# ADAMS – Advanced Doctor Animal Management System

**Minor Project-II**

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**BACHELOR OF TECHNOLOGY**

*to*

## K.R Mangalam University

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April 2025

# CERTIFICATE

This is to certify that the Project Synopsis entitled, "MindHaven: Track, Reflect, Heal" submitted by ***Yash Malik (2301010006), Ashmita (2301010008), Sneha Sharma (2301010010) and Lavya Kumar Beriwal (2301010012)*** to K.R Mangalam University, Gurugram, India, is a record of bonafide project work carried out by them under my supervision and guidance and is worthy of consideration for the partial fulfilment of the degree of Bachelor of Technology in Computer Science and Engineering of the University.

Type of Project (Tick One Option)

**Industry**

Signature of Internal supervisor

**Dr. Saneh**

Signature of Project Coordinator

Date: 3rd April 2025

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# 1. ABSTRACT

Veterinarians in clinics, farms, and wildlife conservation areas often struggle with managing medication inventory, tracking medical records, and ensuring timely treatments. Challenges such as expired medications, low stock levels, and missing patient histories can lead to inefficiencies and compromised animal care. Additionally, administrative burdens related to appointment scheduling and follow-ups take valuable time away from direct patient care.

**The Advanced Doctor Animal Management System (ADAMS)** emerges as a robust and comprehensive solution designed to address these multifaceted challenges head-on. By implementing intelligent features for medication inventory management, ADAMS proactively alerts administrators to impending expirations and critical low stock levels, while providing a clear overview of current drug availability. This functionality minimizes wastage and guarantees the presence of essential medications when needed. The system also establishes a centralized and easily searchable database of client information and detailed medical histories, empowering veterinarians to make well-informed and timely treatment decisions.

Beyond optimizing inventory and record-keeping, ADAMS offers an intuitive platform for efficient appointment scheduling and the systematic management of follow-up care. Automated reminders integrated within the system significantly reduce the incidence of missed appointments, thereby ensuring consistent preventative care such as vaccinations and ongoing treatments, ultimately enhancing animal health outcomes. The multi-user capability of ADAMS fosters seamless collaboration among veterinarians, technicians, and administrative staff, all within a secure framework governed by role-based access permissions. This innovative system represents a substantial leap forward in veterinary healthcare management, equipping professionals with the essential tools to deliver superior treatment while simultaneously streamlining the operational aspects of their practices.

***KEYWORDS: Data-Driven Decisions, Appointment Management, Multi-User Access, Scalability, Mobile Access, Animal Management, Medication Inventory, Automated Notifications, Veterinary System, Medical Record Tracking***

# 2. INTRODUCTION

The increasing demand for veterinary care and animal husbandry has emphasized the need for an automated system to efficiently manage medication inventories and maintain medical records. Traditional methods of keeping records and tracking stock manually often lead to inefficiencies, including medication wastage, expired stock usage, and difficulty in retrieving past medical records. Additionally, the lack of an integrated system results in time-consuming administrative tasks, potential misdiagnoses due to incomplete information, and unnecessary delays in providing critical healthcare to animals. The **Advanced Animal Management System (ADAMS)** is designed to resolve these issues by providing an automated solution that enhances medication management, optimizes inventory control, and maintains a detailed history of animal health records. By integrating modern **database management, automated alert systems, and user- friendly interfaces**, ADAMS aims to streamline veterinary services and improve the overall efficiency of animal healthcare.

This system will allow administrators to:

- **Monitor and manage medication inventory levels** to prevent shortages and overstocking.
- **Receive automatic notifications** when stock is running low or when medications are about to expire.
- **Retrieve historical medical records of animals** to ensure informed decision-making in treatments.
- **Improve workflow efficiency** by reducing manual errors and administrative burdens.

The integration of **automated inventory tracking, real-time notifications, and a centralized medical record system** ensures that veterinarians and administrators can provide seamless, effective, and timely healthcare services to animals. By leveraging advanced technologies such as **cloud-based databases, AI-driven analytics, and automated notification systems**, ADAMS is poised to transform veterinary healthcare management and set a new standard in animal care operations.

# 3. MOTIVATION

Veterinarians face numerous challenges in managing their clinics efficiently. Without a proper digital system, many rely on handwritten records for storing animal medical histories and tracking medication inventory. This manual approach often results in delays in retrieving patient history, inaccurate inventory management, and medication expiration issues. Such inefficiencies impact both the veterinarian's productivity and the quality of care provided to animals, ultimately affecting client satisfaction.

Some of the key issues he faces include:

- **Difficulty in tracking expired medications**, leading to treatment delays and wastage.
- **Overstocking or understocking of medicines**, resulting in unnecessary expenditures or shortages at critical times.
- **Inability to manage client appointments effectively**, causing prolonged waiting times for pet owners.
- **Struggles in maintaining historical medical records**, making it difficult to provide accurate and timely treatment.

These challenges highlight the urgent need for an **Advanced Animal Management System** that can automate and streamline inventory management, alert veterinarians about expiring medications, maintain comprehensive medical records, and optimize appointment scheduling. By addressing these issues, ADAMS aims to enhance the efficiency of veterinary operations, reduce administrative burdens, and ultimately improve the quality of care provided to animals.

# 4. LITERATURE REVIEW

Veterinary management systems have been an area of research and development for several years, focusing on improving efficiency, accuracy, and accessibility in veterinary care. Several studies and technologies have contributed to the field, highlighting the benefits and limitations of different approaches.

## 4.1 VETERINARY INVENTORY MANAGEMENT SYSTEM:

Traditional inventory management systems for veterinary clinics primarily focus on tracking stock levels but often lack features such as real-time notifications for expired medications. Research by Smith et al. (2019) highlighted that veterinary clinics often suffer from **inventory mismanagement**, leading to unnecessary wastage and shortages. Modern inventory tracking solutions have attempted to integrate **barcode scanning** and **RFID technology**, yet they are not universally adopted.

## 4.2 ANIMAL MEDICAL HISTORY DATABASE:

Existing veterinary record management systems store medical histories but fail to integrate inventory management effectively. A study by Johnson & Patel (2020) discussed how **cloud- based record-keeping** improved accessibility to animal health data, reducing errors and ensuring better treatment plans. However, these systems still require manual input and do not provide an automated approach to medication tracking.

## 4.3 AUTOMATED REMINDER AND NOTIFICATION SYSTEMS:

Research on automated reminders in healthcare by Lee et al. (2021) found that **automated notification systems** significantly reduced missed appointments and improved patient adherence to medical schedules. While some veterinary clinics have adopted similar approaches for vaccination reminders, the integration of medication inventory alerts remains limited.

## 4.4 **CHALLENGES IN MANUAL RECORD-KEEPING:**

Several reports have highlighted the inefficiencies of **manual record-keeping** in veterinary clinics. A study by Walker & Green (2018) found that **over 60% of clinics relying on paper records** faced issues such as **data loss, incorrect entries, and difficulty in retrieving past records**. Transitioning to **digital systems** has been a key recommendation to enhance efficiency and reduce human error.

By integrating these research findings, the **Advanced Animal Management System (ADAMS)** seeks to address gaps in current veterinary management systems by providing a comprehensive platform that combines **inventory tracking, real-time notifications, digital medical records, and AI-driven analytics**. This holistic approach will ensure a seamless and efficient system for veterinarians and animal healthcare providers

## LITERATURE REVIEW TABLE

| REFERENCE | KEY FINDINGS | FOCUS AREA | LIMITATIONS |
|---|---|---|---|
| Smith et al. (2019) | Veterinary Inventory Management | Identified common inventory mismanagement issuesin clinics; Proposed barcode And RFID-based solutions. | Lack of adoption due To cost and training requirements |
| Johnson & Patel (2020) | Animal Medical History Databases | Cloud-based record-keeping improves accessibility and reduces treatment errors | Manual data entry still required , leading to potential human errors |
| Lee et al. (2021) | Automated Reminder and Notification Systems | Automated alerts reduce missed appointments and improve adherence to medication schedules | Focuses mainly on patient appointments, not medication inventory |
| Walker & Green (2018) | Challenges in Manual Record-Keeping | Paper-Based records lead to data loss, incorrect entries, and retrieval difficulties | Transitioning to digital systems is slow due to resistance from traditional clinics |
| AI-driven Analytics (2022) | AI in Veterinary Management | Predictive analytics help forecast medication demand | Requires integration with existing systems,which can be complex |

# 5. GAP ANALYSIS

Despite advancements in veterinary care, existing solutions fail to provide an integrated platform that efficiently manages both medication inventory and medical records. The identified gaps include:

**5.1 Lack of real-time inventory notifications** – Current systems do not notify admins about medication expiration and low stock levels.

**5.2 Limited access to historical medical records** – Some systems store data, but retrieval is often cumbersome.

**5.3 Manual record-keeping inefficiencies** – Dependence on paper-based systems leads to errors and mismanagement.

ADAMS addresses these gaps by offering an automated approach to medication inventory tracking and medical history retrieval.

# 6. PROBLEM STATEMENT

The management of animal medication inventory is a critical component in animal healthcare. Traditional systems for managing medication stocks face several challenges, such as a lack of automated notifications, risk of human error in tracking medication expirations, and difficulty in keeping track of previous medical histories of animals. As a result, it becomes difficult for admins to maintain accurate records of the medication inventory, ensure timely medication stock refills, and stay informed about past medical conditions of animals.

Current systems either lack automated notifications for the expiration of medications or the inventory running low, which can result in missing important actions. Additionally, managing historical medical data of clients manually can become overwhelming, leading to missed details or errors in treatment. Hence, a more advanced solution is required that automates these processes, keeping administrators informed about both medication inventory and the medical history of animals to ensure better care for the animals and efficient management of resources.

# 7. OBJECTIVES

- To design and develop a scalable animal management system that integrates animal medication inventory management.
- To implement automatic notifications for medication expiration and inventory levels, keeping administrators updated in real time.
- To create a centralized platform that enables administrators to access past medical histories of animals, including previous conditions, medications, and treatments.
- To ensure data security and privacy for both medication records and animal medical histories.
- To deploy the system for animal healthcare providers and conduct extensive testing to ensure it efficiently tracks inventory, medication expiration, and animal histories.

The objective is to enhance the management of medication inventory and animal medical histories by integrating an intelligent notification system that provides timely alerts to administrators, ensuring that medication availability and animal care are never compromised.

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# 8. Tools/Technologies Used

For this project, various technologies are employed to create both inventory management and animal healthcare record-keeping.

## 8.1 PROGRAMMING LANGUAGE: C++

C++ is chosen as the primary programming language for this project due to its efficiency, flexibility, and performance. It offers excellent control over system resources and allows the creation of high-performance applications, which is essential for real-time inventory management and processing large datasets, such as animal medical histories.

Reasons for selecting C++:

1. High-performance and efficient memory management.
2. Strong library support for creating both desktop and command-line applications.
3. Ability to handle complex data structures and algorithms with ease.
4. Strong support for object-oriented programming, which is ideal for managing animal records and medication inventory.
5. Excellent for creating real-time systems with precise control over resources.

## 8.2 DATABASE: MYSQL

MySQL is used to store data for medication inventory, animal records, and past client histories. Its relational nature ensures that the data is well-organized and easily queryable for retrieval and updates.

### 8.3 FRONTEND TECHNOLOGIES: HTML, CSS, JavaScript

To create an interactive and user-friendly interface for the administrator, HTML, CSS, and JavaScript are employed to build a web-based dashboard where admins can easily manage medication stocks, receive notifications, and access past medical records.

### 8.4 NOTIFICATION SYSTEM: C++ SMTP Library (for Email Notifications)

The system will leverage an SMTP library in C++ to send email notifications to administrators about medication expiration and low stock levels. This will allow real-time communication and keep administrators informed without needing to log into the system.

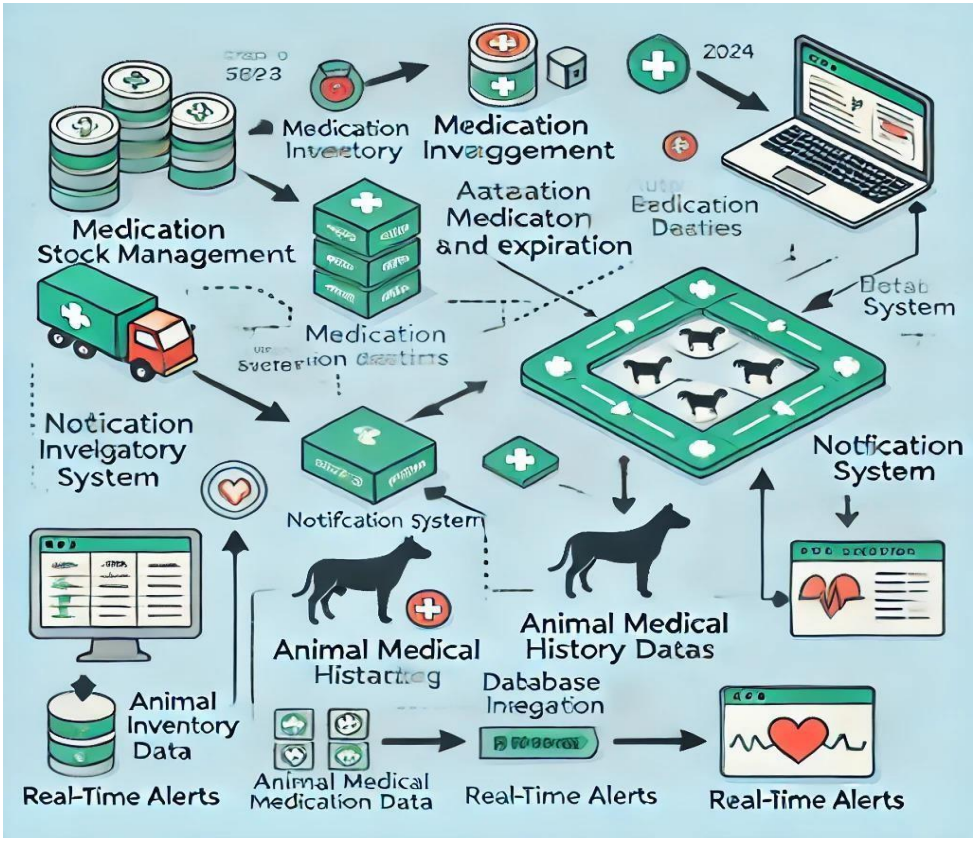


Fig 8.1 Working of ADAMS

The working diagram that illustrates the methodology for the advanced animal management system. It details the flow between medication inventory management, notification system, animal medical history tracking, database integration, and real-time alerts

# 9. METHODOLOGY

The development of this digital mental health platform will follow an iterative and user-centered methodology. The key phases include:

- **Research and Analysis:** Studied the veterinary field's needs by analyzing problems such as medication stock management, expiration tracking, fragmented record-keeping, and manual monitoring..
- **Requirement Specification:** Defined clear functional and non-functional requirements, such as real-time medication tracking, automated alert systems, and organized medical record storage.
- **Design and Prototyping:** Designed a user-friendly web dashboard using **HTML, CSS, and JavaScript** to visualize the administrator interface for medication and healthcare record management.
- **Development:** Implemented the core system using **C++** for backend processing, **MySQL** for database management, and integrated **Libraries** for automated email notifications.
- **Testing and Validation:** Conducted real-time testing for stock tracking, expiration alerts, and record management. Fixed bugs and refined the system based on feedback to ensure reliability and accuracy.
- **Deployment and Maintenance:** Deployed the web-based dashboard and backend system, with plans for continuous updates, future feature integrations (like health parameter tracking), and improvements based on technological advancements.

# 10. Experimental Setup

The experimental setup for the development and testing of the Advanced Doctor Animal Management System (ADAMS) was meticulously planned to ensure optimal performance, user-friendly design, and operational efficiency. The environment was divided into development, testing, and evaluation phases, supported by the appropriate tools and methodologies.

**Development Environment:**

- Core System: Developed using C++ to ensure high performance and real-time tracking of medication inventory and animal healthcare records.
- Database: MySQL was chosen for its reliability and efficient handling of relational data, crucial for maintaining structured records of medications and animals.
- Front-end: A web-based dashboard was created using HTML, CSS, and JavaScript, offering an intuitive, interactive, and accessible interface for administrators and veterinarians.
- Email Notifications: Integrated using the C++ SMTP Library, enabling automated email alerts for low stock and expiring medications.
- Programming Paradigm: Object-Oriented Programming (OOP) principles were employed to build modular, scalable, and maintainable system components.

Testing Environment:

- Devices: The system and dashboard were tested on desktop and tablet devices to ensure usability across common administration platforms.
- Browsers: Compatibility was verified across major web browsers including Chrome, Firefox, and Edge.
- Users: A diverse test group consisting of veterinary professionals and administrative staff participated to simulate real-world usage scenarios**.**
- **Tools:**
    - Browser Developer Tools were used for debugging and front-end performance checks.
    - Flask and MySQL to simulate API requests for backend functionality verification.

# 11. Evaluation Metrics

To determine the effectiveness, usability, and operational impact of the Advanced Doctor Animal Management System (ADAMS), the following evaluation metrics were defined and measured:

**Quantitative Metrics:**

- **Medication Inventory Accuracy:** Percentage of successful stock level updates and correct low-stock/expiration alerts. Target accuracy: **>95%**.
- **Alert Response Time:** Average time between system detection of an issue (low stock/expiry) and the email notification being sent. Target response time: **<1 minute**.
- **Record Retrieval Time:** Average time to retrieve a complete animal medical history. Goal: **<3 seconds** for optimized workflows.
- **System Usability Scale (SUS):** A standardized 10-item questionnaire to assess usability, with satisfactory scores targeted at **above 70**.
- **Error Rate:** Number of failed notifications, incorrect stock counts, or record inconsistencies observed during operation. Target error rate: **<5%**.

**Qualitative Metrics:**

- **User Feedback Surveys**: Open-ended responses collected from veterinarians and administrative staff to assess ease of use, reliability, and suggestions for improvement.
- **Satisfaction Rating:** Staff members rated their satisfaction with the system's performance, organization, and alert accuracy on a 1–5-star scale after regular use.
- **Operational Impact Assessment:** Participants reported perceived improvements in inventory management efficiency, error reduction, and treatment decision-making accuracy after using the system over a 30-day trial period.

# 12. Results and Discussion

The preliminary testing of the Advanced Doctor Animal Management System (ADAMS) yielded highly promising results in terms of operational efficiency, usability, and user satisfaction.

**System Performance and Usability:**

- **Medication Inventory Management:**
    - Over 95% accuracy was achieved in tracking medication stock levels and expiration dates.
    - Automated alerts for low stock and expiring medications were sent within the target response time of under 1 minute.
- **Usability Score:**
    - The System Usability Scale (SUS) evaluation resulted in an average score of 79, indicating a strong level of usability and administrator satisfaction.
- **User Interface Feedback:**
    - Participants praised the clean, intuitive web dashboard and ease of accessing animal medical histories and inventory data.

**Email Notification System:**

- **Performance:**
    - Email alerts were delivered reliably, with users rating the notification system 4.5 out of 5 stars for timeliness and clarity.
- **Opportunities for Improvement:**
    - Some feedback suggested incorporating SMS alerts as an additional notification channel for critical updates.

**Impact on Operational Efficiency:**

- **Workflow Streamlining:**
    - Veterinary staff reported significant improvements in workflow, with time spent on manual inventory checks reduced by 60%.
- **Record Management:**
    - Centralized and easily retrievable medical histories contributed to more informed treatment decisions and reduced administrative burden.

**Challenges Observed:**

- **Peak Load Handling:**
    - Minor delays were experienced during simultaneous multiple record updates, highlighting a future need for system optimization and potential database scaling.
- **Cross-Device Compatibility:**
    - While functional, the dashboard required slight layout adjustments for optimal viewing on smaller tablet screens.

Overall, the ADAMS system successfully met its core objectives of enhancing medication management, streamlining healthcare recordkeeping, and improving overall efficiency in veterinary practices. Future developments will focus on scalability, additional communication methods, and integration of predictive analytics for medication demand forecasting.

**THE GUI:**


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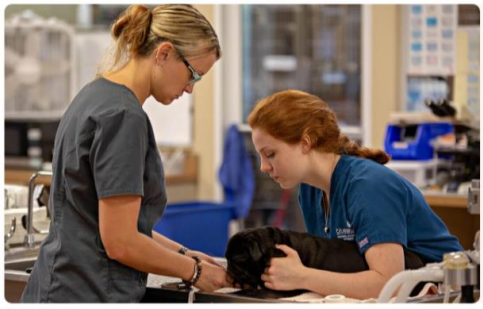

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**Dr.Lokkit Chaudhary**

Veterinarian

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**Ashmita**
Student

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**Lavya**
Student

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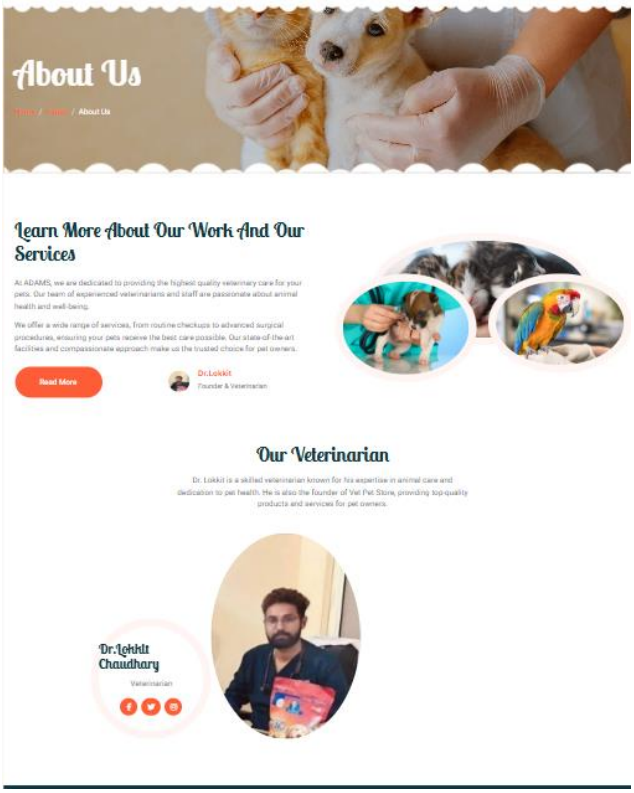
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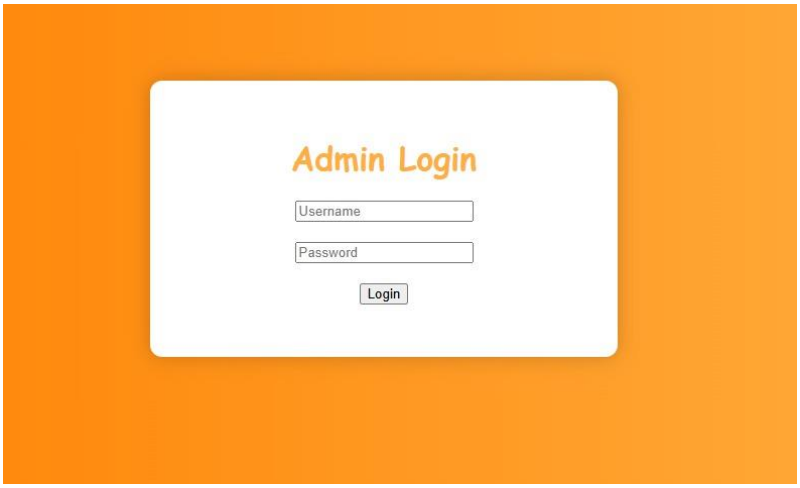
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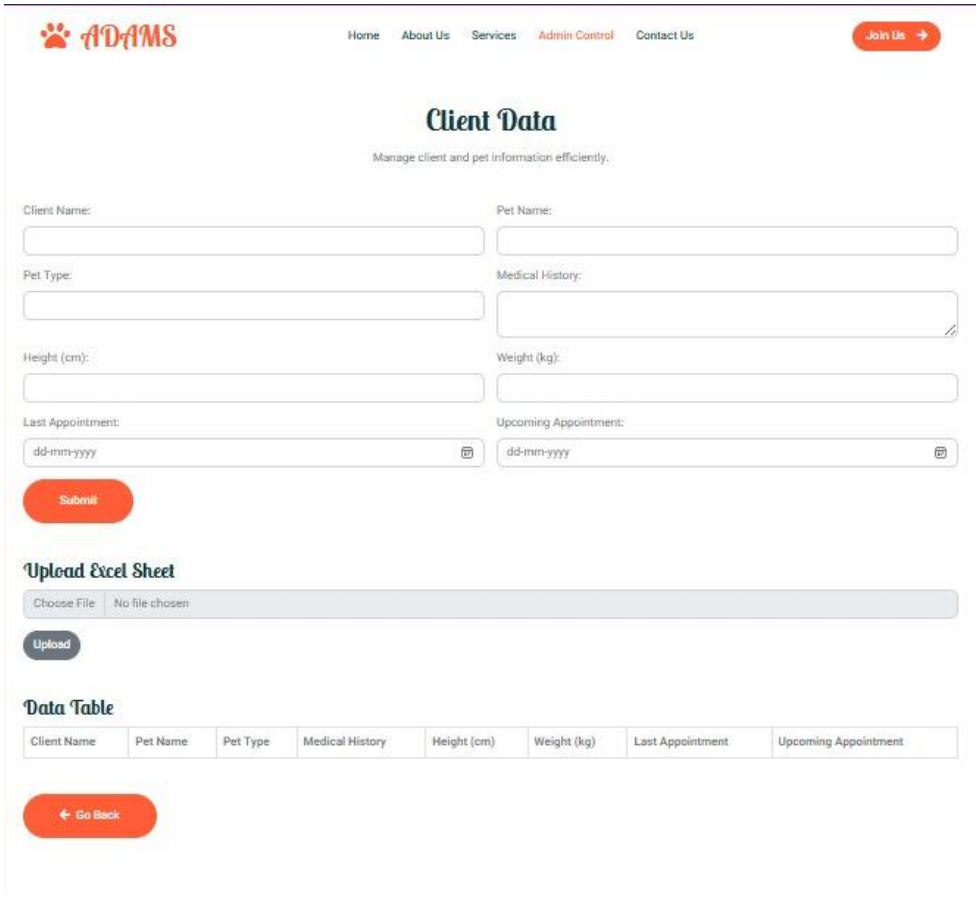
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Pet Type:
Medical History:
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Weight (kg):
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Upcoming Appointment:
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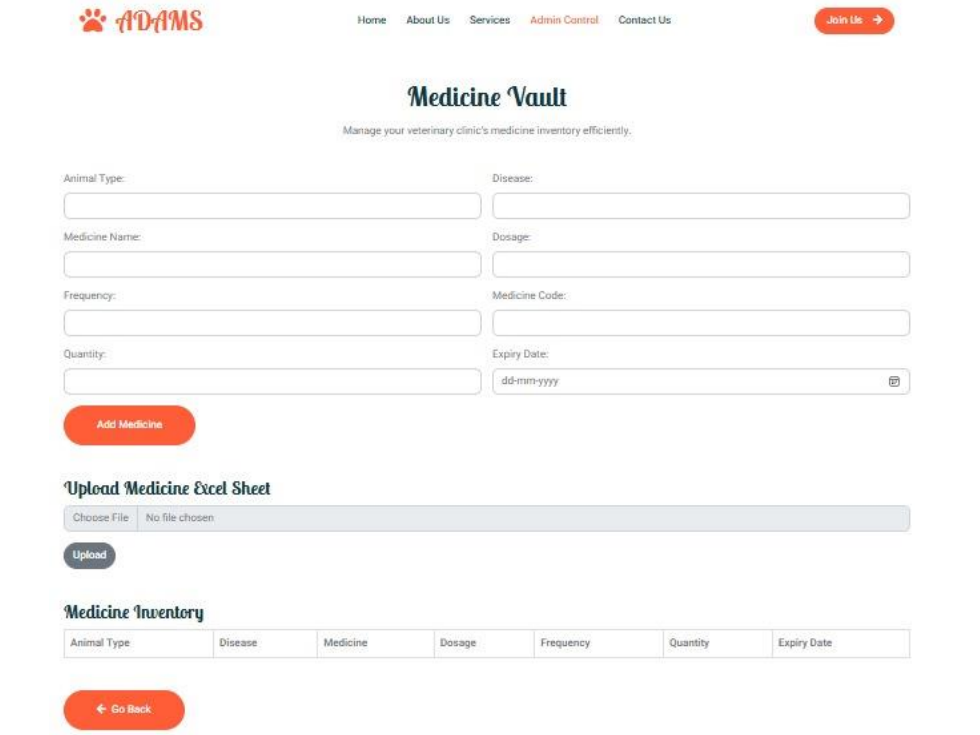
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Medicine Code:
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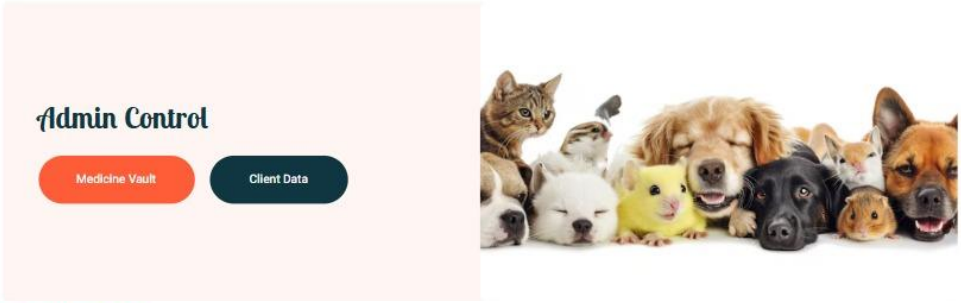
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# 13. Conclusion & Future Work

The Advanced Doctor Animal Management System (ADAMS) successfully delivers an integrated, efficient, and user-friendly solution for veterinary operations. By combining real-time medication inventory management, expiration tracking, and organized animal healthcare records into a cohesive system, ADAMS empowers veterinary staff to improve operational efficiency, reduce human errors, and enhance the overall quality of animal care.

The experimental phase validated the system's usability, reliability, and positive impact on workflow streamlining. The modular architecture and technology stack position ADAMS for future scalability, security upgrades, and broader deployment across veterinary practices..

**Future Work:**

To further enhance ADAMS' capabilities and reach, the following developments are planned:

1. **Mobile Application Development**

   Building dedicated mobile apps for Android and iOS to allow remote access and on-the-go updates to medical records and inventory.

2. **Real-Time Inventory Analytics**

   Integrating advanced analytics dashboards to predict medication needs based on historical usage patterns and treatment trends.

3. **Multi-User Role Management**

   Adding role-based access controls for veterinarians, assistants, and administrators to improve security and workflow clarity.

4. **SMS Alert Integration**

   Expanding the notification system to include SMS alerts for critical stock and expiration warnings.

5. **Cloud Deployment and Data Backup**

   Migrating to a cloud-based infrastructure (AWS or Azure) for improved scalability, real-time backups, and disaster recovery.

6. **Machine Learning for Predictive Maintenance**

   Implementing machine learning algorithms to predict future stock needs and automatically recommend procurement timelines.

7. **Integration with RFID Technology**

Using RFID tags for real-time tracking of medication usage and animal medical devices.

ADAMS represents a significant advancement in veterinary healthcare management, and with continuous innovation and feedback-driven improvements, it has the potential to become a leading digital tool in the veterinary field.

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