information or use apps related to dog health and care?

- ○ Rarely
- ○ Occasionally
- ○ Frequently
- ○ Always

What features do you currently find most valuable in a dog care app? (Select all that apply)

- ☐ Health tracking
- ☐ Reminders for vaccinations and appointments
- ☐ Nutrition guidance
- ☐ Emergency information
- ☐ Training tips
- ☐ Other

Can you describe your current methods for managing your dog's health and well-being, if any?

What challenges or frustrations do you typically encounter when using existing dog care apps or websites?

On a scale of 1-10, how satisfied are you with existing dog care solutions available in the market?

(1 being very dissatisfied, 10 being very satisfied)

☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆

FYP Pre Development Survey - Dogtor

58 Responses | 06:36 Average time to complete | Closed Status

1. **CONSENT FORM**

    1. I confirm that I have read the information sheet for the above research project.
    2. I confirm that I have understood the information sheet and that I have had the opportunity to ask questions and that these have been answered satisfactorily.
    3. I understand that my participation is voluntary and I am free to withdraw at any time without giving a reason.
    4. I understand that this study is part of a module and anonymised data I provide may be included as part of coursework.
    5. I understand that anonymised excerpts and/or verbatim quotes from my questionnaire may be used as part of the research publication.
    6. I agree to take part in this research project.

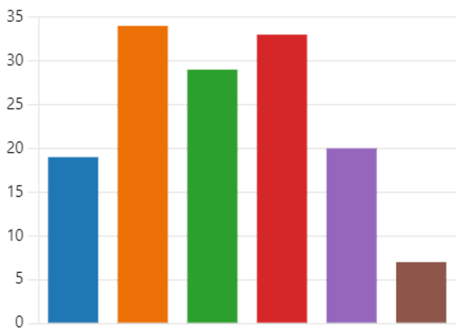
Yes	58
No	0

2. How often do you seek online information or use apps related to dog health and care?

Rarely	28
Occasionally	22
Frequently	8
Always	0

3. What features do you currently find most valuable in a dog care app? (Select all that apply)

Health tracking	19
Reminders for vaccinations and ...	34
Nutrition guidance	29
Emergency information	33
Training tips	20
Other	7



4. Can you describe your current methods for managing your dog's health and well-being, if any?

46
Responses

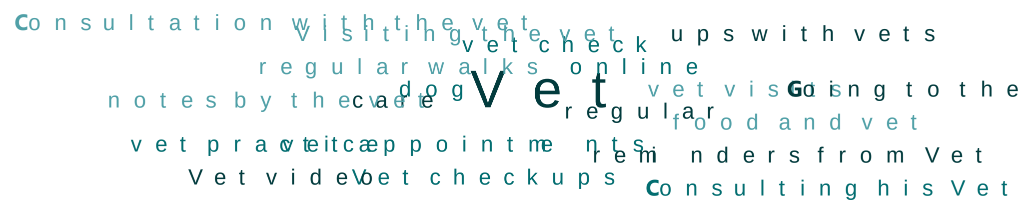
Latest Responses

"She is vaccinated annually and wormed regularly. Diet is mainly trial and er...

"We rely on our excellent vet practice down the road, and for sudden emerge...

Update

21 respondents (**45**%) answered Vet for this question.



5. What challenges or frustrations do you typically encounter when using existing dog care apps or websites?

43
Responses

Latest Responses

"The same as human ones. I don't really have any diagnostic skills and the vo...

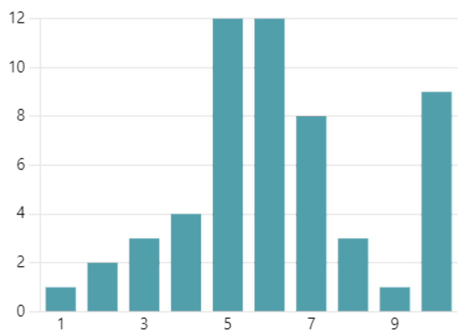
"there is a lot of not necessarily clearly trustworthy information about allergi...

Update

11 respondents (**25**%) answered information for this question.

6. On a scale of 1-10, how satisfied are you with existing dog care solutions available in the market?

6.20
Average Rating



ID	Start time	Completion time	Email
1	2/23/24 11:58:39	2/23/24 11:59:33	anonymous
2	2/23/24 11:59:32	2/23/24 12:01:30	anonymous
3	2/23/24 12:10:06	2/23/24 12:11:54	anonymous
4	2/23/24 12:30:13	2/23/24 12:32:03	anonymous
5	2/23/24 12:34:05	2/23/24 12:48:45	anonymous
6	2/23/24 13:39:36	2/23/24 13:40:38	anonymous
7	2/23/24 13:44:42	2/23/24 13:48:26	anonymous
8	2/23/24 13:53:44	2/23/24 13:54:57	anonymous
9	2/23/24 14:02:11	2/23/24 14:04:16	anonymous
10	2/23/24 14:42:26	2/23/24 14:47:43	anonymous
11	2/23/24 16:43:17	2/23/24 16:43:57	anonymous
12	2/23/24 18:13:46	2/23/24 18:14:12	anonymous
13	2/23/24 18:14:17	2/23/24 18:14:44	anonymous
14	2/23/24 18:15:02	2/23/24 18:16:01	anonymous
15	2/23/24 18:16:08	2/23/24 18:16:16	anonymous
16	2/23/24 18:16:19	2/23/24 18:16:25	anonymous
17	2/23/24 18:16:28	2/23/24 18:16:35	anonymous
18	2/23/24 18:16:37	2/23/24 18:16:45	anonymous
19	2/23/24 18:22:10	2/23/24 18:22:46	anonymous
20	2/23/24 18:56:27	2/23/24 18:57:09	anonymous
21	2/23/24 20:56:12	2/23/24 20:57:43	anonymous
23	2/24/24 8:55:06	2/24/24 8:56:10	anonymous
24	2/24/24 12:12:26	2/24/24 12:15:03	anonymous
25	2/26/24 11:30:37	2/26/24 11:31:51	anonymous
26	2/26/24 14:38:42	2/26/24 14:42:12	anonymous
27	2/26/24 14:42:19	2/26/24 14:47:31	anonymous
28	2/26/24 15:32:26	2/26/24 17:16:06	anonymous
29	2/26/24 20:08:36	2/26/24 20:11:14	anonymous
30	2/27/24 9:28:31	2/27/24 9:29:53	anonymous
31	2/27/24 9:29:19	2/27/24 9:30:25	anonymous
32	2/27/24 9:35:26	2/27/24 9:37:40	anonymous
33	2/27/24 9:43:40	2/27/24 9:47:05	anonymous
34	2/27/24 10:05:58	2/27/24 10:06:34	anonymous
35	2/27/24 10:15:43	2/27/24 10:17:34	anonymous
36	2/27/24 10:22:28	2/27/24 10:23:26	anonymous
37	2/27/24 10:33:55	2/27/24 10:36:14	anonymous
38	2/27/24 11:26:53	2/27/24 11:28:24	anonymous
39	2/27/24 13:13:33	2/27/24 13:15:31	anonymous
40	2/27/24 16:20:38	2/27/24 16:24:59	anonymous
41	2/27/24 16:23:06	2/27/24 16:26:27	anonymous
42	2/28/24 7:56:53	2/28/24 7:59:13	anonymous
43	2/28/24 9:47:24	2/28/24 9:49:54	anonymous
44	2/28/24 10:35:49	2/28/24 10:39:13	anonymous
45	2/28/24 11:07:13	2/28/24 11:09:00	anonymous
46	2/28/24 12:45:43	2/28/24 12:46:26	anonymous
47	2/28/24 12:41:15	2/28/24 12:51:15	anonymous
48	2/28/24 15:23:31	2/28/24 15:39:30	anonymous
49	2/29/24 9:31:37	2/29/24 9:33:24	anonymous
50	2/29/24 9:38:38	2/29/24 9:39:33	anonymous

51	2/29/24 9:55:56	2/29/24 9:58:38	anonymous
52	2/29/24 10:12:17	2/29/24 10:14:52	anonymous
53	2/29/24 10:14:18	2/29/24 10:16:53	anonymous
54	2/29/24 9:07:28	2/29/24 11:23:25	anonymous
55	2/29/24 16:33:37	2/29/24 16:38:11	anonymous
56	2/29/24 18:55:52	2/29/24 18:58:42	anonymous
57	3/1/24 9:58:57	3/1/24 10:01:19	anonymous
58	3/1/24 12:14:25	3/1/24 12:15:13	anonymous
59	3/1/24 13:33:54	3/1/24 13:38:28	anonymous

Name	Last modified time	CONSENT FORMI confirn	How often do you seek c
		Yes	Frequently
		Yes	Rarely
		Yes	Occasionally
		Yes	Occasionally
		Yes	Occasionally
		Yes	Rarely
		Yes	Rarely
		Yes	Rarely
		Yes	Occasionally
		Yes	Frequently
		Yes	Rarely
		Yes	Rarely
		Yes	Rarely
		Yes	Rarely
		Yes	Rarely
		Yes	Rarely
		Yes	Rarely
		Yes	Rarely
		Yes	Rarely
		Yes	Rarely
		Yes	Occasionally
		Yes	Rarely
		Yes	Occasionally
		Yes	Rarely
		Yes	Rarely
		Yes	Rarely
		Yes	Occasionally
		Yes	Rarely
		Yes	Rarely
		Yes	Rarely
		Yes	Occasionally
		Yes	Rarely
		Yes	Occasionally
		Yes	Occasionally
		Yes	Frequently
		Yes	Frequently
		Yes	Rarely
		Yes	Frequently
		Yes	Frequently
		Yes	Occasionally
		Yes	Occasionally
		Yes	Occasionally
		Yes	Occasionally
		Yes	Occasionally
		Yes	Occasionally
		Yes	Frequently
		Yes	Occasionally
		Yes	Occasionally
		Yes	Rarely

	Yes	Occasionally
	Yes	Rarely
	Yes	Frequently
	Yes	Rarely
	Yes	Occasionally
	Yes	Rarely
	Yes	Occasionally
	Yes	Occasionally
	Yes	Rarely

What features do you cu	Can you describe your cu	What challenges or frust	On a scale of 1-10, how s
Reminders for vaccinatio	File/folder	Specificity to my breed	6
Nutrition guidance;Remi	Vet checkups. Also if they	I don't use them.	10
Training tips;	Making sure he has a goo	Hard to navigate	4
Reminders for vaccinatio	Annual vet appointments	Poor design in terms of h	6
Health tracking ;Reminde	Writing down on a calend	I typically just write anyth	4
Training tips;Emergency i	Don't have a pet dog.	Never used an app	5
Reminders for vaccinatio	Healthy food that varies f	I don't use them often, b	4
Health tracking ;Reminde	Checkups and making su	Not enough help	5
Health tracking ;Reminde	General monitoring of fo	General advice that's not	8
Health tracking ;Reminde	Keeping reminders online for deworming, vaccinat		7
Health tracking ;Reminders for vaccinations and appointments;Nutrition gui			5
	None	None	10
	N/a	N/a	10
	Going to the vets		10
			10
			10
			10
			10
Nutrition guidance;			9
Reminders for vaccinations and appointments;Emergency information;			5
Reminders for vaccinatio	If I notice any strange syr	Can be hard to find detai	6
Health tracking ;Reminde	Vet	Being specific to age of b	7
Training tips;Emergency i	Regular vet appointment	Misinformation regarding	5
Emergency information;F	Regular vet visits and onl	Often limited, one use or	4
Nutrition guidance;Traini	N/a	N/a	
Nutrition guidance;Reminders for vaccinations and appointments;			5
Training tips;Reminders f	N/A	N/A	5
Reminders for vaccinatio	Simply using google to ke	N/A	6
Emergency information;T	None	Too much conflicting info	6
Training tips;Emergency i	observation	I dont use any	
Nutrition guidance;Emerg	Try to ensure she doesn't	I tend to find that they ar	7
Health tracking ;Reminde	Frequent visits to the vet	Non-trustable informatio	5
Reminders for vaccinations and appointments;Emergency information;			6
Nutrition guidance;	Consultation with the vet	There are lots of resourc	6
Emergency information;N	NA	they tell you contradictor	3
Health tracking ;Reminde	I use the internet if i thin	There's always so many c	6
Emergency information;T	None	None	7
Reminders for vaccinatio	Taking them to the vets,	Not specific to my dog	5
Reminders for vaccinatio	Researching advised dog	Vague information resulti	7
Diseases and symptoms;	bi-annual vet visits incl. v	identifying symptoms of	5
Reminders for vaccinatio	Speak to his day care lea	There is so much informa	3
I don't currently use a do	Visiting the vet	No interaction, have realised talking to the vet is m	
Emergency information;F	My elderly dog needs dai	Need to look at many we	5
Reminders for vaccinatio	Written notes by the vet	No website or app availal	2
Reminders for vaccinations and appointments;			6
Reminders for vaccinatio	I ask my vet direct for ad	It is difficult to 'self diagn	6
Health tracking ;Reminde	Subscriptions to healthy	Currently I don't use any	1
Training tips;Reminders f	Diary entries and vet visi	It's hard to find what you	6
Health tracking ;			3

Emergency information;I	regular appointments at	Lots of conflicting inform	8
Reminders for vaccinatio	Book appointments online. Text reminders from V		10
None;	Consulting his Vet	Little to no real informati	2
None;	N/A	N/A	8
Emergency information;I	- Home-cooked meals -Re	- Conflicting ideas of wha	6
Typically go to the vets. ;	Through my Vet and any	Not Applicable	5
Emergency information;T	We rely on our excellent	there is a lot of not neces	7
Emergency information;Reminders for vaccinations and appointments;Nutri			7
Emergency information;	She is vaccinated annuall	The same as human ones	7

atisfied are you with existing dog care solutions available in the market?

8. References

"The details are not the details. They make the design."

— Charles Eames

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